



Making Conservation Work:

Linking Rural Livelihoods and Protected Area Management in Bangladesh



Edited by

Jefferson Fox
Bryan R. Bushley
Sugato Dutt
Shimona A. Quazi

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East-West Center
and
Nishorgo Program of the
Bangladesh Forest Department





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Introduction: Linking Rural Livelihoods and Protected Areas in Bangladesh

Jefferson Fox
Senior Fellow, East-West Center, Honolulu, Hawaii

Introduction

Protected areas such as national parks and reserves form the front line in the campaign to conserve biodiversity. Worldwide protected areas cover more than 12% of the planet's surface (Chape et al. 2003). In Bangladesh, one of the world's most populated nations, protected areas cover only 1.67% of the total land area. Overall, Bangladesh ranks 129 out of 155 countries in terms of the percentage of its national territory under some form of protected area status (World Resources Institute 2006).

Simply declaring an area to be a 'national park' or 'protected area' has not worked in Bangladesh or elsewhere to stop the steady loss of biodiversity for a number of reasons. Among others, these include the fact that timber- or fuelwood-based commercial operations located in and around these areas perceive them to be a direct threat to their economic well-being, while neighboring low-income households perceive a threat to their livelihoods from reduced access to forest biomass in different forms. In addition, a number of non-local groups such as timber companies, international development banks, the military, and tourism agencies often have valuable economic and political interests at stake in these areas (Brechin et al 2002). Scholars such as Dove (1993) suggest that if local people develop an economically valuable forest resource, elite economic and political interests will assume control of it. These scholars suggests that the problem for forest peoples is not that they are poor but that they are politically weak; they inhabit a resource which is coveted by groups that are more powerful than they are.

Based on the belief that human activities are incompatible with ecosystem conservation, managers of national parks and other protected areas across the

globe often prioritize keeping local people out. Many national agencies charged with managing protected areas lack the human and financial capacities, the knowledge of conservation, motivation, and commitment, and the resources necessary for supervising the vast protected areas under their rule, particularly if they have alienated local communities or local commercial interests with a stake in resource extraction from those areas. Mounting pressures on protected areas from growing populations, persistent poverty, and the penetration of the market economy all compound the pointlessness of trying to manage protected areas by isolating them from human activities.

In the 1980s and 90s conservation organizations responded to these threats to biodiversity by pioneering new approaches to protected area management that promised to build support among local constituents by sharing the social and economic benefits derived from these areas. Brechin et al. (2002) refers to these as 'people-oriented' conservation programs. These programs include community-based conservation, such as integrated conservation and development projects (ICDPs), community based natural resource management (CBNRM), co-management, community-managed or indigenous reserves, and community conservation areas (CCAs). Co-management or collaborative management involves two or more social actors negotiating, defining and guaranteeing amongst themselves a fair share of the management functions, entitlements and responsibilities for a given territory, area or set of natural resources. The co-management approach has been a fundamental recommendation of the past two World Parks Congresses, and is actively advocated by the IUCN. The goals of these initiatives include compensating local people for lack of access to protected areas and providing alternative income sources that allows people to benefit economically from conservation while refraining from environmentally destructive practices.

While a number of successful community oriented approaches to conservation can be cited such as the Il Ngwesi Community Conservation Area in northern Kenya (Oates 1999) and Kakadu National Park in northern Australia (Perdan 2004), critics of community-oriented approaches to conservation have started to question or even reject these approaches. Despite significant investments in hundreds of relatively expensive projects, almost entirely carried out or financed by conservation organizations and international development agencies, there are few unambiguously successful cases where local people's needs and aspirations have been reconciled effectively with protected areas management (Wells and McShane



2004). Demonstrating constructive ways of involving local stakeholders in the conservation and sustainable use of biodiversity in and around protected areas remains one of the most important challenges and priorities for nature conservation.

Many past efforts to incorporate local people into the management of protected areas proceeded on the basis of simple and incorrect assumptions about the nature of the dependence of poor local people on natural resources systems. Experience has shown that site-specific biodiversity conservation is rarely compatible with unfettered development, income generation, or livelihood interests. In practice, there will be winners and losers. Better techniques are needed to identify and understand the goals and interest of the local people living in and around protected areas.

In 2004, the Bangladesh Forest Department launched the "Nishorgo Program for Protected Forest Area Management". At field level, the Nishorgo Program was to test and refine a model for collaborative management of five protected areas in the country, including Lawachara National Park, Satchari National Park, Rema-Kalenga Wildlife Sanctuary, Chunati Wildlife Sanctuary, and Teknaf Game Reserve. At these five pilot co-management sites, the Forest Department has been working to develop a collaborative management platform by which key local stakeholders are to have a greater voice in management decision-making while also perceiving a greater benefit from the protected areas and their surrounding landscapes. The Nishorgo Program receives assistance from USAID in the form of the Nishorgo Support Project.

In 2006 the East-West Center, the Nishorgo Support Project, and the Bangladesh Forest Department provided eight research fellowships to students, lecturers, and professors in various Bangladeshi universities, and to Assistant Conservators of Forests in the Forest Department, to conduct six months of field research in the five pilot sites. Through these small research grants we sought to explore the impacts and implications of protected areas on the livelihoods of people living in and around the chosen protected areas. Among others, the types of questions we were interested in exploring included: What benefits (products) do rural people derive from protected areas and what services do they provide in return? What are the market dynamics and market chains of these products? Who benefits from these products and in what ways? Who are the key stakeholders? What is the impact of protected areas on women, the rural poor, and ethnic minorities? What is the potential for alternative products such as ecotourism to be developed in these

areas? What are the points of contention between key stakeholders over existing or potential resource use patterns? Are local institutions capable of supporting innovation and experimentation in resource management systems? How do farmers respond to risk and uncertainty? How do they respond to new technologies and innovations?

The Role of Non-Timber Forest Products

Numerous studies have attempted to document how traditional communities living in and nearby protected areas use forest resources. Understanding the resource-use patterns of such communities provides a basis for seeking the participation of such communities in forest conservation. Hegde and Enters (2000) addressed the importance of forests in the household economies of eight indigenous communities located near a Wildlife Sanctuary in Southern India. They found that villagers living within or near the sanctuary collected more non-timber forest products (NTFPs) than villagers living far from the sanctuary and depended on NTFPs for a greater portion of their income. All income groups used NTFPs for subsistence although, with the exception of the low income group, the contribution of NTFPs to household subsistence was not high. The collection of NTFPs was more important in villages that had legal access to the sanctuary (where collection of forest products was allowed) and had access to markets. Where there were no restrictions on forest use, higher income groups used the resources more heavily than lower income groups and would suffer more from any restriction on forest use. People's reliance on forests declined with increased levels of both education and opportunities in non-forestry vocations.

Among our case studies, Belal Uddin and Sharif Mukul found that NTFPs and homegardens play important roles in improving the livelihoods of people living in around Satchari National Park. The authors found that wealthier households are less dependent on NTFPs than poorer households and suggest that enriching homegardens and buffer zones with commercially important NTFPs may pay off through reduced pressures on the national park. Likewise, Rahimullah Miah (this volume) examined the role of NTFPs and homegardens in Chunati Wildlife Sanctuary. He found that people living in four villages within and nearby the sanctuary received a significant portion of their livelihood from the sanctuary. He suggests that the cultivation and domestication of NTFPs in the interface landscape of protected areas can play an important role in the co-management of those areas.



C.M. Caron (1995) examined household food procurement strategies in a Sri Lankan village located adjacent to the Sinharaja Man and the Biosphere Reserve. Caron found that after the reserve prohibited villagers from conducting swidden agriculture that the community adjusted by switching from growing their food needs in their swidden fields, to a variety of alternative practices including collecting NTFPs illegally from the forest and tapping kitul palms (which is legal with a permit from the reserve) for a type of sugar known as jaggery. Within their homegardens villagers planted cash crops of tea and rubber and began protecting all kitul palm trees and saplings for tapping in the future. The study suggests that establishment of the forest reserve shifted the supply of basic needs from the forest to the market. While this reduced the overall pressure on the reserve, it also intensified the pressure on specific resources such as the kitul palm.

In this volume, Zashim Uddin and Snigdha Roy focused on the collection of two medicinal plants, menda (*Litsea glutinosa*) and bohera (*Terminalia bellerica*) in Rema-Kalenga Wildlife Sanctuary for sale in the medical plant markets. They found that local residents knew little about the cultivation of these species and that they currently manage them as open-access resources with whomever wishing to collect them doing so freely, if illegally. The authors suggest that unless the cultivation and management of these species is promoted by sanctuary personnel that they will become increasingly rare, if not extinct, in the sanctuary.

Udaya Nagothu (2001) studied fuelwood and fodder collection in the Sariska Tiger Reserve in Rajasthan, India. He found that the extraction of fuelwood and fodder resources by the local community did not cause deforestation in the reserve as the major portion of fuelwood and fodder came from dry wood and grasses. He also found that local people initiated strategies such as changing the composition of their livestock herds, regulating grazing patterns, producing fodder on private farms, and restricting the use of resource from temple lands in order to reduce pressures on the reserve. Nagothu concluded that main stream resource management agencies such as the Forest Department often ignore local modes of resource exploitation resulting in conflicts between local people and conservation agencies.

Rafiqa Sultana (this volume) examined fuelwood collection in Satchari National Park. Contrary to Nagothu's conclusions that fuelwood collection in the Tiger reserve does not cause deforestation, Sultana found that local households are collecting close to two tons of fuelwood daily from the 243 hectare park; a figure that she suggests is not sustainable.

Ecotourism

Many managers of protected areas view ecotourism as an effective method for promoting the conservation of endangered species and habitats in developing countries. By creating economic incentives for impoverished villagers or their communities, ecotourism is thought to encourage local guardianship of biological resources. Bookbinder et al (1998) assessed the impact of ecotourism on the income of villagers living near Royal Chitwan National Park, Nepal. They found that despite a visitation rate exceeding 60,000 tourists, most from industrial nations, that the economic impact of ecotourism on household income was minimal and limited to villages close to the park's main entrance. They concluded that ecotourism is not a panacea for long-term biodiversity conservation.

In another study in Sariska Tiger Reserve Nagothu (2003) examined local people's attitudes towards conservation and wildlife tourism. In this study he found that villagers were aware that a well-conserved protected area could result in greater benefits from tourism. Nagothu suggests a positive correlation between the benefits people obtained from tourism and their support for the existence of the protected area. Some of the main problems the study identified included unequal distribution of the benefits from tourism, and a lack of local people's involvement in tourism and development activities.

In this volume, Modinul Ahsan examined the perceptions of tourism by people living in three indigenous communities located in and around Lawachara National Park. Modinul found that people living in two of the three communities received relatively minimal benefits from the park, while people in the third community, located within the park and most affected by tourists, have not entered the tourism economy and as a result have received no benefits at all. He suggests that local institutions, both formal and informal, should be more involved in helping local people to gain benefits from tourism.

Towards a More Comprehensive Understanding of Human Needs and Biodiversity

Salafsky and Wollenberg (2000) developed a conceptual framework for assessing the impact of various activities implemented to support rural livelihoods on biodiversity conservation. This framework attempted to rank how dependence on diverse livelihood activities such as collecting NTFPs or timber harvesting affected:



1) maintaining species at the site; 2) maintaining habitats at the site; 3) percentage of the site on which the livelihood activity depends; 4) period and frequency of biodiversity use on which the livelihood depends, and 5) dependence of the livelihood activity on associated conservation values. Salafsky and Wollenberg tested the framework and the scales they developed by evaluating 39 project sites in the Biodiversity Conservation Network. Their results suggest that because most NTFP harvesting businesses depend on only one or two species, there is likely to be strong pressure to increase the management of the system to promote these species, ranging from forest enrichment to domestication in agroforestry systems. These management approaches may maintain the population of the focal species, but may have no impact or even a negative impact on overall habitat conservation.

Among our case studies, Sayeed Riadh found that cultivating betel leaf in the park provided an important source of cash income for local communities. While betel leaf cultivation may improve the livelihoods of park residents, implications of cultivating betel leaf trees in the park are less sanguine for park habitat.

Of the various product harvesting projects they evaluated, Salafsky and Wollenberg (2000) found that the projects with the highest linkage to conservation are timber production and wildlife management both for harvesting and tourism purposes. Timber is highly ranked because it uses a number of species and has a strong habitat linkage. Animal harvesting and viewing of animals in ecotourism are highly ranked because animals are at a higher trophic level and thus depend on the surrounding habitat for their survival. Salafsky and Wollenberg also showed that unless local stakeholders recognized the link between their livelihood activities and biodiversity conservation that it will not matter in terms of influencing their actions. If local people do not perceive this link, they may not take action to stop direct or indirect threats to the protected areas. Linkages between livelihood activities and conservation, however, are only among many factors influencing conservation success.

Among our case studies, Ala Uddin and Abu Shadat Foisal examined local perceptions of wildlife in Chunati Wildlife Sanctuary. They found that local people are knowledgeable about wildlife, are interested in their sustainable management, and are aware of the links between their activities and wildlife conservation. But the failure of local forest department officials to solicit local participation in the management of the sanctuary severely impacted the livelihoods of both local people as well as wild animals.

Salim Uddin and Abu Sayed Arfin Khan (this volume) analyzed the impact of

Muslim refugees forced to flee their homes in Myanmar on the Teknaf Game Reserve, which is located on the Bangladesh/Myanmar border. This is an example of increasingly common problem as people are forced to flee from wars, civil conflicts, and natural disasters. The authors found that the refugees are far more dependent on the game reserve to meet their livelihood needs than are local people that live in and near the reserve.

Overview of Papers in this Volume

Belal Uddin and **Sharif Mukul** question the roles NTFP collecting and home gardening play in the livelihoods of local residents and forest conservation in and around Satchari National Park. Their paper suggest that 27% of households in the park receive at least some cash income from NTFPs, and that for 18% of households processing and selling NTFPs forms their primary occupation. The authors found that wealthier households rely less on forest products from the park, while poorer households are heavily dependent on the park to meet their subsistence needs. Belal and Mukul conclude that park managers should seek to enrich home gardens and the park's buffer zone with commercially important NTFPs.

Sayed Riadh examines and compares the role of NTFPs in the livelihoods of communities living both within and outside of Lawachara National Park. His paper suggests that local people meet their fuelwood demands from the forest either by collecting it themselves or purchasing it from the market. Betel leaf cultivation in the park provides the only source of cash for the Khasia communities that reside within the park. With the exception of a few wealthy households living outside of the park, all households collect bamboo, cane, wild vegetables and medicinal plants for domestic consumption.

Strategies to foster development based on the gathering, processing, sorting, collection period, and diversification of non-timber forest products (NTFPs) implicitly target households as principal beneficiaries. **Rahimullah Miah** studied four villages located in or near Chunati Wildlife Sanctuary that derive a significant portion of their livelihoods from NTFPs. He concludes that both research on the cultivation and domestication of NTFPs and co-management practices are needed to allow forest villagers to continue to live in the sanctuary in a sustainable manner.

Large portions of the world's population depend on medicinal plants to meet the primary health care needs. **Zashim Uddin** and **Snigdha Roy** explore linkages between two medicinal plants, menda (*Litsea glutinosa*) and bohera (*Terminalia bellerica*), and the livelihoods of local people living in the vicinity of Rema-Kalenga



Wildlife Sanctuary. Uddin and Roy found that while many people are involved in the illegal collection and sale of both species, that the income gained from these activities forms an important component of local livelihoods. They recommend that local people should be consulted and involved in the design and implementation of plans to cultivate and manage these species.

Resource managers and academics are increasingly aware of the importance of recognizing local perceptions, knowledge and participation in defining management strategies and actions for the conservation of natural resources. **Ala Uddin** and **Abu Shadat Ahmed Faisal** evaluate local peoples' perceptions and attitudes toward wildlife in Chunati Wildlife Sanctuary. They argue that because Forest Department officials failed to solicit local participation in the design and management of the sanctuary, management policies have severely impacted the livelihoods of both local peoples and wild animals. Despite their problems with park officials, however, local people remain interested in playing an active role in protecting the environment so that wild animals can make a come-back.

Rafiq Sultana examines linkages between fuelwood collection and community livelihoods in Satchari National Park. She found that three distinct groups collect fuelwood: villagers living in the park, villagers living outside of the park, and tea estate laborers. Overall, approximately two tons of fuelwood are extracted from the park by these communities daily. All villagers (those living in and outside of the park and tea estate laborers) meet 100% of their energy needs from the park. While tea estate laborers do not collect wood for purposes other than energy, approximately 39% of households in the interior village and 100% of collectors from villages outside the park depend on the park for earning cash income. Fuelwood collection accounts for 62% and 100% of the cash income earned by villagers living in and outside of the park, respectively.

The Bangladesh Forest Policy recognizes ecotourism as a forestry activity that should be promoted. **Modinul Ahsan** looks at the perceptions of tourism and the benefits received from tourism by three communities living in and adjacent to Lawachara National Park. He found that two out of the three villages studied received benefits from tourism activities such as the sale of handmade clothes, eco-tour guide services and cultural shows. On the other hand, the community residing within the park both received the fewest benefits from tourism and encountered the most problems with tourists disturbing their village. He suggests that not all communities benefit from tourism.

Finally, **Salim Uddin** and **Abu Sayed Arfin Khan** compare the dependency,

livelihood activities, and impacts of Rohingya refugees from Myanmar with activities of local people on Teknaf Game Reserve. Their paper suggests that 57% of all households, including 100% Rohingya refugees, are totally dependent on the reserve for their livelihoods. The authors assessed four livelihood activities—fuelwood collection, sungrass collection, illicit felling, and brickfields—as having a major impact on the game reserve and posing a high risk to its future. While Rohingya refugees are comparatively more dependent on the forest than local people, both local people and refugees desperately need alternative income generation activities. The authors suggest that both groups want to collaborate with national and international organizations to resolve the refugee situation in a timely and congenial manner and to repatriate Rohingya refugees to their country.

Conclusions

Bangladesh is among the most poor and densely populated nations on the face of the globe. The difficulties forest department officials face in promoting the conservation of flora and fauna are among the most severe found anywhere. This joint project of the East-West Center, Nishorgo Support Project, and Bangladesh Forest Department encouraged university students, teachers, and forest department officials to conduct field research on the impacts and implications of protected areas on the livelihoods of people living in and around the chosen protected areas. The papers in this volume are the results of this initiative. These papers point to several important conclusions about linkages between rural communities and conservation in protected area management. They also set a baseline of information from which the NSP will work to improve the implementation effectiveness of protected area conservation through co-management with local stakeholder participation.

First, they suggest the difficulties and constraints that have occurred in Bangladesh in linking rural livelihoods and conservation. Promoting the management and even domestication of NTFPs may give local communities incentives for protecting these species, but this may have little or no impact on overall habitat conservation. Likewise, eco-tourism may encourage local guardianship of biological resources, but the benefits local people receive may be minimal and/or unequally distributed among participating communities. Second, they provide valuable lessons (or recommendations) in how to improve the linkage between rural livelihoods and conservation. For example, these papers suggest that no one strategy will work everywhere and indeed, probably no one strategy can work on its own at any given



site. It may be possible to link tourism enterprise, for example, in only one part of a protected area, and use other approaches in other parts of the park. To make conservation happen, park and resource managers need to be able to understand the specific local conditions at their project site, both at the start of the project, and as they change over time. They need to develop the appropriate mix of strategies that include incentives and other strategies such as education and awareness. In addition, they need to monitor the results of their interventions, analyze the data, and use it to make appropriate responses in a process of adaptive management.

Third, these case studies illustrate the importance of developing constructive ways of involving local stakeholders in conservation and sustainable resource use practices based on the goals, interests, and understanding of the people living in and around the protected areas. These case studies confirm that protected areas cannot be managed successfully on the basis of simple and incorrect assumptions about how local people use natural resources. The authors of these case studies unanimously argue for incorporating local people and their knowledge into park management decisions through some type of co-management system. These authors suggest that establishing a process to constructively work with people is perhaps the most important step that can be taken on the road to sustainable protected area management. The process by which decisions are made about resource management may be more important than any product or plan protected area managers can produce.

Brechin et al. (2002) argue that much of the debate on biodiversity protection has relied on a false dichotomy between rural livelihoods and biodiversity conservation. In contrast they suggest that establishing a legitimate process to constructively work with people is the most feasible and morally just way to achieve long-term nature protection. They suggest that since conservation is a human organization process, the goal of biodiversity protection depends on the strength and commitment of social actors. They posit that successful biodiversity conservation will ultimately be based the adoption of three broad principles that local people must have the right to: 1) participate at all levels of the policymaking process as equal partners; 2) self-representation and autonomy, and 3) political, economic, and cultural self-determination.

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Improving Forest Dependent Livelihoods Through NTFPs and Home Gardens: A Case Study from Satchari National Park

Mohammad Belal Uddin

Sharif Ahmed Mukul

Department of Forestry, Shahjalal University of Science and Technology, Sylhet, Bangladesh

Abstract

Non-timber forest product and home gardens play crucial roles in the livelihoods of people living in most tropical countries. They also play important roles in forest conservation. This paper explores the roles NTFPs and home gardens play in improving the livelihoods of forest dependent people and forest conservation in and around a newly declared protected area, Satchari National Park. We conducted an intensive field survey from mid-February to late June, 2006. Study results suggest that 27% of households in the Satchari area receive at least some cash income from NTFPs. Moreover collection, processing and selling of NTFPs constitutes the primary occupation of 18% of these households. We also found that wealthier households with rich homegarden compositions rely less on nearby forests, than poorer households who are mostly dependent on forests to meet their subsistence needs. Based on these results and discussions with various stakeholders in the study area, we suggest that it would be useful to enrich home gardens and buffer zones with commercially important NTFPs. We conclude that a co-management approach should be introduced to reduce local dependency on Satchari National Park.

Introduction

Millions of people throughout the world make extensive use of biological products from the wild (Koziell and Saunders 2001 and Lawes et al. 2004). These items, commonly termed non-timber forest products (NTFPs), are harvested for both subsistence and commercial use, either regularly, or as a fallback during times of need. They add to peoples' livelihood security, especially for forest-dependent people (Posey 1999, Cocks and Wiersum 2003). NTFPs also create new opportunities for entrepreneurial development. The collection and processing of

NTFPs provides major employment opportunities to the poorest rural population of nearly 300,000 (Basit 1995), and contributes about Tk 1.3 billion annually to Bangladesh's national economy (GOB 1993).

The contributions of non-timber forest products have a positive impact on rural livelihoods. The fact that their use is less ecologically destructive than timber harvesting has encouraged the belief that more intensive management of forests for such products could contribute to both development and conservation objectives, and have thus led to initiatives to expand commercial use of NTFPs (Arnold and Ruiz Perez 2001). It is also widely believed that poor rural communities may be less inclined to engage in illegal logging if they are able to derive more material benefits from maintaining forests for various alternative goods and services (Oldfield 1988). Moreover, in many cases, development of non-timber forest resources has assisted stakeholders in obtaining opportunities to merge forest conservation with economic development at the community and national levels (CBD 2003).

Home gardens have a long tradition in many tropical countries. They consist of an assemblage of plants and may include trees, shrubs, vines, and herbaceous plants, growing in or adjacent to a homestead or home compound (Nair 1993). Home gardens represent a well-established traditional land-use system in Bangladesh and about eighty percent of the population lives in villages having small home gardens (Zashimuddin 2004). Such gardens play an important role in the livelihoods of rural poor, and in the rural economy of the country (Chowdhury and Mahat 1993). Moreover, trees and tree products from home gardens play an important role in household food security, as it is a sustainable source of food, fruits and vegetables. Home gardens also play a significant role in forest conservation by providing for subsistence needs of local populations, which they may otherwise have derived from the forest.

Protected areas should help to conserve biodiversity. However, in developing countries like Bangladesh, the declaration of a site as a protected area is often done without thinking about rural communities abutting forests who are traditionally dependent on their resources for subsistence and food security (Sharma et al. 2005). Thus conflicts occur between protected area managers and local forest dependent peoples who maintain their livelihoods with forest resources, particularly non-timber forest products. Our study focuses on the contribution of NTFPs and home gardens in improving rural livelihoods and forest conservation in and around the newly declared Satchari National Park.



Background

Satchari National Park (SNP) is the newest among the seventeen protected areas of Bangladesh. The word "Satchari" comes from "seven streams" (locally called 'chara') and refers to the streams that flow through the forest. The park is located in Chunarughat Upazilla of Habigonj District and is situated nearly 130 km northeast of Dhaka, and about 60 km southwest of Srimongol. The area of the park is about 243 ha and is comprised of forests of Raghunandan Hills Reserve Forests within the Satchari Range. The Raghunandan Hill Reserve borders the park on its northwestern side, while India lies to the south of the park (Fig. 1). Tea estates, coffee and rubber plantations, and rice fields abut other adjacent areas of the park.

The park originally supported a vegetation cover of mixed tropical evergreen forests. However, almost all of the original forest cover has been removed or substantially altered and turned into a secondary forest (Mollah et al. 2004). Now only 200 ha of natural forest remains, which has a higher potential for eco-tourism than the remaining secondary forest. Some areas of the park are subjected to flash floods. Soil texture of the park area is generally sandy loam to silty clay and soils are more acidic than in adjoining ecological zones. The topography is undulating with slopes and hillocks, locally called *tila*, ranging from 10 to 50 meters in elevation. A number of small, sandy-bedded streams drain the forest, all of which dry out in the winter dry season after November. The total annual average rainfall is 4162 mm. July is the wettest month, having an average of about 1250 mm of rain, while December is the driest, with no rainfall. May and October, the hottest months, have an average maximum temperature of around 32°C, while January is the coldest month, when the minimum temperature drops to about 12°C. The relative humidity is about 74% during December while it is over 90% during July-August (Choudhury et al. 2004).

The park is very rich in flora (about 241 species) and fauna. From various secondary sources we found that a total of 6 species of amphibians, 18 species of reptiles, 220 species of birds and 24 species of mammals (including 6 species of primates) have been recorded from this forest (Mollah et al. 2004). Moreover, it is one of the last habitats in Bangladesh for hoolock gibbons (*Bunopithecus hoolock*) and the rare Hooded Pitta (*Pitta sordida*). But in recent years, the biodiversity of the park has become highly degraded. Already a number of animals and tree species have become locally extinct, while many more are on the verge of disappearing. Overall, a large number of species are variously threatened due to habitat destruction, illegal poaching and over-exploitation.

A total of 19 villages with varying degrees of interaction with SNP have been identified. Of them, one village (Tiprapara) is located inside the park and the rest are located from 5 to 8 km away. Table 1 lists the degree of dependency the various villages have on the park. Local people have traditionally collected various resources from SNP and other adjacent reserved forests. Many households, particularly poor households from the identified villages, rely either entirely or partially on the park for collecting fuelwood, timber, and bamboo.

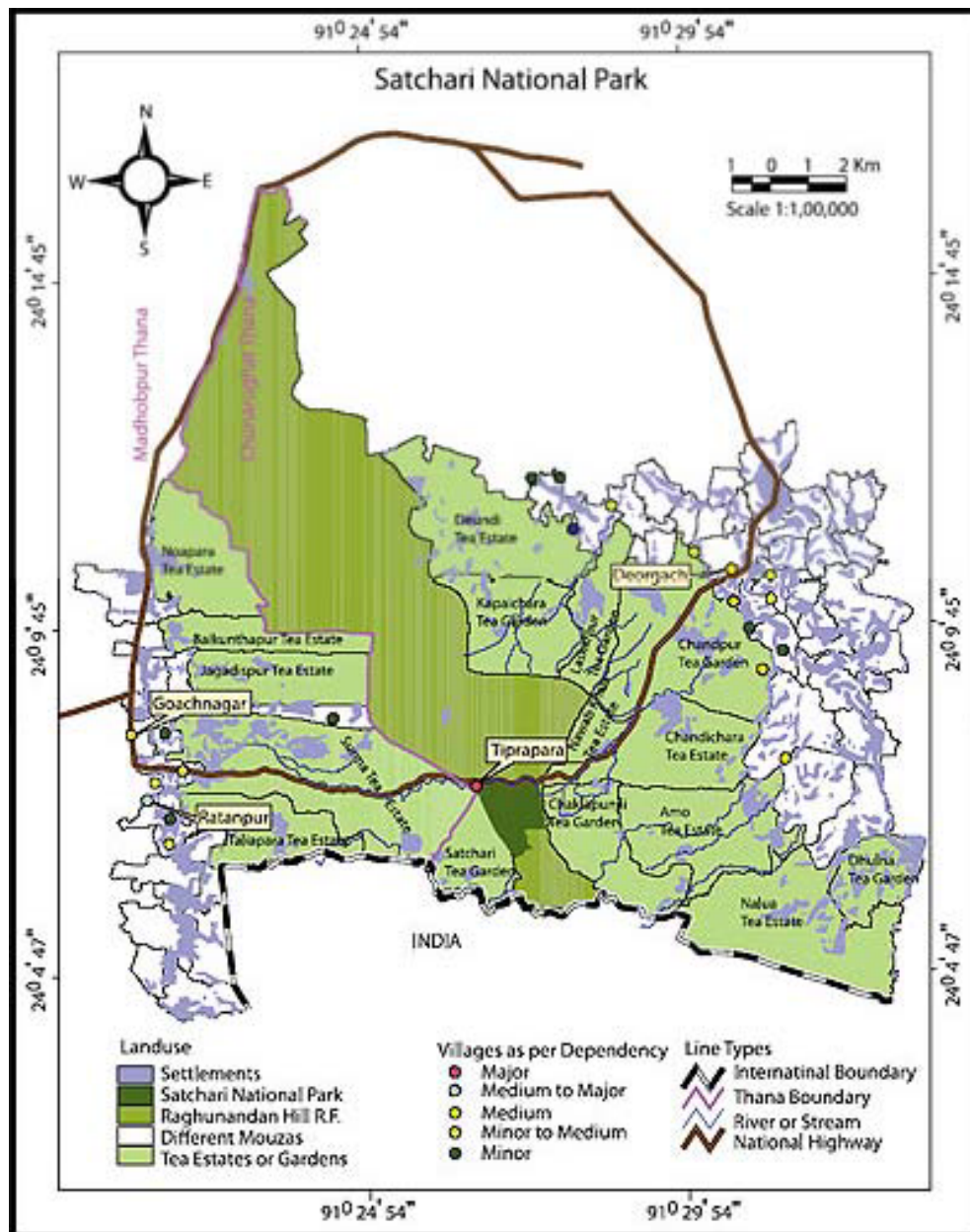


Figure 1. Map of Satchari National Park (Source: Nishorgo Support Project 2007)



Little is known about the availability and collection of NTFPs in Satchari National Park. According to Mollah *et al.* (2004) people extract about 12 different types of NTFPs from the park and adjacent forests. Fuelwood is extracted on a large scale; bamboo and building materials are extracted on a medium scale, and other resources are extracted on a minor or negligible scale. Extraction of resources from the forest is seasonally dependent. Villagers extract forest resources primarily for meeting household needs, as well as for earning additional income to support or supplement their livelihoods.

An average household owns approximately 0.10 ha, though the amount of land owned varies with the household's economic condition. Within the homesteads people usually have home gardens and plant various timber species, horticultural species and seasonal vegetables to meet their own needs and sometimes to sell for additional cash income.

Table 1: Degree of Dependency on Satchari National Park Found in Various Villages

Degree of dependency	Name of the Villages
Major	<i>Tiprapara</i>
Medium to major	<i>Gazipur, Ratanpur</i>
Medium	<i>Kalishiri, Ghanoshyampur, Doulatkhabad, Deorgach</i>
Minor to medium	<i>Baghbari, Teliapara, Goachmagar, Ektiarpur, Marulla, Nayani Bongaon</i>
Minor	<i>Shanjanpur, Rasulpur, Promnandapur, Bhaguru, Enatbad, Holholia</i>

Source: Mollah et al. (2004); Names of case study villages are in italics.

Study Objectives and Methodology

The aim of our study was to illustrate the role and importance of NTFPs to local people's subsistence and income and to find out the potential of NTFPs as well as home gardening in forest conservation and poverty alleviation among the people living in and around Satchari National Park.

Our study was based on a literature review and primary data collection. We reviewed reports from existing studies done by the government and various national and international non-governmental organizations (NGOs) concerning Satchari National Park and protected area management. We randomly selected one village from each of the first four forest dependency categories as identified by Mollah et al. (2004 - Table 1) including the only village inside the park - Tiprapara. We did not select any villages with only minor dependency on the park. As key

informants, we chose the residents of the villages who had a broad and in-depth knowledge about their village and its various households. We conducted focus group discussions (FGD) to construct community maps and community profiles. During field visits we walked transects in order to observe and verify the information we recorded during the community mapping exercises.

We conducted intensive household surveys in our four sample villages - Tiprapara, Ratanpur, Deorgach and Goachnagar - from mid-February to late June, 2006. We classified households within each village into three forest dependency strata or classes: "totally or most dependent", "moderately dependent", and "less dependent". To calculate a household's level of forest dependency we considered the contribution of forest to the household's annual cash income - i.e., the direct cash derived from selling of forest products, and the cash value of products they consume from forest, which they may have otherwise purchased from the market. We also considered local peoples' perceptions regarding their dependency on forest.

In Tiprapara, we took a 100% sample, as villagers are highly dependent on the park for their subsistence. In Ratanpur, Deorgach, and Goachnagar we took a 10% sample of households from each of the forest dependency classes using a stratified random sampling approach. We used a semi-structured questionnaire to collect data on each household, their relationship with the forest, resources exploited from the forest, quantity and frequency of exploitation of resources, traditional patterns of resource utilization, major threats and causes of forest destruction and each household's perception of conservation and park management, their home garden composition and its role in households food security and livelihoods. Samples of unknown or difficult to identify species were collected and verified by botanists. We also gathered additional data on the market potential of different locally available NTFPs, and their probable contribution to a household's socio-economic enrichment. Furthermore, on each topic the respondents were free to express their own views.

Results

Community livelihoods in and around Satchari National Park

Demographically, the sample households in our study area fall into four categories: forest villagers, local poor people from villages outside the forest, tea estate laborers, and auctioneers (*moholdars*). In our sample villages there are about 818 households with an average family size of around six members (Table 2). Among



818 households we interviewed about 96 households having 597 members (49% female). The primary occupation in our study area is agriculture (37%), mainly paddy cultivation, followed by NTFP extraction (19%), timber poaching (18%), day labor (15%), small business (5%), service in government agencies or NGOs (4%), and overseas employment (2%) (Fig. 2). The scenario is different in Tiprapara; here there are no agricultural lands as in other villages, and so the main income generating activities observed are day labor (38.5%) followed by extraction of NTFPs (mainly fuelwood, 32%). Forest patrolling is the main service conducted by residents of Tripura. Moreover, day laborers also collect fuelwood on their days off.

During the time of our household survey we have categorized the households into three different income classes i.e., extremely poor (monthly income below Tk. 2,000); medium to poor (income is below Tk. 7,500 but above Tk. 2,000 /month) and rich (monthly income is Tk. 7,500 or higher) by asking them two basic question, i.e., what is their monthly expenditure and monthly savings (if any). Based on this categorization, approximately 37% of the households in our sample villages fall into extremely poor group followed by medium to poor (32%) and rich (31%). Beside this, the literacy rate in the villages is about 54%, among which children who read at the primary level comprise the largest group (61 %).

Table 2: Information of Selected Villages Having Interests in Satchari National Park

Name of village	Approximate No. of HHs	Location	Union	Level of dependence	Forest practices
Tiprapara (Forest village)	18	Inside Satchari NP	Paikpara	Major	Collect fuelwood, house building materials, fruits and other NTFPs, cultivate lemon and others
Ratanpur	156	Outside Satchari NP	Sahajanpur	Medium to major	Mainly involved with illegal tree felling, and majority of HHs collects fuelwood
Deorgach	316	Outside Satchari NP, east	Deorgach	Medium	Mainly collect fuelwood, some involved with illegal tree felling
Goach Nagar	328	Outside Satchari NP, west	Sahajanpur	Minor Medium	Same as above

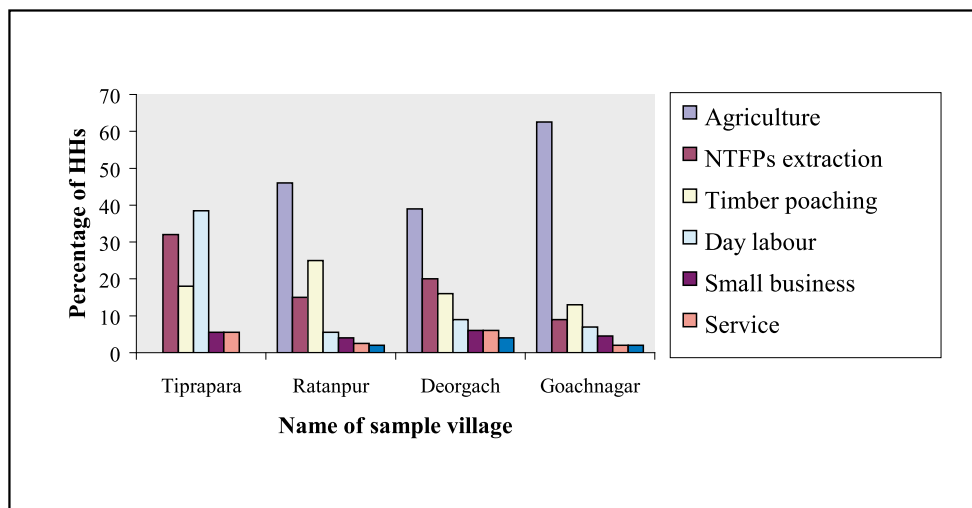


Figure 2: Households Involved in Various Livelihood Activities in and Around Satchari NP

Dependency of Households on Forest

The local inhabitants have traditionally used Satchari National Park and adjacent forest area for centuries. Our study suggests that, about 13% of households of our sampled villages are totally dependent on the forest for their livelihoods, while the others are moderately or less dependent (Fig. 3). In Satchari National Park many poor households are entirely or partially dependent on the forest for collection of fuelwood, timber, and bamboo. All of households in Tiprapara depend on the forest for their fuelwood. They also cultivate lemons in a confined area of the national park.

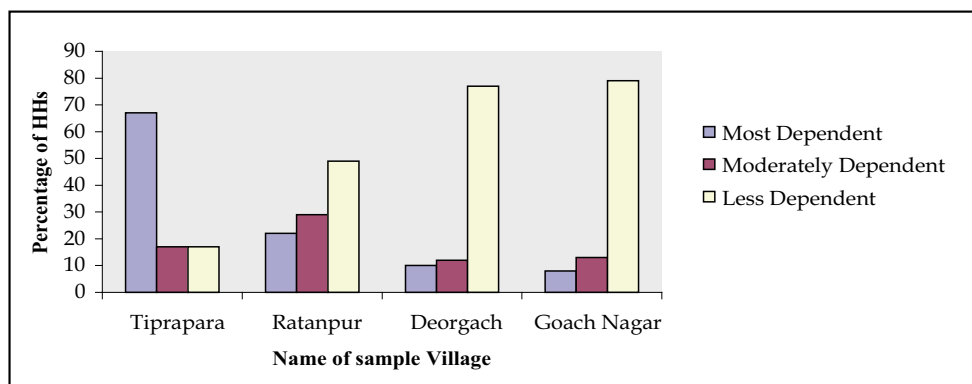


Figure 3. Forest Dependency of the villages by household



NTFP Diversity and Households Dependency on NTFP Collection

In the Satchari area about 27% of the sampled households gets at least some of their cash income from the extraction and sale of NTFPs and NTFP-based products. These contribute, on average, 19% of household cash income. However this figure varies from village to village, household to household and season to season, and usually ranges from Tk. 2,500 to Tk. 15,000 annually and from Tk. 40 to Tk. 120 daily. Our study reveals that the sale of NTFPs is the primary occupation for 18% of households in the sampled villages, and that 76% of these households are poor to extremely poor. Income from NTFPs supplies households with extra cash on occasion, and provides security in emergencies. A local person from Deorgach Village said:

When we have no work to do or when there's a crisis of money in our family we go to the forest and collect some NTFPs for sale and thus these forest products secures our livelihoods. Furthermore, during other times it provides us with some extra cash income, which ultimately improves our living standards (Deorgach village, personal communication, March 2006).

During the household surveys, interviewees named a total of 14 NTFPs that they extract from the forest (Table 3). However, only a few of these NTFPs make a significant contribution to their household income. In our study area, four NTFPs - fuelwood, *menda* bark (used for herbal medicine and mosquito coils), *taragota* (used for its aromatic properties) and *kumbi* leaves (used to wrap tobacco) - account for more than 90% of NTFP-based income. However, the importance and collection of these NTFPs in our four sample villages was not uniform. We observed that, people's dependency on nearby forest for various NTFPs varies with their socio-economic condition as well as from their distance from the nearby forest. Fuelwood is the most harvested NTFPs of all. All the households of Tiprapara (100%) collect fuelwood from the national park, compared with 60% of households from Ratanpur, 55% of households in Deorgach and 56% of those in Goachnagar. Fig. 4 presents a comparison of household involvement in different NTFPs collection in the area of Satchari NP.

Among the NTFPs, medicinal plants possess a great diversity in Satchari. Although people mostly depend on modern medicines, some households (25%) use medicinal plants for treating various common ailments. We observed a total of 39 species in our study area that have some sort of medicinal properties and are collected by local users for commercial purpose (63%) or for their own consumption (37%) (Appendix 1).

Table 3: Different NTFPs Exploited from Satchari NP and Adjacent Forest by Local HHs

Products/ Service	Origin	Amount of collection (based on peoples perception)
Fuelwood	All woody species	High
Bamboo	<i>Bambusa vulgaris</i> Schard.	Medium
	<i>Melocanna baccifera</i> Roxb.	
Fruits	<i>Artocarpus heterophyllus</i> Lamk.	Low
	<i>Artocarpus chaplasha</i> Roxb.	
	<i>Artocarpus lakoocha</i> Roxb.	
	<i>Citrus limon</i> L.	
	<i>Syzygium</i> spp.	
Menda bark	<i>Litsea monopetala</i> (Roxb.) Pers.	Medium
Taragota	<i>Ammomum aromaticum</i> Roxb.	Medium
Sun grass	<i>Imperata cylindrical</i> L.	Medium
Forage and fodder	Various species	Low
Herbal remedy	Different medicinal plants	Low
Rattan	<i>Calamus guruba</i> Ham.	Low
	<i>Daemonorops jenkinsianus</i> Mart.	
Broomsticks	<i>Thysanolaena maxima</i> Roxb.	Medium
Kumbi leaf	<i>Careya arborea</i> Roxb.	Medium
Sand	Sylhet sand	Medium
Honey	<i>Apis florae</i>	Very low
	<i>Apis dorsata</i>	
Bushmeat	<i>Gallus gallus</i>	Very low
	<i>Sus scrofa</i>	

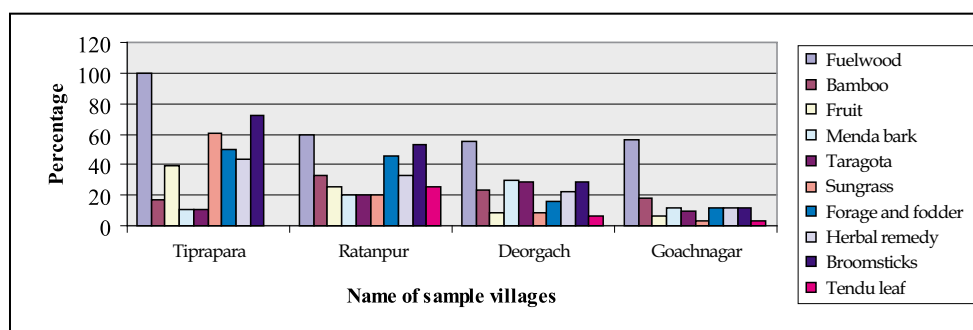


Figure 4: Percentage of Households Involved in Different NTFP Collection Activities



Box 1: Income from NTFPs (Some Examples from Satchari)

1. *Menda*

In our study area we found four *menda*-based small-scale processing factories that use *menda* bark as a material to make mosquito repellent. All of the factories are located in Deorgach. Approximately fifty to sixty laborers work in these factories and the majority of them are women (53%) followed by children (27%) and men (20%). The average wage rate for men is Tk 100*/day, for women is Tk 50/day and for children is Tk 40/day. Work in these factories is entirely seasonal; the factories only operate when there is enough *menda* bark from the adjacent forests. People from other areas are generally involved with the collection of *menda* bark from the national park, as well as from adjacent reserve forests, and they sell the bark to local factories at the rate of Tk 25 per kg. The quantity of *menda* trees in the forest has decreased alarmingly due to illegal logging and unsustainable collection of bark. A *menda* factory owner in Deorgach said, "The raw material for our factory seems to be declining day-by-day as the species is decreasing from the forest. Already one factory has moved from this area and others face various crises, since *menda* factories require high capital investments and an adequate supply of raw materials. Moreover, we have no loans or support to keep our factories running" (Deorgach village, May 2006, personal communication).

2. *Taragota (Wild cardamom)*

Taragota is a common species in our study area, which is used as an alternative for cardamom as well as for manufacturing *Unani* preparations (a type of herbal medicine). About 32% of people in our sample villages collect *taragota*, both for their own use and for sale in the market. Usually people collect *taragota* during the onset of the monsoon. We also found that a person can sell dried *taragota* in the local market for Tk 60/kg, while fresh *taragota* sells for Tk 18/kg.

3. *Kumbi pata (Tendu leaves)*

In Satchari National Park a number of local people collect *kumbi* or *tendu* leaves (*Careya arborea*), which are used to wrap tobacco to produce a kind of cigarette known locally as *biri*. We found that people usually collect *tendu* leaves twice a week and supply it to the nearby Teliapara market, which yields about Tk 500 per week. *Biri* manufacture is a well organized and flourishing small-scale industry in India (Nair 1993), and if properly managed it can also create some employment opportunities in the areas surrounding Satchari NP.

* 70 Tk = 1US\$

People's Perceptions of the Impact of NTFP Collection on Forest Conservation

Our study shows that the extraction of resources from the forest is seasonally dependent. Most of the fuelwood is collected during the dry season due to easy access and mobility inside the forest. Bamboo extraction also takes place mainly in the drier months to meet local needs for house construction at that time of year. The following quote from some local informants highlights the perceived role of NTFP collection in forest conservation (Ratanpur village, personal communication, February 2006):

"We have collected NTFPs from Satchari since prehistoric times, but it doesn't damage the forest ecosystem as illegal felling does. Moreover we collect NTFPs seasonally, so it has enough time to recover."

In addition, one villager from Tiprapara said, "NTFP collection keeps the forest safe from sudden fire and also destroys harmful organisms. It also accelerates the growth of seedlings and saplings by reducing the competition for nutrition" (personal communication, June 2006). People's perceptions regarding different NTFPs collected from Satchari National Park Forest and their impacts on the Park's ecosystem are summarized in Table 4.

Table 4: Perceptions of Amounts, Impacts and Risks of Collection of Various NTFPs

Item	Amount collected	Impacts on the park	Future risks
Fuelwood	High	Loss of habitat and forest biodiversity.	High risk
Building materials	Medium to high	Reduce abundance of small trees, loss of habitat, and loss of wildlife.	Medium to high risk
Fruits	Medium	Causes low -level damage to forest regeneration low	Low risk
Vegetables	Less	No apparent impact.	Low risk
Medicine	Medium to less	Negligible.	Medium risk

Box 2: Reasons for Unsustainable Resource Extraction in Satchari National Park

- **Poverty and unemployment:** Poverty and unemployment are common problems in and around SNP. About 37% of the population in our study area is extremely poor and most people have no steady income or occupation. 63% of our respondents cite poverty as the main threat to the forest destruction and



unsustainable resource extraction, and 42% of them think unemployment is the major source of unsustainable exploitation of resources from the protected area.

■ ***Forest Department corruption and other limitations:*** Local people in our study area maintain a poor perception/image of Forest Department staff. In our study area, about 71% of respondents blame Forest Department staff for unsustainable collection of resources in the national park and adjacent forests. Moreover FD staff enforces its power only against the rural poor who traditionally harvest forest resources for their subsistence but overlook their duty in case of local elites and politically influential persons who are sometimes involved in illegal poaching and resource collection from the forest. Furthermore, the department suffers from inadequate and unskilled personnel, modern equipment, and poor infrastructure and facilities.

■ ***Lack of awareness:*** About 44% of the population of our study area is illiterate and few people have a clear understanding of protected areas or sustainable resource exploitation.

■ ***Poor socio-economic conditions in adjoining tea estates:*** Eight tea estates surround Satchari National Park and are part of the attraction of the park for eco-tourists. Laborers on the tea estates earn very low or subsistence wages, and unemployment is very high among tea estate families. Most tea laborers collect their daily fuelwood and housing materials from the nearby national park and reserve forest.

■ ***Sawmills and brickfields:*** There are 18 sawmills in the Satchari area that produce timber products. According to local people they are one of the main causes of forest destruction in Satchari. Local people illegally collect timber poles from the park and sell them to the sawmills at lower than market prices. In addition, fifteen nearby timber merchants supply timber products from the park and reserve forests to different areas of the country, including Dhaka. We also found several brickfields in close proximity to the national park, which use fuelwood for firing their kilns. Local poor people often extract fuelwood illegally from the national park to supply to the brickfields.

Status of Home gardens in and Around Satchari National Park

Home gardens can provide families with important protection against food insecurity. From our household surveys we found that the home gardens in our study area (except Tiprapara village) are rich in diverse species. Families in the Satchari area have always cultivated a variety of timber, fruits and edible plants in their home gardens. They fulfill a traditional subsistence role

in our sampled villages. Now, with the declaration of the protected area, these gardens are expected to play a more important role in food security.

A total of 39 species were found in the home gardens of our study area (Table 5) but none of these species were ubiquitous. We recorded 10 timber species, 9 fruit species, 5 species that produce timber and fruit, 12 vegetable crops, and 3 multipurpose species and medicinal plants from the home gardens. Around 70% of the species in our study area are edible. It also seems that most villagers prefer to grow fruit and timber rather than vegetables in their home gardens. For timber production people usually prefer fast growing species. The livelihood benefits of home gardens go well beyond simply meeting subsistence needs. In many cases, the sale of products produced in home gardens significantly improves the household's financial status.

Table 5. Composition of a Typical Home Garden in the Study Area

Common Name	Botanical Name	Abundance	Performance
Timber Species			
Acacia	<i>Acacia spp.</i>	C	+++
Chapalish	<i>Artocarpus chaplasha</i>	FC	+
Mahagoni	<i>Swietenia macrophylla</i>	C	+++
Koroi	<i>Albizzia spp.</i>	C	+++
Rain tree	<i>Albizzia saman</i>	FC	++
Chatim	<i>Alstonia scholaris</i>	R	++
Eucalyptus	<i>Eucalyptus camaldulensis</i>	FC	++
Menda	<i>Litsea monopetala</i>	FC	++
Teak	<i>Tectona grandis</i>	FC	++
Chalta	<i>Dillenia indica</i>	R	++
Fruit Species			
Lemon	<i>Citrus spp.</i>	C	+++
Papaya	<i>Carica papaya</i>	C	++
Pineapple	<i>Ananas comosus</i>	FC	++
Banana	<i>Musa sapientum</i>	FC	++
Star fruit	<i>Averrhoa carambola</i>	FC	++
Batabi lebu/ Pomelo	<i>Citrus grandis</i>	FC	++
Guava	<i>Psidium guajava</i>	FC	++
Coconut palm	<i>Cocos nucifera</i>	C	++
Betel nut	<i>Areca catechu</i>	C	++
Timber and fruit bearing species			
Mango	<i>Mangifera indica</i>	C	++
Jack fruit	<i>Artocarpus heterophyllus</i>	C	+++
Sajna	<i>Moringa oleifera</i>	C	+++
Jaam	<i>Syzygium spp.</i>	FC	++
Neem	<i>Azadirachta indica</i>	C	+++
Vegetable Crops			
Radish	<i>Raphanus sativus</i>	C	+++
Bean	<i>Dolichos lablab</i>	C	++



Common Name	Botanical Name	Abundance	Performance
Vegetable Crops			
Eggplant	<i>Solanum melongena</i>	C	++
Bottle gourd	<i>Lagenaria siceraria</i>	C	++
Lal shak	<i>Amaranthus tricolor</i>	C	+++
Indian spinach	<i>Basella alba</i>	C	++
Lai shak	<i>Brassica rugosa</i>	FC	++
Chillies	<i>Capsicum frutescens</i>	C	++
Cabbage	<i>Brassica oleracea</i>	FC	++
Ladies finger	<i>Abelmoschus esculentus</i>	FC	+++
Tomato	<i>Lycopersicon lycopersicum</i>	FC	++
Pumpkin	<i>Cucurbita maxima</i>	C	++
Others Species with Multipurpose Use			
Bamboo	<i>Bambusa spp.</i>	C	+++
Patipata	<i>Schumannianthus dichotoma</i>	FC	+++
Rattans	<i>Calamus spp.</i>	FC	+++

KEY: C = common, FC = fairly common, R = rare; +++ = very good, ++ = good, + = not so good.

In Satchari we found that the average rich household owned approximately 0.18 ha of land, while medium, poor, and extremely poor households owned less than 0.08 ha. Rich households usually plant different plant species in their home gardens to meet their subsistence needs. On the other hand, people in poorer households mostly depend on the forest for their fuelwood and other needs, as they have no land for home gardens. Study results suggest that home gardens are negatively correlated with dependency on the forest.

Discussion

Our results paint an interesting picture of the use and role of NTFPs and home gardens for livelihoods and forest conservation by the communities under study (Appendix 2 contains photographs of the study site). Non-timber forest products make a vital contribution to livelihoods for a large proportion of the poor living in, or close to, the forest in most tropical countries (Arnold and Perez 2001). In the Satchari area villagers collect a large number of NTFPs—more than 14 products were identified. Some NTFPs, including the medicinal plants we have looked at in this study, hold real potential for livelihoods, and as an incentive to conserve forest. Our study suggests that the sale of NTFPs and NTFP-based products provide an important source of cash income for villagers in and around Satchari National Park. The most important point is that NTFPs represent a significant component of their livelihoods strategies, accounting for 19% of their total annual income. In addition, about 18% of households receive cash income only from the sale of NTFPs. These findings are comparable to the results of others studies done in Southeast Asia (Table 6). We also found that a majority of the people (76%) who benefit from the

extraction and sale of NTFPs are poor. If they didn't derive these benefits they might not have an incentive to manage it as sustainably. This finding agrees with the observations of Cavendish (2000) in Zimbabwe who also found that NTFPs benefit mostly the poorest populations.

Home gardens provide livelihood benefits in terms of nutrition and daily subsistence. The data in our study identified 39 different species in home gardens in the Satchari area, of which approximately 70% are edible. All of the wealthier people in our study depend on their home gardens for fuelwood and other needs. Hence the study suggests that home gardens can play an important role in forest conservation by shifting the dependency for fuelwood and other forest products from the forest to home gardens. This finding also agrees with Caron (1995) i.e., home gardens could play an important role in forest protection by shifting the dependency for food and income from the forest onto home gardens.

Table 6: A Comparison of Cash Incomes Obtained from NTFPs in Various Studies

Topics	Our Study	Other Studies
Contribution of NTFPs to households cash incomes	19%	14% (Mahapatra et al. 2005) 17% (Malhotra et al. 1991) 24% (Ganesan 1993) 21% (Gunatillike et al. 1993)
Households receive at least some cash income from NTFPs	27%	-
Households receive cash income only from NTFPs	18%	12% (Mahapatra et al. 2005)

Conclusion and Recommendations

The main conclusion from our study is that NTFPs, NTFP-based products, and home gardens in and around Satchari National Park play important roles in improving the livelihoods of forest dependent people and forest conservation. Understanding the dependency of households on the forests of Satchari National Park is critical for developing effective management strategies. The data presented here suggest that the production and sale of NTFPs and NTFP-based products provide an important source of cash income for villagers in and around Satchari National Park. This study also found that households in villages with diversified home gardens are less dependent on the national park for forest products.

Our study suggests some new policy avenues such as enriching forest and buffer zones with commercially important NTFPs, which may be used for establishing



NTFP-based small-scale enterprises. In addition, protected area management strategies should be coordinated with the overall development of communities that depend on the protected areas. Management plans should give these people the right to collect forest resources in a sustainable way, enable them to enrich the park and buffer areas with different subsistence crops (i.e., NTFPs, fruits, vegetables), and give them incentives like seeds and seedlings to develop their home gardens.

Managers should take a cautious approach. First, a comprehensive feasibility analysis of the contribution that NTFPs, NTFP-based small-scale enterprises, and home gardens can make to forest conservation and livelihoods must be conducted. This analysis must consider the social, economic and ecological aspects of the proposed changes. Secondly, a co-management plan that involves local people in forest management and which ensures equity in decision-making and benefit sharing must be developed. The plan should specify both short-term and long-term objectives and goals. Thirdly, institutions must be identified to facilitate the implementation of the plan and ensure equitable distribution of benefits to local communities.

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Appendix 1: Medicinal Plant Diversity and their Traditional Use in SNP

Family	Botanical Name	Local Name	Parts used	Traditional use	Habit	Occurrence	Remarks
Acanthaceae	<i>Adhatoda vasica</i> Nees	Basak	Fresh green leaves	Cough, cold ailments and asthma	Sh	C	W
Apocynaceae	<i>Alstonia scholaris</i> (Linn.) R. Br.	Chatim	Leaf	Fever	Tr	R	D
Aslepiadaceae	<i>Calotropis gigantea</i> (L.)	Akanda	Leaf, latex	Gout pain, cut and wounds	Sh	C	W
Bromeliaceae	<i>Ananas sativus</i> (Lindley) Schultes f.	Anaras	Fruit	Jaundice	Sh	FC	D
Caricaceae	<i>Carica papaya</i> L.	Pepe	Fruit	Stomach trouble	Sh	C	D
Combretaceae	<i>Terminalia arjuna</i> W & A	Arjun	Bark	Heart disease, cough	Tr	R	W
Combretaceae	<i>Terminalia belerica</i> Roxb.	Bohera	Fruit	Constipation, stomach trouble, eye disease	Tr	FC	W
Combretaceae	<i>Terminalia chebula</i> Retz	Horitaki	Fruit	Constipation, fever, heart disease, cough, urinary problems	Tr	FC	W
Compositae	<i>Chromolaena odorata</i> (L.) King & H.E. Robins	Assam lata	Green leaves	Anti-hemorrhoid	Cl	C	W
Compositae	<i>Eupatorium odoratum</i> L.	Assam pata / Uzaru	Green leaves	Anti-hemorrhoid	Sh	C	W
Convolvulaceae	<i>Ipomoea fistulosa</i> Roxb.	Donkalos	Whole plant	Cold ailments	Sh	C	W
Cucurbitaceae	<i>Coccinia cordifolia</i> Linn.	Telkucha pata	Green leaves	Cold ailments	Cl	FC	W
Dilleniaceae	<i>Dillenia indica</i> Lmn.	Chalta	Fruit	Hair falls	Tr	FC	D
Euphorbiaceae	<i>Phyllanthus emblica</i> Linn.	Amoloki	Fruit	Dysentery, skin diseases, hair falls, digestive problem	Tr	FC	D
Euphorbiaceae	<i>Trewia nudiflora</i>	Chagalledi	Leaf	Fever	Tr	R	W
Gramineae	<i>Cynodon dactylon</i> (L.) Pers.	Durba grass	Tender leaves	Tooth ache, cut and wounds	H	C	W
Hydrocotylaceae	<i>Centella asiatica</i> (Linn.) Urban	Thankuni	Whole plant	Dysentery, diarrhea, gastric	H	C	W
Labiatae	<i>Ocimum sanctum</i> Linn.	Tulsi	Fresh green leaves	Cough, cold ailments, cut and wounds	H	FC	D



Lauraceae	<i>Litsea monopetala</i> (Roxb.) Pers.	Menda	Fresh green leaf and bark	Amoebic dysentery, diarrhea, constipation	Tr	C	W
Leguminosae	<i>Cassia fistula</i> Linn.	Sonalu	Fruit, bark	Constipation	Tr	R	W
Meliaceae	<i>Azadirachta indica</i> A. Juss.	Neem	Fresh green leaf and seed	Skin diseases, chicken pox, fever, dysentery, diabetes	Tr	FC	D
Meliaceae	<i>Melia azedarach</i> Linn.	Bokain	Green leaves	Scabies, insecticidal use	Tr	FC	D
Mimosoideae	<i>Mimosa pudica</i> Linn.	Lazzabati	Roots	Not-specified	H	C	W
Moringaceae	<i>Moringa oleifera</i> Lamk.	Sajna	Bark	Cold ailments	Tr	C	D
Orchidaceae	<i>Cymbidium aloifolium</i> (L.) Sw.	Kuntus pata	Leaves, seeds	Ear ache, cut injury	H	C	W
Piperaceae	<i>Piper betel</i> Linn.	Paan	Fresh green leaves	Indigestion	Cl	C	D
Poaceae	<i>Cymbopogon citratus</i> (DC.) Stapf	Lemon grass	Leaves	Not-specified	H	FC	W
Polygonaceae	<i>Polygonum hydropiper</i> L.	Biskatali	Green leaves	Insect bites, anti-venomous	H	C	W
Rutaceae	<i>Glycosmis pentaphylla</i> (Retz).	Fatigila	Leaf	Fever	Sh	C	W
Rutaceae	<i>Aegle marmelos</i> (Linn.) Correa	Bel	Fruit	Weakness, colitis, diarrhea	Tr	FC	D
Rutaceae	<i>Citrus acida</i> (Linn.)	Jambura	Fruit	Jaundice	Tr	C	D
Rutaceae	<i>Citrus limon</i> (Linn.) Burm. f.	Lebu	Fruit, Leaf	Digestive trouble	Sh	FC	D
Sterculiaceae	<i>Abroma augusta</i> (L.) Lf.	Ulatkambal	Bark, root	Dysmenorrhea	Sh	R	W
Theaceae	<i>Camellia sinensis</i>	Chaa	Tender leaves	Heart disease, cold ailments, refresher	Sh	C	Cu
Verbenaceae	<i>Vitex negundo</i> Linn.	Nimunda	Green leaves	Tooth ache, insecticidal use	H	C	W
Zingiberaceae	<i>Curcuma longa</i> Linn.	Holud	Rhizome	Skin ailments	Sh	FC	Cu
Zingiberaceae	<i>Zingiber officinale</i> Roscoe	Ada	Rhizome	Cough, cold ailments	Sh	FC	Cu
Zingiberaceae	<i>Ammomum aromaticum</i> Roxb.	Taragota	Seed	Used as spices and for manufacturing Unani medicine	Sh	C	W
		Horin paya	Whole plant	Diarrhoea, dysentery	Sh	C	W

KEY:

Cl-climber, H-herb, Sh-shrub, Tr-tree, C-common, FC-fairly common, R-rare
Cu-cultivated, D-domesticated, W-wild

Appendix 2: Photos from Study Sites



Plate 1: NTFPs gathered for sale.



Plate 2: A local person returns from the forest with fuelwood.



Appendix 2: Photos from Study Sites (Continued)



Plate 3: Saw mills located near the forest represent a serious threat.



Plate 4: An ethnic Tripura woman weaving their traditional cloth.



Assessing the Role of Non-Timber Forest Products in the Livelihoods of Communities Living Inside and Outside of Lawachara National Park

Sayed Mahmud Riadh
Assistant Conservator of Forests, Forest Department, Bangladesh

Abstract

Protected area managers find linking the livelihoods of local populations living near natural resources to the conservation of those resources to be the biggest challenge for effective co-management of protected areas. Many scholars and managers believed that non-timber forest products (NTFPs) can play important roles in this regard, by contributing to people's livelihoods without placing major stress on forest resources. This paper examines and compares the roles of NTFPs in the livelihoods of communities living both within and outside the forest boundaries of Lawachara National Park. The study illustrates that local people meet their fuelwood demands from the forest either by collecting it themselves, or by purchasing it from the market. The Khasia communities in the interior village depend highly on the park, as their only source of cash is betel leaf cultivation on forest lands. All households - except a few wealthy homes in the village located outside the park - collect bamboo, cane, wild vegetables and medicinal plants for their domestic consumption. For Khasia households in the interior village (rich, medium-income and poor), the hunting of wild animals and birds is a part of their traditional culture. .

Introduction

Biological products from wild areas are commonly termed non-timber forest products or NTFPs (Shackleton and Shackleton, 2004). There is no unique definition of NTFPs; however, for the purpose of this paper NTFPs are identified as all plants and animal products of forests, except timber. Here NTFPs do not include economic and environmental services. (Ambrose-Oji, 2003).

Non-timber forest products have long been considered of minor or secondary importance in local economies and livelihoods. It is only from the 1980s onward



that there has been a surge of interest in the ways in which NTFPs are used by people living in and around forests. The contribution of NTFPs to the livelihoods and welfare of forest-dependent people has become increasingly recognized (Arnold and Perez 2001, Gram 2001, Belcher 2005). NTFPs play a role in the household economy of not only the poor, but also the rich (Nguyen 2006).

The collecting and processing of NTFPs provide major employment opportunities to the poorest rural populations worldwide. In Bangladesh, this amounts to a contribution of about Tk 1.3 billion annually to the economy (GOB 1993), and employment for nearly 300,000 people (Basit 1995). In India, NTFPs contribute from 10% to 40% of income for 50 million indigenous households (Shiva 1993, cited in Sekar et al., 1996); about 200 to 300 million villagers depend on NTFPs to varying degrees (Shiva 1995b); and 1.6 million person-years of employment are generated in the NTFP sector (Gupta 1994). In Indonesia, the rattan industry alone provides jobs for 200,000 people (Haury and Saragih 1995). In Vietnam, more than 320,000 people are involved in NTFP production (Tien 1994). These figures are impressive and, given the number of forest-dependent people involved, the implication is that forest management policies should properly address the dependence of local people on forests for their livelihood needs.

This paper attempts to compare the role of NTFPs in the livelihoods of communities living inside and outside of the boundaries of Lawachara National Park in Sylhet, Bangladesh. The paper seeks to give policy makers a better idea of the roles NTFPs can play in local livelihoods, so that they can design better policies for community based natural resource management (CBNRM).

Background

The study was conducted at Lawachara National Park (LNP), which forms part of the West Bhanugach Reserved Forest located in the division of Sylhet in northeastern Bangladesh (Fig. 1). Currently the park covers an area of 1,250 ha, and there is a plan to extend this area further to include 281 additional ha of the Reserve Forest. The topography is undulating, with slopes and hillocks (locally called *tila*) that range from 10 to 50 m in elevation. These *tilas* are scattered and interspersed with numerous streams that flow through the forest. The forest types of Lawachara are a combination of planted exotic species and mixed forest with a deciduous canopy and an evergreen understory (Ahsan 2000). The forest originally supported an indigenous vegetation cover of mixed tropical evergreen forest (Alam 1998). Approximately 167 plant species and 276 animal species are found within the park (NACOM 2004).

There are 14 villages in and around Lawachara National Park. Two are located within the park and the rest lie in the area surrounding the park (CNRS 2000). The settlement history dates back to the early 1940s, when people employed by the Forest Department to carry out logging and plantation operations in the forest were settled in the area. The largest interior village, Magurchara Punji, was established around 1950 and presently consists of 40 households inhabited by people from the Khasia ethnic community. The other interior village, Lawachara Punji, was established in the 1940s and currently consists of 23 households who are also from the Khasia community (FSP 2000; Chemonics 2000).

The remaining 12 villages are located along the northeastern boundary, inhabited by ethnic Bengali migrants and a few families from the Tripura ethnic community. The Bengali migrants came mainly from the districts of Noakhali, Comilla and also from neighboring India. The major influx of these people occurred about 50 years ago, and they converted the low-lying forest areas to paddy cultivation. The settlers in these outside villages are almost all Muslims, whereas Khasias are primarily Christians and Hindus. The total settler population is reported to be between 4,000 and 4,500 people (CNRS 2000).

The Forest Department allotted 1.2 ha of land to each registered villager living in the interior villages. The main income of the Khasia communities comes from betel leaf plantations. They also collect fuelwood to supplement their family income. Seventy percent of these people depend on the cultivation of lemons and pineapples on hill slopes, and the remaining 30% are day laborers. Khasia women mainly sort betel leaves while Tripura women weave cloth, conduct household work, and sometimes work in the lemon and pineapple orchards (CNRS 2000).

Subsistence and small-scale woodcutters and NTFP harvesters have used Lawachara intensively for many years. The households of the interior villages are completely dependent on forest resources for their entire fuelwood and house building material demands (FSP 2000, CNRS 2000). In addition to their subsistence needs they also collect fuelwood to supplement their income, but they primarily depend on the betel vines they grow in the forest (FSP 2000).

In addition to resident villagers, the park is also widely used by people from adjacent villages, residents of neighboring tea estates, and some poor people from urban areas. Subsistence harvesting of fuelwood appears to be the most common and widespread use of the park. Bamboo is also widely harvested within the park and its proposed extension area, presumably for both subsistence and small-scale



commercial use (FSP 2000). Local people collect 23 species of fruits, which are also eaten by non-human primates in the forest. Some people collect these fruits for home consumption as well as for sale. They also collect vines and climbers for making baskets and other household materials (CNRS 2000), as well as medicinal plants (FSP 2000, CNRS 2000, Chemonics 2000). No qualitative or quantitative information about medicinal plant collection is available at present. A small number of people also extract tree bark for medicinal uses from a number of trees and sell it to local agents. The presence of some NGOs, like BRAC, ASA, RUSA and Heed-Bangladesh in the area has been mentioned by CNRS (2000). These NGOs, however, concentrate primarily on micro-credit for the very poor, such as programs to support poor Khasia families during lean periods between betel leaf harvests. Some also provide micro-credit to these families for bamboo and cane weaving.

Methodology

I selected two villages in Lawachara National Park and its surrounding area, with the aim of investigating and comparing the role of NTFPs in the livelihoods of communities of two variously located villages: Magurchara Punji, within Lawachara National Park; and Baligaon which is adjacent to the park. These villages were chosen because they are both easily accessible and heavily depend on forest resources from the park. I began by constructing community maps. I then prepared a community profile through focus group discussions with villagers in each village. Finally I prepared household profiles by conducting household surveys. I visited the two villages once before the surveys were conducted, to inform villagers about the purpose of the research.

Based on the community profile and secondary sources that summarized households according to their monthly incomes, housing, and homestead and agricultural land holdings, I classified the households in each village as rich, middle and poor income. I randomly selected households and conducted surveys from February to May 2006, interviewing family members using a semi-structured questionnaire. In Magurchara Punji, I identified three income classes and surveyed one rich household, three middle-income households, and six poor households (24% of all households were sampled). In Baligaon, I surveyed three rich households, ten middle-income households, and eight poor households (7% overall sampling intensity) (Table 1). The questionnaire was in English. It was translated into the local language and administered orally by a hired interpreter. The questionnaire dealt with the respondents' background, household assets, and their

dependency on NTFPs. I collected information on household composition, age, education, land and livestock holdings, sources of family income, NTFPs, and monthly income.

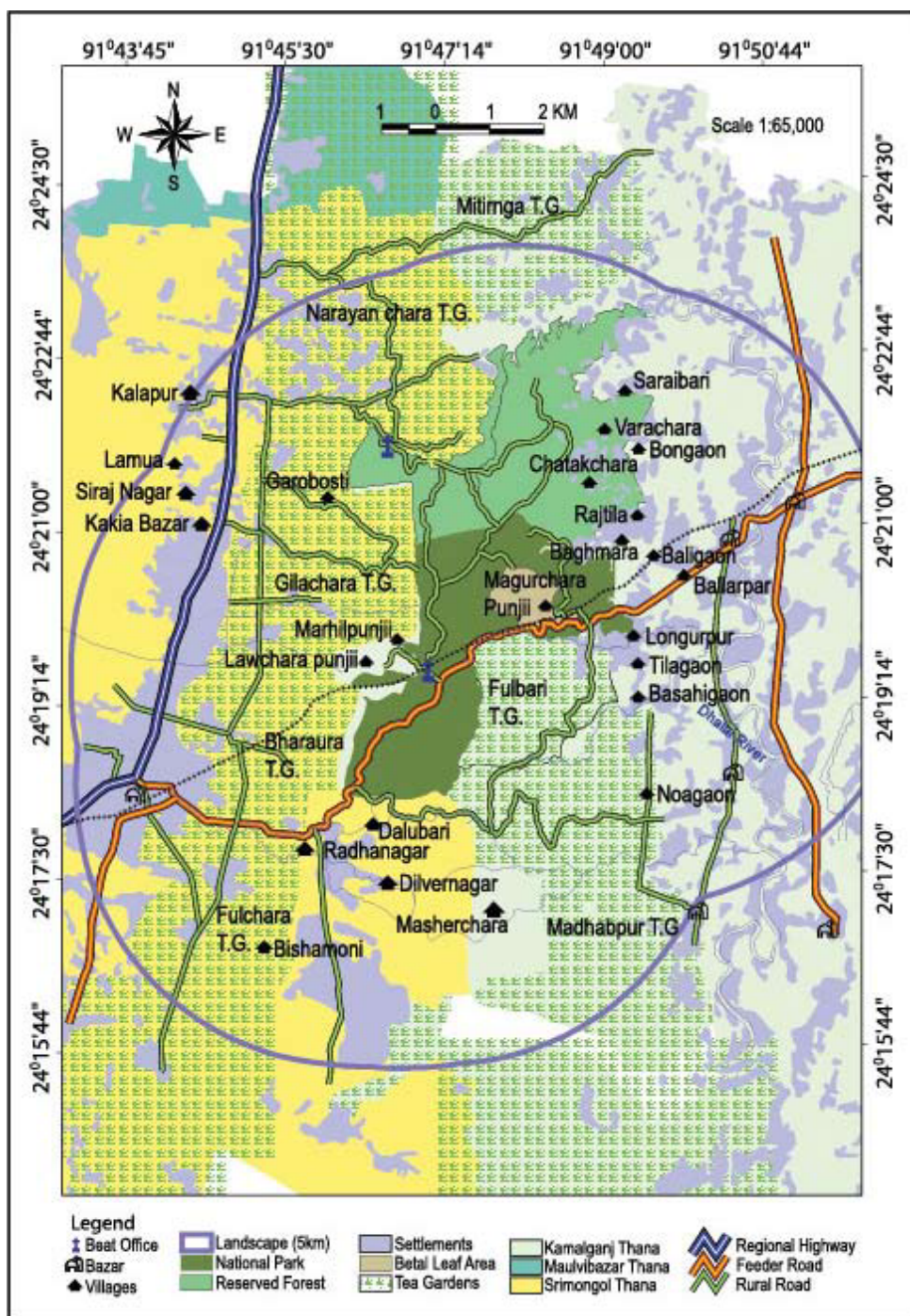


Figure 1: Map of Lawachara National Park. (Source: Nishorgo Support Project, 2007)



Results

Households with monthly income more than Tk 8,000 and with paka (brick or concrete buildings) or semi-paka housing (with corrugated iron roof) were classified as rich. Households with monthly incomes from Tk 5,000 to Tk 8,000, with semi-paka housing were classified as middle-income. Households with monthly incomes less than Tk 5,000 and kacha housing (constructed with bamboo and roof with straw or corrugated iron) were classified as poor.

Table1: Demographic Description of Respondents

	Magurchara Punji			Baligaon		
	Rich	Middle	Poor	Rich	Middle	Poor
No. of households sampled	1	3	6	3	10	8
No. of people per household	7	5.33	5.67	8.33	7	6.5
Age of respondents (years)	45	31	30	46	38	43
Male (%)	00	33	67	100	60	63
Female (%)	100	67	33	00	40	38
Illiterate (%)	-	-	17	-	10	63
Can only sign (%)	-	33	67	-	40	13
Primary school (%)	-	33	1	-	30	25
Secondary school (%)	100	33	17	100	20	

Betel leaf cultivation is the main NTFP-based activity in Lawachara National Park. It has a high cash-earning potential and is the main source of cash income for the Khasia communities who live in the park. All members of the Khasia community are engaged in betel leaf cultivation. The average monthly income from betel leaf cultivation for all households (rich, middle, and poor) is Tk 4,900. The average monthly income of rich households is Tk 9,000 a month, while the average monthly incomes of the poor and middle-income groups are Tk 1,833 and Tk 4,333, respectively. The sole rich household in Magurchara Punji has other additional sources of cash income (which were undisclosed). The middle and poor segments of the Khasia community do not have any other cash income sources, but they supplement their incomes by collecting fuelwood and wild vegetables for domestic consumption (Table 2).

Table 2: Average income of households sampled (in Taka)

Village	Rich	Middle	Poor
Interior village: Magurchara	9,000	4,333	1,833
Exterior village: Baligaon	12,500	5,727	3,143

In Baligaon, the village bordering the park, according to our classification about 70% of the population belonged to the rich and middle-income classes. The middle class and rich people earn their livelihoods mostly from business, agriculture, and services. The average income for middle-income and rich households is Tk 5, 727 and Tk 12, 500 per month respectively (Table 2). In the case of the poor households, 86% of the cash income is from wage labor, amounting to approximately Tk 3,000 per month. In all cases, the incomes are substantially higher than those of the communities living inside the park.

Patterns of NTFP Collection

Villagers from Magurchara Punji and Baligaon can identify thirteen categories of NTFPs, as shown in Fig. 2 and Fig. 3. The NTFPs available at Lawachara National Park are bamboo, cane, fuelwood, betel leaves, mushrooms, grasses, wild vegetables such as bamboo shoots, taro, banana, thankuni (*Centella asiatica*); wild fruits like chapalish (*Artocarpus chaplasha*), kau (*Garcinia cowa*), jackfruit, cane fruits, banana, dewa (*Artocarpus lacucha*); different kinds of medicinal plants; honey; birds such as horikol (orange-breasted green pigeon) and jungle fowl; animals, fish and shellfish including shrimp.

The households from the interior village of Magurchara Punji collect non-timber forest products in eleven of the thirteen categories (Fig.2). All of the households in the interior village collect bamboo, cane and fuelwood. In addition, ninety percent of households collect wild vegetables and mushrooms for their subsistence consumption. An average of 33% poor and middle-income households hunt wild birds such as orange-breasted green pigeon (*Treron bicincta*) and jungle fowl, and all rich households of the interior village hunt for animals like wild boar. Approximately 67% of middle-income households and 33% of poor households collect wild fruit from within the national park, while 50% fish there (Fig. 2).

Patterns of NTFP collection are very different in the exterior village. Households in Baligaon collect only five categories of NTFPs (Fig. 3), and rich households do not collect any NTFPs from the forests. Furthermore, none of the middle-income households, and only 38% of poor households, collect wild vegetables. No families in Baligaon collect mushrooms (Figure 3). Among poor households in Baligaon, approximately 50% collect bamboo, and about 38% collect both cane and wild vegetables for their own consumption. In addition, 40% of middle-income households and 25% of poor households collect medicinal plants. All the households collect fuelwood except the rich.

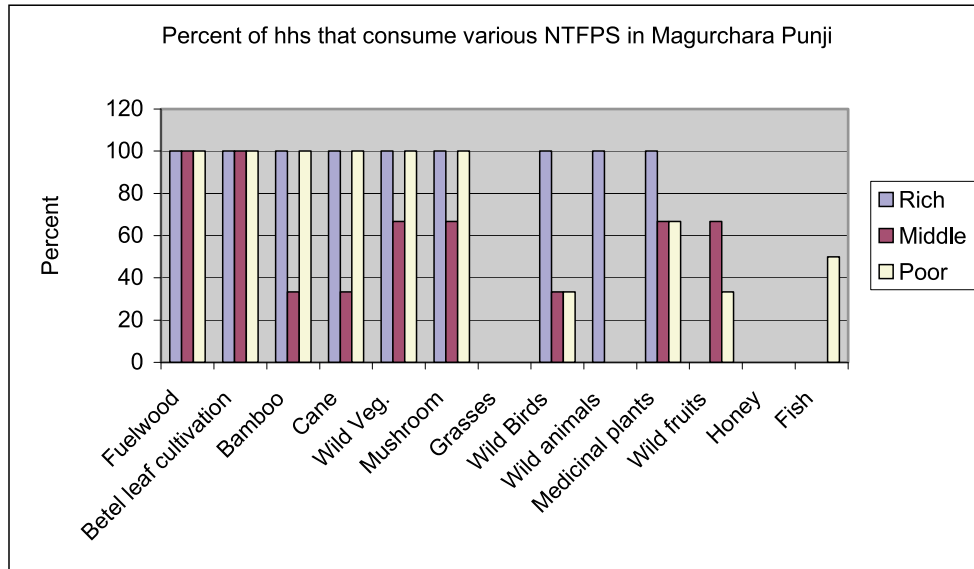


Figure 2: Percentage of Households that Consume Various NTFPs in Magurchara Punji

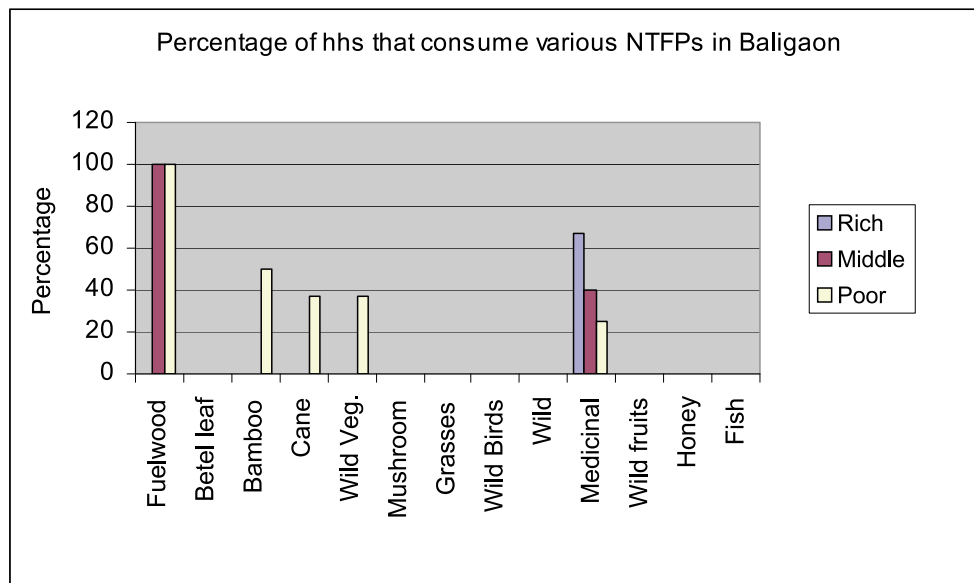


Figure 3: Percentage of Households that Consume Various NTFPs in Baligaon

Patterns of Fuelwood and Medicinal Plant Use

In Lawachara National Park, people depend most heavily on forests for fuelwood as their main source of domestic energy. Households from both the interior and exterior villages meet their fuelwood demand from Lawachara NP. In the interior village, Magurchara, all the households (rich, middle-income and poor) collect

fuelwood from the forest for their own consumption. I asked respondents to calculate the cash value of the fuelwood consumed on a monthly basis. Accordingly, the monthly average cash values of fuelwood reportedly used by rich, middle-income and poor households are Tk 800, Tk 338, and Tk 314, respectively (Table 3).

In the exterior village of Baligaon, rich households do not collect fuelwood from the forest, but they buy it from the neighboring market and pay an average of Tk 767 per month. Middle-income and poor households collect fuelwood both from the forest and from their homesteads for subsistence consumption, and the average values are Tk 410 and Tk 263 per month respectively (Table 3).

Table 3: Value of NTFPs Consumed per Month per Household (Taka per month)

	Magurchara Punji			Baligaon		
	Rich	Middle	Poor	Rich	Middle	Poor
Fuelwood	800	338	314	767 ^a	410 ^b	263 ^b
Medicinal plants	50	50	17	83 ^c	36	26
Other NTFPs	417	167	133	00	83	134
Total	1,267	555	464	850	529	423

NOTES: a=collected from homestead/market, b=collected from homestead/forest, c=collected from homestead only

In Magurchara Punji all rich households use medicinal plants, consuming an average value of Tk 600 per year, whereas only 67% of households from both the middle-income and poor groups use medicinal plants. The middle-income and poor households consume medicinal plants at an average value of Tk 600 and Tk 200 per household per year respectively .

In Baligaon, 67% of rich households collect medicinal plants from their homesteads. These plants have an average value of Tk 1,000 per household per year. Approximately 40% of households from the middle-income group and 25% of the poor households use medicinal plants, with an average value of Tk 435 and Tk 316 per year, respectively. Except for rich households in Baligaon, all households collect their medicinal plants from the forest.

Discussion

In this study, different income groups in the interior and exterior villages showed considerable differences in their patterns of collection of NTFPs. This study shows that households in the village inside the park collect more NTFPs than households in the exterior village, both in terms of number of NTFP types gathered and the



cash value of the products collected. The households of both villages are heavily dependent on the forest to meet their demand for fuelwood, bamboo and cane. The Forest Department allocated 1.2 ha of land from the forest for betel leaf cultivation to each household in Magurchara Punji. Therefore, regardless of income class, Magurchara residents are heavily dependent on the forest for betel leaf production, their main source of income. Despite the fact that all households in Magurchara Punji have the same amount of land, their incomes vary because of site factors and input supports. Site factors include variables such as land fertility, slopes, and aspect. Input support factors include variables such as labor, fertilizer and irrigation. Household heads or sometimes their spouse and children contribute labor. Rich households usually hire labor and can afford chemical fertilizers and irrigation during droughts. Poor households cannot afford these inputs, so most of the poor households in Magurchara Punji collect bamboo, cane, wild vegetables, mushrooms, wild animals, birds, wild fruits and fish from the forest for their subsistence consumption.

In Baligaon the rich households do not collect fuelwood from the forest; they buy it from the neighboring market. As the rich and middle-income households have large land holdings, and earn their living mainly from business enterprises, they do not depend on NTFPs to sustain their livelihoods. In contrast, most of the poor households have no agricultural land and wage labor is their main income source. They only collect bamboo, cane and wild vegetables for their subsistence consumption from the forests.

Analysis of income composition revealed that in terms of contribution to income, betel leaf cultivation is important for Magurchara Punji, whereas wage labor is important for the poor households of Baligaon. The study also showed that all income groups collect fuelwood and medicinal plants from the forest for domestic consumption, except for rich households in Baligaon. In general, the contribution to total household economies from fuelwood was higher than that from medicinal plants. Therefore, we conclude that the forest plays a more important role in the supply of household energy than for medicine.

In both villages, the contribution of medicinal plants to the livelihood of poor households is not as high as expected. It is clear that comparatively richer households use more medicinal plants. I hypothesize that due to lack of information regarding the identification and use of medicinal plants, poor households lag behind richer households in using these plants. In addition, an NGO operates a hospital on the outskirts of Lawachara National Park, in the

proximity of both villages, where people can get medical services at nominal cost. The richer households usually do not go to such NGO operated hospitals as a matter of social prestige, since they do not wish to be perceived as needy.

The study also reveals that in Magurchara Punji the rich household is more involved than poor and middle-income households in collecting wild birds and animals for domestic consumption. This is because hunting is a traditional practice for the Khasia community, and richer Khasia households also have links with local elites and law enforcement agencies which allow them to continue this tradition. As Magurchara Punji is a Khasia community, all households are members of the Khasia Welfare Society (KSA). Through this common platform, Khasia communities can negotiate with government agencies, particularly the Forest Department and other local patronage groups, regarding their community interests.

Conversely, villagers from Baligaon do not have a tradition of hunting wild birds and animals. There is no common platform for discussion in Baligaon, as poor households are not involved with many social and political institutions. Among the rich and middle groups, 67% and 40% of heads of households respectively are involved with political parties or the union parishad. This means that in the exterior village richer people are more involved with outside political parties in order to maintain their power relations.

Conclusion and Recommendations

Non-timber forest products form an extremely heterogeneous group of materials. Typical NTFPs include various foods, fodder, fuel, medicines, and many other collectibles-literally every product derived from a forest besides timber (Wickens 1991:4). The variety can be staggering. Different people collect them for different reasons. Some products are consumed locally without any further processing and play no role in the marketplace. Some NTFPs have been domesticated by local communities for centuries, some are both cultivated and collected from the forest, and others still come exclusively from natural forests (Enters 1997).

Understanding the role of NTFPs in the livelihoods of people living inside and outside the forest is critically important for developing management strategies for protected areas. This study found that households in an exterior village with higher average incomes do not collect any NTFPs from the forest in Lawachara National Park. However, this does not mean that they do not rely on forest resources; they



could be buying them from those who do collect locally or even from a more distant regional market.

Study results also suggest that the main source of cash incomes for all households in an interior village comes from betel leaf cultivation in the forest; suggesting that they are highly dependent on the forest to sustain their livelihoods, especially because many do not have their own land to cultivate betel leaf.

Another important finding is that all households from both interior and exterior villages meet their fuelwood demands from the forest (rich households of the exterior village purchase their wood from local markets but it still comes from the forest). This means the dependency on forest for fuelwood is high in both interior and exterior forest villages. In order to meet the high fuelwood demand of people living both in and outside of forests, fast-growing tree plantations could be cultivated in the buffer zone area.

Policy design should ensure the participation of local users in the governance and management of buffer zone plantations. Local forestry personnel suggested that betel leaf cultivation is not good for biodiversity conservation. As betel leaf cultivation is the only cash income source for most of the Khasia households living in the forest, the boundaries around the betel vines should be clearly demarcated and self-governance of Khasia communities should be ensured in betel vine zones. Local people, both indigenous and Bengali, should be involved in the management of buffer zone bamboo groves and cane plantations through co-management programs. Households in both interior and exterior villages can benefit from horticultural and medicinal species cultivated in the national park. Development of human capacity can be another way to reduce pressures on natural resources and to ensure sustainable livelihoods. Co-management policies for protected areas should consider these possibilities. These findings suggest that an understanding of the role of NTFPs in the livelihoods of local communities should be incorporated into the formulation of co-management policies for all protected areas.

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Non-Timber Forest Products and Co-Management: A Case Study of Chunati Wildlife Sanctuary

Md. Rahimullah Miah

Institute of Forestry and Environmental Sciences, University of Chittagong, Bangladesh

Abstract

Strategies to foster development based on the gathering, processing, sorting, collection period, and diversification of non-timber forest products (NTFPs) implicitly target households as principal beneficiaries. This paper suggests that the cultivation and domestication of NTFPs can play important roles in the co-management of protected areas. Chunati Wildlife Sanctuary (CWS) is a co-managed site where local communities are dispersed throughout the forest. This study focuses on four villages in CWS that derive a significant portion of their livelihoods from NTFPs collected in the sanctuary. It concludes that both research on the cultivation and domestication of NTFPs and co-management practices are needed to allow forest villagers to continue to live in CWS in a sustainable manner.

Introduction

Millions of people throughout the world make extensive use of biological products from the wild (Koziell and Saunders 2001, Lawes et al. 2004). These items, commonly termed non-timber forest products or NTFPs, are harvested for both subsistence and commercial use, either regularly or as a fallback during times of need. NTFPs are biological products and services, derived mainly from forests, deserts, grasslands, agroforests or farm forests, as well as marginal lands. They may be used to make different products for domestic use, or marketed through middlemen. They add to peoples' livelihood security, especially for rural dwellers, and may also have substantial cultural significance and value (Posey 1999; Cocks and Wiersum 2003).

Non-timber forest products include plants used for food, beverages, fodder, fuel,

medicine, fibers and biochemicals; animals, birds and fish used for food, fur and feathers; and other animal products such as honey, lac and silk (Wickens 1994). Shiva (1995a) has called non-timber forest products "potential pillars of sustainable forestry." They are now recognized as more important than timber, and are regarded as a more viable commercial option in forest management (Peters et al 1989; Anderson 1990; Anon. 1990; Chakravarthi 1990; Godoy and Bawa 1993; Blay 1996). Today's interest in NTFPs is based on the argument that in order to conserve the world's tropical forest we have to find new products and develop market systems for NTFPs, so that the forests will become too valuable to destroy (Byron and Ruiz-Perez 1996).

In developing countries, 80% of people use forest products for food and personal care (Anon, 2000). Rijsoort (2000) suggests that farmers cultivate NTFPs on their homesteads as a strategy for reducing the pressure on natural forest resources. Research reveals that NTFP cultivation can also have concrete ecological benefits. For example, it can encourage natural regeneration and mimic natural forest ecosystems in plantations and afforestation sites (Campbell, 1995). Rijsoort (2000) further suggests that food security means having access to sufficient food for a healthy and productive life in the right quantity and at the right time. NTFPs and trees contribute to household food security and family nutrition through a variety of mechanisms. Food NTFPs are often used as "snack foods" while working on the land or tending cattle, and they have a buffer function in times of scarcity. In a study from southwest Bengal, Malhotra et al. (1993) recorded 189 different NTFPs used by local people, of which 113 are derived from plant species and 76 from animal species. Of these 27 are used commercially, 39 are consumed as food, and 47 are used for medicinal purposes for both livestock and humans. In a study from South Africa, Shackleton and Shackleton (2004) found that NTFPs were used commonly by more than 85% of households as a source of mats, brooms, brushes, utensils, and edible fruits.

The sustainable production and conservation of forest products is influenced by a number of factors, largely socioeconomic and institutional in nature. Non-timber forest products are used for cultural, subsistence, recreational, and commercial purposes, and offer a wide range of opportunities for cultural maintenance and revival, support of forest biodiversity, as well as rural community economic development and stability (Cocksedge 2006). NTFP-based activities are often perceived as transitional, giving way to other enterprises and products as the economy improves (FAO 1995a). However, availability of NTFPs is not the only



factor that determines their collection; different social and economic status is also an important contributing factor in determining what is collected and by whom. On the whole, tribal communities depend most on NTFPs for their livelihoods. Local communities also use NTFPs, but there are some significant differences between the two groups. For instance, only tribal groups eat fern leaves (dhekishak) and bamboo shoots as vegetables (Malhotra et al 1993). It is therefore important to acknowledge that NTFP collection and commercialization can make a positive contribution to the livelihoods of the poor, and can be incorporated into socio-economic development programs involving forest management.

Men and women also have differing roles in collecting NTFPs. In southwest Bengal, Malhotra et al. (1993) found that women constitute the major gatherers of forest products - particularly fuelwood and fodder and other items for domestic consumption, while a few elderly men usually collect medicinal plants. Some men gather dry leaves and fodder. Most women also take their children to the forest to collect tubers, brushwood and dry leaves. Studies show that NTFP-based activities can provide women with a greater sense of self-confidence and improved status within the household and the community (Marshall et al. 2006a).

As human populations increase, a natural extension of the process of collecting NTFPs and wood from a common resource is to move on to the domestication of these species, and for agricultural agencies to encourage on-farm cultivation, especially where forest-based collection by rural harvesters is perceived as an ecological threat. Previous field surveys have shown that three factors in particular may influence small-scale farmers' decisions about domesticating trees to produce marketable products: (1) market opportunities and constraints, (2) the properties of a given species relative to farmer needs, and (3) the role trees play in risk management (Miah, unpublished data).

Background

Study Objectives

This study focuses on four villages in Chunati Wildlife Sanctuary (CWS), Chittagong Division, Bangladesh. A total of 170 families inhabit these four villages. Household level data were collected to examine the various sources of income and the relative importance of income from NTFPs. The main goal of the study is to provide a detailed profile of the NTFPs collected in the four villages. The collected information is expected to contribute to general knowledge of the current forest use

practices and villager dependence on NTFPs. It will deepen the understanding of the economic and social value they provide to different sections of the community. The primary research objectives are as follows: (a) to identify the main NTFPs and aspects of NTFP extraction, processing and sorting of NTFPs originating from woody plants, herbs and shrubs; (b) to describe the division of labor in NTFP collection with regard to gender; (c) to identify the maximum collection period of NTFPs and latest month of collection; and (d) to assess the contribution of NTFPs to household income and the overall degree of household dependence on them.

Study Site

The Chunati Wildlife Sanctuary is located at 21°40' N and 92° 07' E, about 70 km south of the city of Chittagong, on the west side of the Chittagong- Cox's Bazaar highway (Fig. 1). It was originally a part of Chittagong Forest Division and is now under the jurisdiction of Chittagong South Forest Division. The total area of the Wildlife Sanctuary, according to the government gazette notification, is about 7,764 hectares (Nishorgo Support Project 2005).

Typically, the rural households of Chunati Wildlife Sanctuary use several different non-timber forest products to meet their everyday needs. The villages cover 56.1 hectares of cultivable land (0.33 hectares per household), and depend solely on rain-fed agriculture. The local people cultivate paddy, wheat, peppers, turmeric, mustard and other vegetables. They also collect bamboo, cane, fuelwood, grass, fruits, ferns, mushrooms, medicinal plants, dry leaves, wild animals, and honey periodically from the forest of CWS. Different collectors - men, women and children - are involved in seasonal or regular collection. Harvesting of NTFPs is usually suspended during the monsoon when people are fully engaged in farm-based agricultural activities.

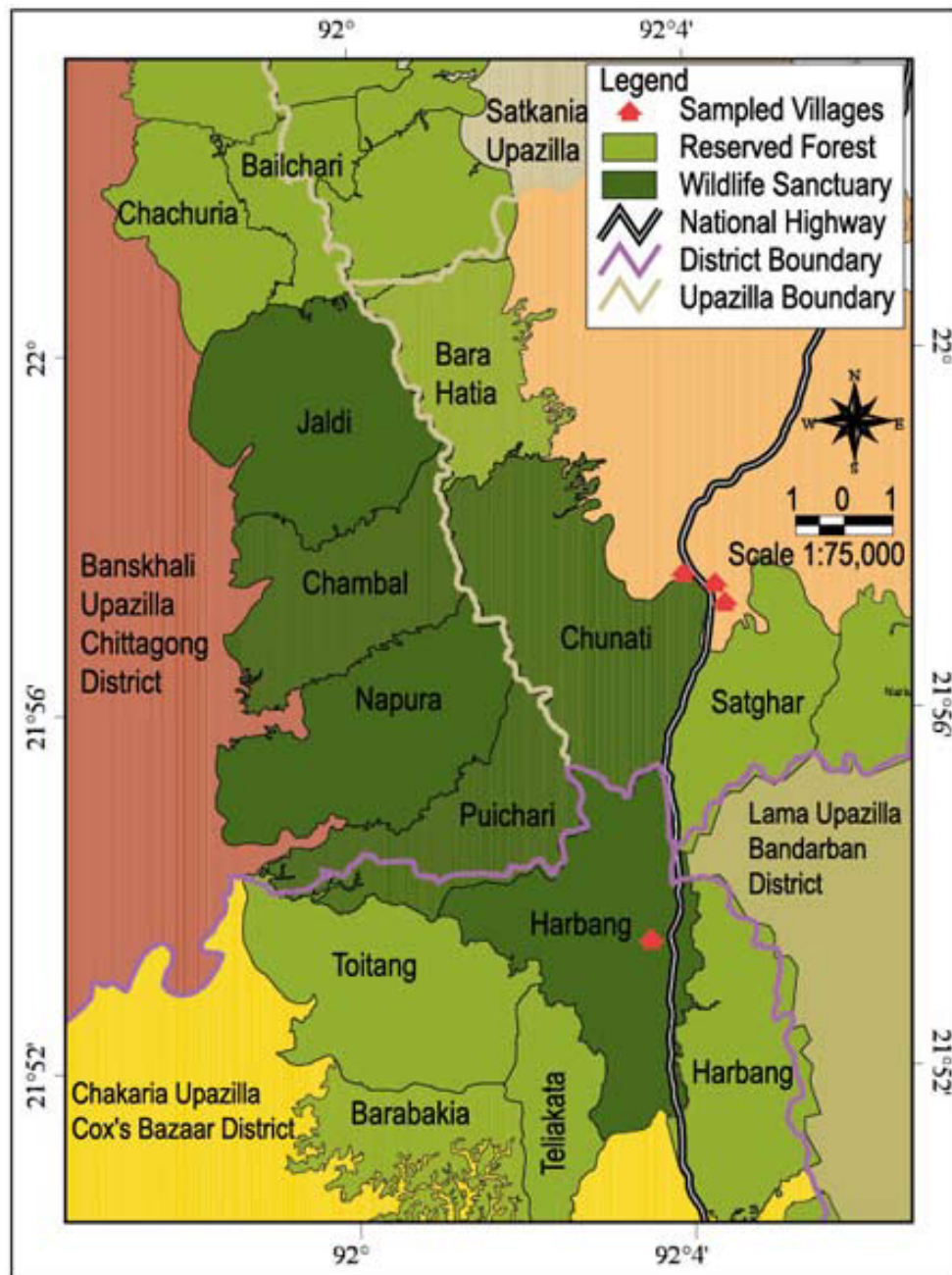


Figure 1: Map of Chunati Wildlife Sanctuary (Source: Nishorgo Support Project 2007)

Methods

The study sites were situated in Chunati Beat and Harbang Beat, located 70 km and 78 km from Chittagong city, respectively. Beats are administrative units used by the forest administration. I selected four paras or small villages located in the two beats. Goyalmara village is located in Harbang Beat, while Nalbania, Teenghoria

and Bonopukur villages are in Chunati Beat. Field data were collected between February and June 2006 and analysis was conducted during July and August 2006. Data were gathered from a total of 24 households selected randomly from the four villages (14% overall sampling intensity). I conducted six household interviews in each village, but because population sizes vary over the villages, this method meant that some villages were more thoroughly sampled than others. There were 10 households in Teenghoria, 40 households in Nalbana, 50 in Bonopukur, and 70 in Goyalmara, which yielded sampling intensities of 60%, 15%, 12% and 9%, respectively.

I surveyed households on the basis of their agrarian holdings (small, medium and large), and also interviewed representative groups of seniors, women, and youth. I collected socioeconomic information from each sampled household (member) regarding family size, age, sex, literacy level, and secondary occupations, land holdings, primary off-farm income, total annual earnings, and collection (amounts and timings) and availability of NTFPs.

In addition, I conducted separate interviews with forest staff involved at the field level (forest guards and foresters), executive staff members (Range Forest Officers and Sub-Divisional Forest Officers), managerial officials (Assistant Conservator of Forest and Divisional Forest Officer at Chunati and Harbang beat office), and a local NGO official. This was done in order to learn about institutional perceptions and problems at the administrative level. Upon completion of the research, I conducted a feedback meeting in order to share the research findings with the villagers and to obtain their suggestions and comments.

Finally, vegetation surveys were carried out in 48 plots (two for each household) in order to determine the abundance of NTFP species collected in the study area. Plots measured 20m by 20m each. In each plot, I noted the number of species, number of individuals, parts used, collecting season, uses and economic value for each NTFP.

Results and Discussion

Socioeconomic Data

I surveyed all age groups, but the majority of respondents were in the lowest age classes, (20-29) and (30-39) (Fig. 2). They constitute the main work force in the villages. The oldest respondent lived in Bonopukur village and was 68 years old. The largest portion (33%) of household heads interviewed were educated to the 10th grade level, 29% to the 5th grade, and 25% had secondary and higher



secondary education, or HSC. Only 12.5% respondents had completed education above the HSC level.

In terms of primary household occupation, most respondents were farmers (33%) while approximately 28% were engaged in small businesses, 21% were day laborers, and (17%) were service holders (Fig. 3). Most houses were tin sheds (54%), while a few people lived in cement homes (4%). Housing is often used as an indicator of household wealth and as such could be linked to livelihood dependency on natural resources and subsistence (Fig. 4).

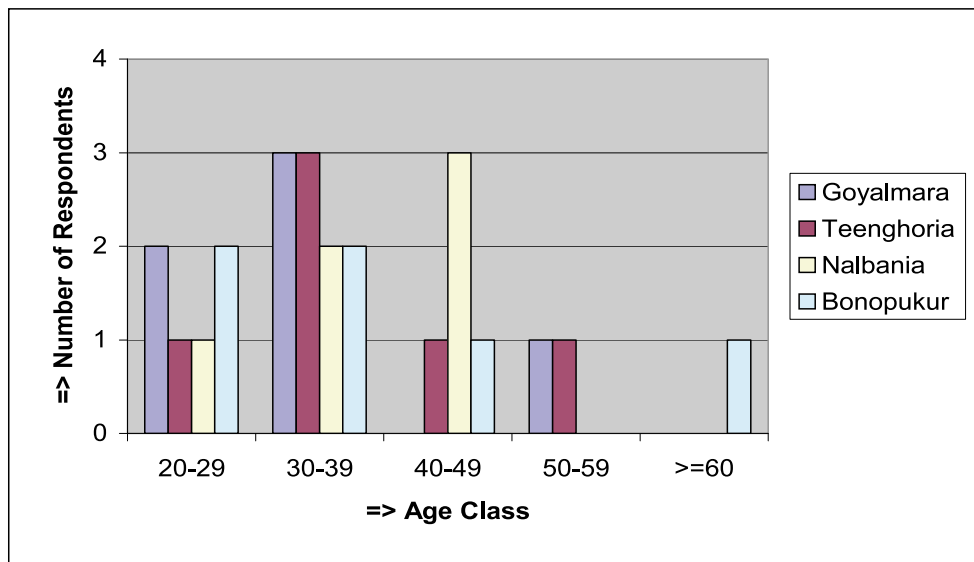


Figure 2: Age classes of surveyed villages

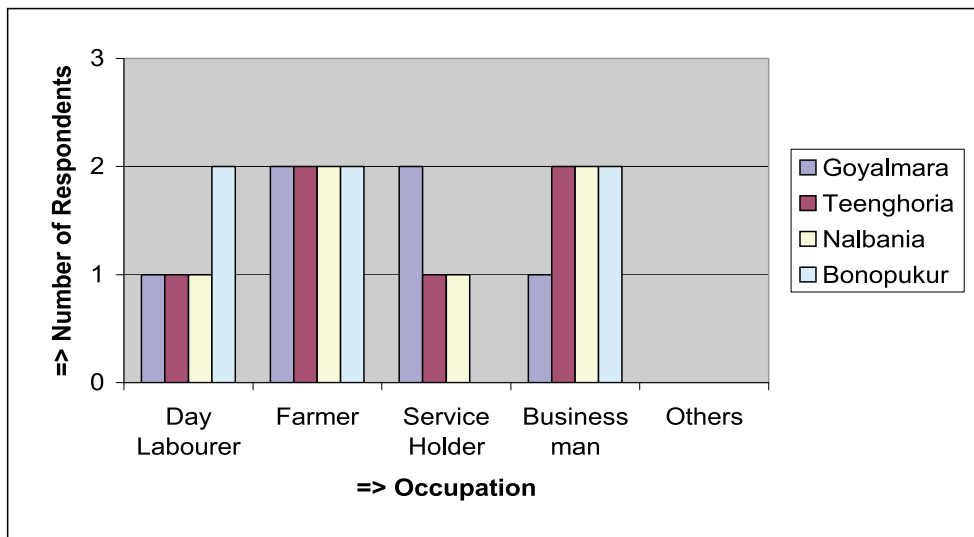


Figure 3: Occupation of Respondents in the Study Sites

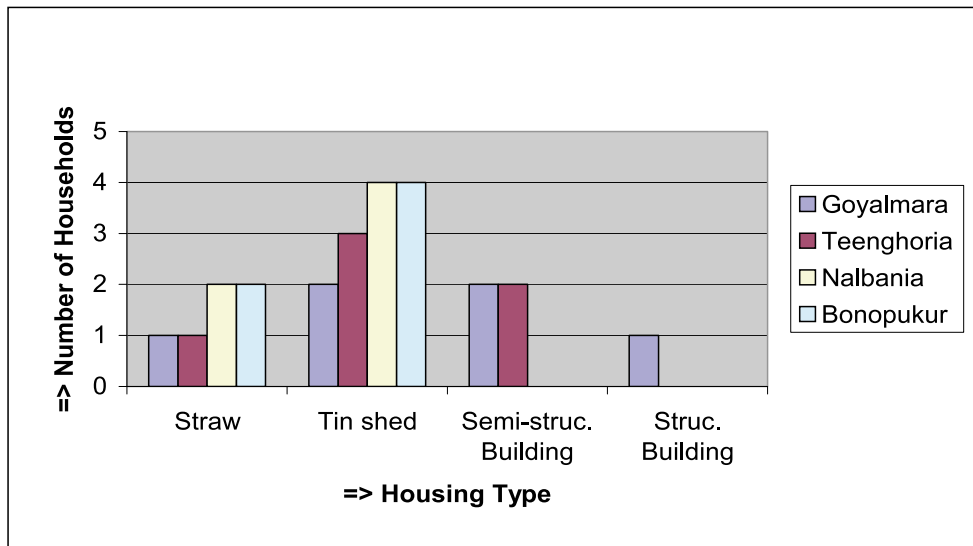


Figure 4: Housing Types of Respondents

Land holding size can influence socioeconomic conditions and people's ability to practice sustainable forest management. The Bangladesh Bureau of Statistics (2005) officially denotes poor people as having up to 1 acre of land, lower middle class owning 1 to 2.49 acres of land, middle class own 2.5 to 4.99 acres of land, upper middle class own 5 to 7.49 acres of land, rich (upper class) owning 7.5 acre or more of land in rural areas. I classified households into 3 groups for interviews on the basis of land holdings (Figure 5). In this study, most respondents (50%) owned less than 1 acre of land, while only a few people in Nalbania and Bonopukur own more than 2 acres of land.

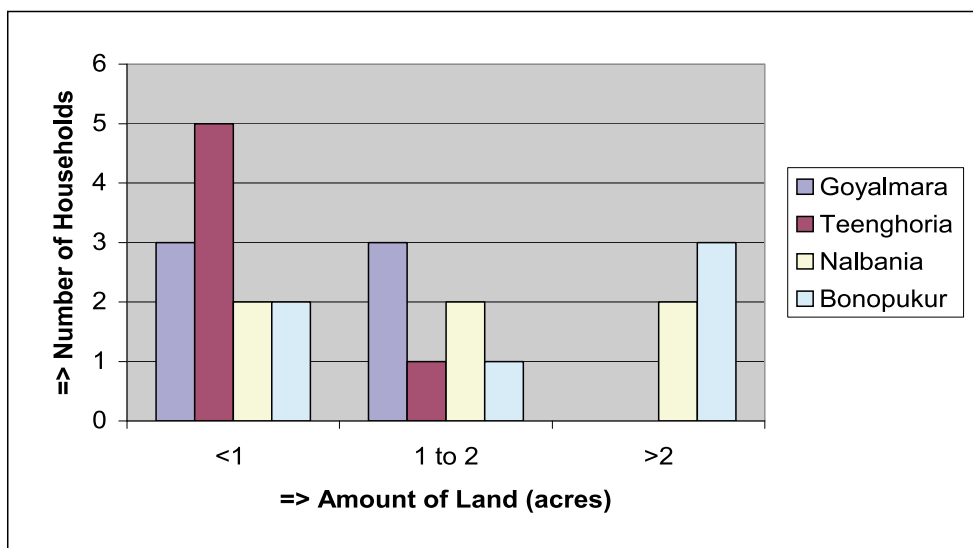


Figure 5: Size of Household Landholdings



Use of NTFPs

The respondents use various NTFPs in their daily lives, which they pick from their household gardens and the surrounding forest lands. These products (and the percentage of households that use them) include deadwood for fuel (83%), herbs (75%), fruits (58%), dry leaves (54%), building poles (33%), vegetables (25%), mushrooms (17%), and honey (8%) (Figure 6).

About 40% of NTFPs collected by the villagers were used for medicinal purposes, including the leaves from 24 different plant species. Villagers used over 29% of all species for food (Figure 7). They also used leaves of various species (35%) for assorted purposes, and fruits of various plants (16%). The most commonly collected NTFPs are listed in Table 1. Households in all the villages I studied, except Teenghoria, also collect mushrooms from the forest.

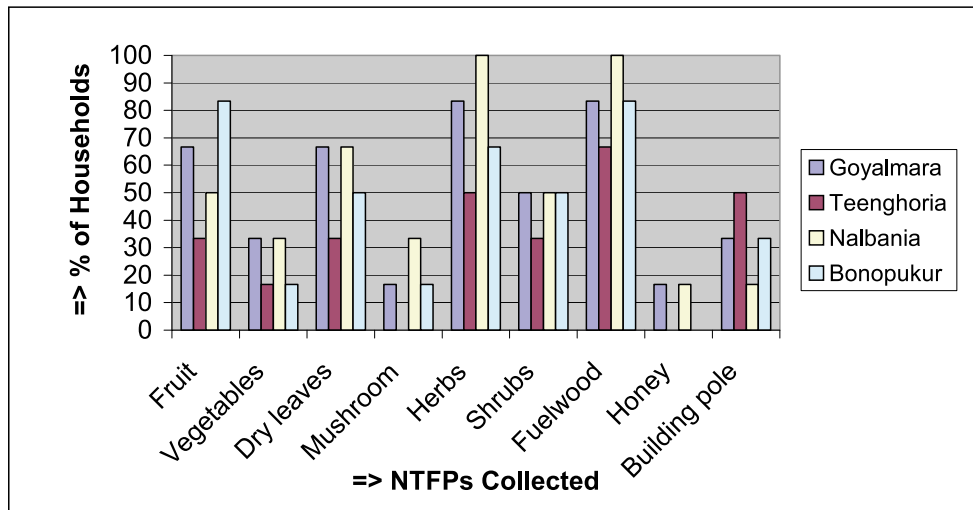


Figure 6: Percentage of Households Collecting Different Types of NTFPs

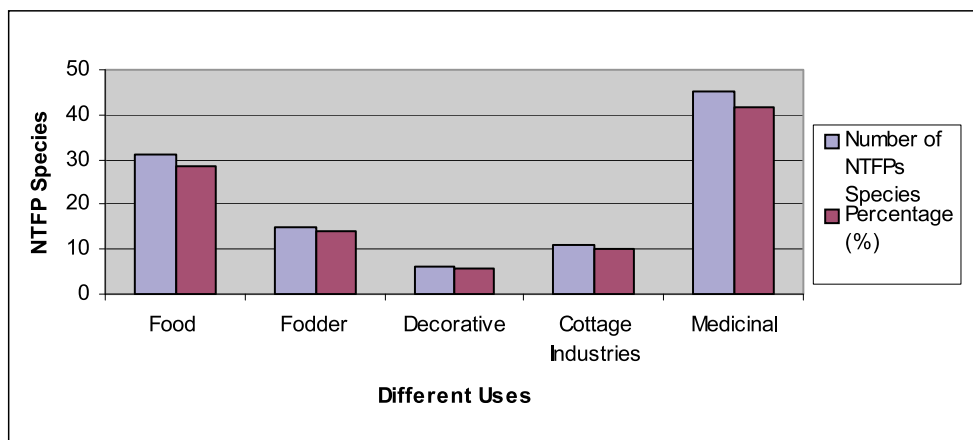


Figure 7: Use of NTFP Species

Table 1: Common NTFP Species Collected at the Study Site

Bengali name	Latin name
Paniyala	<i>Calophyllum inophyllum</i>
Kanthal	<i>Artocarpus heterophyllus</i>
Borta	<i>Artocarpus lakoocha</i>
Bael	<i>Aegle marmelos</i>
Lutki	<i>Melastoma melaboثرicum</i>
Jonglikola	<i>Musa sapientum</i>
Jongliboroi	<i>Zizyphus rugosa</i>
Tentul	<i>Tamarindus indica</i>
Kalojam	<i>Syzygium cuminii</i>
Bon Kochu	<i>Diplazium esculentum</i>
Thankuni	<i>Centella asiatica</i>
Chhoi	<i>Piper chaba</i>
Dhenkishaak	<i>Colocasia esculenta (Linn.) Schott</i>
Bamboo	<i>Melocanna baccifera and Bambusa tulda</i>
Cane	<i>Calamus viminalis and Calamus tenuis</i>
Jonglilebu	<i>Citrus aurantifolia</i>
Bon alu	<i>Dioscorea bulbifera</i>
Tokma	<i>Hyptis suaveolens</i>
Kolmishak	<i>Ipomoea aquatica</i>
Totola	<i>Oroxylum indica</i>
Odal	<i>Sterculia villosa</i>
Lali	<i>Amoora wallichii</i>
Chilauni	<i>Schima wallichii</i>
Fuljharu	<i>Thysanolenia latifolia</i>
Bonpata	<i>Paederia foetida</i>
Nayantara	<i>Vinca rosea Linn.</i>
Arjun	<i>Terminalia arjuna Linn.</i>
Lemon grass	<i>Cymbopogon citratus DC. Stapf.</i>
Sungrass	<i>Imperata arundinaria</i>

All the selected NTFP species were cultivated in the home gardens (Fig. 8). These included bamboo (41% of individuals planted in the sample plots), cane (10%), mat palms or patipata (26%), fruit species (6%), medicinal plants (6%), betel leaves or paanpata (3%), and areca nuts or superi (8%). Poorer people used small timber and thatch for household construction and roofing, respectively; leaf litter and leaves, medicinal herbs; as well as edible roots and tubers, mushrooms, flowers and fruits as substitutes for staple foods, especially during lean seasons. Women in particular are quite dependent on NTFPs for self-support and income. Of the household members that collect NTFPs, 62% were women, compared with the approximately 17% that were children and 21% that were men. Thus, nearly three times more women than men are involved in NTFP collection.

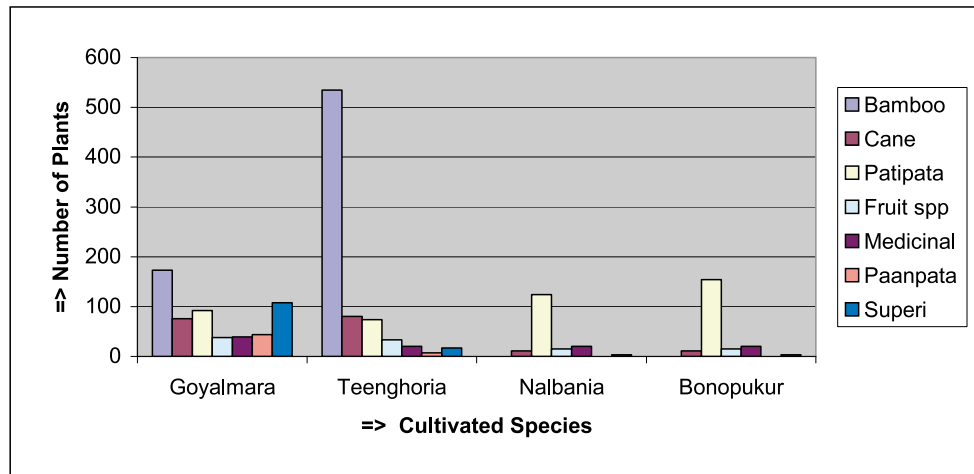


Figure 8: Different NTFPs Cultivated in Study Areas

The total annual income for a household was calculated as: the sum of annual agricultural farm income, income from other on farm sources including NTFPs and animal products, earnings from primary and secondary occupations i.e. off-farm wage income, and income from NTFP gathered from the forests.

The average income per year from NTFP sales varied from village to village. Average income level from NTFPs sales ranged from Tk 2,700 to Tk 7,425 per year, and the daily average incomes from NTFPs varied from Tk 20 to Tk 50 per day, during the collection season of 3 to 7 months. Villagers collecting NTFPs from the forests sell directly to markets. These sales differ from family to family on the basis of the products collected, family needs, and other factors. Villagers collected NTFP year-round except for 2 to 3 months; actual timing of collection would vary according to monsoon and winter seasons, but collection time is mostly from November to May each year (Table 2).

Non-timber forest products are a significant contribution to the income and welfare of study households. Respondents suggested that local NTFP collection helps them meet important household needs and sources of income such as leaves and medicinal herbs, food for livestock, fruits, fuelwood and honey; while also supporting the production of secondary goods like processed or prepared food (animal and vegetable), baskets and other crafts. Table 2 also shows that NTFP collection makes a significant contribution to household income.

Relative Contribution of NTFPs to Annual Family Income

From the household survey, I learned that agriculture, NTFP collection, secondary occupations and others (remittances, wage labor, livestock, and small businesses)

are the main sources of annual family income. About 12% of the annual income of villagers in Bonopukur comes from the collection and sale of NTFPs, compared with 7% in Nalbania, 6% in Goyalmara, and 4% in Teenghoria (Table 3).

Table 2: Distribution of Income from Sale of NTFPs in Some Forest Villages of CWS

Village	Months per year that NTFPs are collected (Maximum)	Average range of income per family per day (Tk) from NTFP sales	Average yearly income (Tk) from NTFP sales	Major types of NTFPs collected
Goyalmara	3-6	15-30	2700	Fruits, vegetables, dry leaves, mushrooms, herbs, shrubs, fuelwood, honey, building poles
Teenghoria	2-4	17.5-35	2100	Fruits, vegetables, dry leaves, herbs, shrubs, fuelwood, building poles
Nalbania	5-7	18.75-26.25	3937	Fruits, vegetables, dry leaves, mushrooms, herbs, shrubs, fuelwood, honey, building poles
Bonopukur	5-6	41.25-49.50	7425	Fruits, vegetables, dry leaves, mushroom, herbs, shrubs, fuelwood, building poles

Table 3: Relative Contribution of NTFPs to Annual Income of Sampled Families of CWS

Villages	Number of family members	Mean family income (Tk) per year	Relative contribution on annual income			
			Agriculture %	NTFPs %	Other occupation %	Others %
Goyalmara	31	59460	37	6	45	13
Teenghoria	27	76188	42	4	39	15
Nalbania	40	53208	39	7	41	13
Bonopukur	28	64768	48	12	32	8

Dynamics of NTFP Collection at Various Levels

The amount of NTFPs collected is somewhat dependent on demand in the market created by external agents (i.e. secondary traders) in Amirabad, Lohagara, and Chittagong. Secondary traders place their orders on various NTFPs to primary traders who operate within Chunati Wildlife Sanctuary. For these orders, they usually advance a lump sum to the primary traders. Next, on the basis of orders of various items, primary traders involve local people of their regions for collection of various NTFPs. Local villagers who actually collect the NTFPs get a minimum price for their goods. Usually primary traders sell NTFPs to secondary traders with minimum profits from the price given to village collectors. The secondary traders sell the NTFPs at a price three to four times higher than that of primary traders. Collection of NTFPs increases during the lean season, and the primary traders often



give advance payments during festival and crisis periods to collectors. Some collectors reported that they have little knowledge about channels of NTFP markets. However, some primary traders in Chunar Wildlife Sanctuary have tried to sell their goods directly to exporters at Amirabad and Chittagong, but failed due to the huge minimum cash requirements for transactions, delays in payments, and reduction of market value of NTFPs by agents. Secondary traders, on the other hand, typically do not face these problems as they are based in the cities and already have well-established connections and agreements with the exporters.

People's Perceptions About NTFP Collection

In general, the people surveyed believed that NTFP collection will increase with time in CWS if they are managed sustainably. This requires monitoring operations and alternative income generating sources for villagers living in and around CWS. Forest villagers believed that NTFPs provide an important source of income for sustaining their daily needs. Villagers report that their agricultural yields are under continuous threat from elephants, wild boars, monkeys and illegal fellers. Villagers felt that NTFP collection has decreased in some areas of the Sanctuary, due to dwindling resources in forests, and the resulting increased protection, and reduction in demand from secondary traders.

Conclusion

NTFP use and cultivation under co-management practices have been implemented in forests that were traditionally open to local communities as common pool natural resources for their livelihoods. Changes in biophysical or socioeconomic conditions have often been stated as the leading cause of forest management failure (Chauvin 1976, Dawkins and Philip 1998).

Livelihood costs of households could be significantly higher if the forests were guarded-either by the local community or by government foresters. Local communities have a built-in capacity to control harvesting as well as effectively monitor illegal felling through local arrangements, so overall livelihood costs will be lower under community management for the same level of control. Moreover, co-management approaches are particularly suitable for CWS because local communities are dispersed throughout the sanctuary. These people practice cultivation and depend on forests for their livelihood needs. An underlying assumption is that communities will conserve and protect forest resources if they receive tangible benefits from sustainable utilization of forests (RECOFTC, 1995).

On the other hand, proper understanding of the levels of social relations in community-based resource management has important welfare implications, especially for the livelihood security of poorer households, as they should not be made worse off from institutional changes in resource management. Though this study could not compare the transaction costs of resource management under different property regimes (state, co-management, community and private management), further research on comparison of transaction costs associated with different forms of property regimes may help to develop a more generalized theory of transaction costs and their significance in managing the local commons. While this assumption still needs to be tested, currently local people appear to have limited rights to forests, despite the recognized importance of NTFPs for income generation and food security (Lynch 1995). There is a pressing need to facilitate specific interventions that enable forest resources to play a greater role in livelihoods through improved local forest governance. Forests can only contribute to poverty reduction when poor people have secure long-term rights to their resources, coupled with the capability to defend them against more powerful actors. The potential contribution of forests to poverty reduction is the subject of some debate. Overcoming these barriers is crucial in achieving progress toward sustainable forest management and making forest resources work optimally toward alleviating poverty, leveraging local and national socioeconomic development, and avoiding the long-term degradation of important forest-based goods and services specially NTFPs.

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Collection and Management of Selected Medicinal Plants in Rema-Kalenga Wildlife Sanctuary

Mohammad Zashim Uddin
Snigdha Roy
Department of Botany, University of Dhaka, Bangladesh

Abstract

*This paper explores linkages between two selected medicinal plants, menda (*Litsea glutinosa*) and bohera (*Terminalia bellerica*), and the livelihoods of local people living in the vicinity of the Rema-Kalenga Wildlife Sanctuary. We conducted four field trips to the study area and collected data from collectors and middlemen between February and June 2006. We interviewed a total of 67 people using semi-structured questionnaires (local people, members of local indigenous communities, and middlemen). We recorded their collection techniques, plant parts used, collection rates, market prices, market demands, monthly supplies, buyers, market chains, and management practices of medicinal plants. Study results suggest that many people are involved in the illegal collection and sale of both species. The demand for these species is high because of heavy use for both commercial and subsistence purposes. We conclude that there is a positive link between these two medicinal plants and local livelihoods. Therefore, co-management plans for Rema-Kalenga Wildlife Sanctuary should be developed with the participation of local residents to incorporate the cultivation and management of the target species. This would promote both improved livelihoods for local people, and better conservation and management of the wildlife sanctuary.*

Introduction

Medicinal plants are gaining popularity in many areas of the world. Currently, eighty percent of the world's population depends on herbal medicine for meeting their primary health care demands (WHO, IUCN and WWF 1993). Scholars have proposed various reasons for this popularity, including affordability, accessibility, availability, expense, few side effects, simplicity, safety, and changing needs and beliefs. Although modern medicine has played an important role in human health

care, including dramatic declines in mortality and increases in life expectancy, it can have many drawbacks including high costs, adverse side effects and difficulties with availability, especially for rural populations. On the other hand, herbal medicines have entered the mainstream global economy. The annual worldwide growth rate for herbal medicines in 1991-1992 was between 5 and 15 percent. In 2001, the world market for traditional medicines (including herbal products and raw materials) reached US\$ 43 billion, as reported by the Secretariat of the Convention on Biological Diversity (UNEP 2001). Furthermore, traditional medicines and complementary or alternative medicines are now playing increasingly important roles in health care and health sector reform globally (UNEP 2001).

Active compounds from medicinal plants are used in most traditional medicines and can play an important role in advancing sustainable rural livelihoods through their conservation, cultivation, propagation, marketing and commercialization (Laird et al. 2004). In Bangladesh, studies investigating the sustainability of the commercial trade in medicinal plants are at an initial stage. To date, studies on medicinal plants have mainly focused on listing medicinal plants, their uses, chemical compositions, and modes of treatment (Khan and Huq 1975, Hassan and Khan 1986, Mia and Huq 1988, Khan and Mia 1989, Khan 1991, Alam 1992, Hassan and Huq 1993, Yusuf et al. 1994, Chowdhury et al. 1996, Alam et al. 1996, Hassan and Khan 1996, Ghani 1998, Uddin et al. 2001, Khan et al. 2002, Uddin et al. 2004, and Uddin et al. 2006). None of these studies have provided practical information about the collection and management of medicinal plants in relation to local livelihoods. In order to address this issue, this paper explores the linkages between two medicinal species - menda (*Litsea glutinosa*) and bohera (*Terminalia bellerica*) - and the livelihoods of local people in Rema-Kalenga Wildlife Sanctuary, Bangladesh.

Background

Rema-Kalenga Wildlife Sanctuary (RKWS) is located approximately 130 km east-northeast of Dhaka and 80 km south-southeast of Sylhet in Chunarughat Thana, a sub-district of Habiganj District, Sylhet. The sanctuary is bounded by Tripura State (India) to the south and east, and Kalenga Forest Range to the north and west. Geographically, the area lies between 24°06'-24°14'N latitude and 91°34'-91°41'E longitude (Fig. 1). The area falls under the Sylhet Hills zones (IUCN 2002), and the administrative area is known as the Rema-Kalenga Forest Range. The sanctuary is



located in the Tarap Hill Reserve Forest, which was established under a declaration of the Forest Act of 1927. In 1982, the government designated 1,095 hectares of the Reserve Forest as the Rema-Kalenga Wildlife Sanctuary. In 1996 the sanctuary area was further expanded by 1,995 hectares via another declaration. RKWS is a habitat and species management area as defined by Green (1990), and it is managed mainly for conservation. Rema-Kalenga is remote and inaccessible to visitors, particularly during the monsoon, due to lack of proper roads.

RKWS is part of the Tarap Hill system, which is a part of the southern hills of greater Sylhet district. It extends approximately 48 km from east to west. The sanctuary encompasses several hills of different elevations and low-lying valleys, with the highest peak at about 67m above sea level (Rizvi 1970). A series of ridges run in different directions, and valleys known locally as longa fill with water during monsoon, but dry up during the winter season. The main channels include the Karangi Chhara, Lokhmiya Chhara and Rema Chhara, with tributaries criss-crossing the sanctuary and constituting the major drainage system in the area. All three channels flow westward into the Khuai River.

Soils of the sanctuary vary from clay loam on level ground to sandy loam on hilly ground. The clay and sandy loams are exceedingly fertile and show low pH. In some cases, soil texture consists of yellowish-red sandy clay mixed with granules of magniferous iron ore (Ahmad 1970). The area enjoys a moist tropical climate characterized by a period of high rainfall from April to September, and five months of a relatively dry period from November to March (Rizvi 1970).

The vegetation of the sanctuary is described as tropical evergreen and semi evergreen forest (Sarker and Haq 1985, Mountfort and Poore 1968 and Uddin 2002) dominated by chapalish (*Artocarpus chaplasha*), gorjon (*Dipterocarpus turbinatus*), bonak (*Schima wallichii*), hargoja (*Dillenia pentagyna*) and kakra (*Aporosa dioica*), and characterized by many giant climbers (Uddin 2002). The undergrowth is mostly dominated by members of the Acanthaceae, Rubiaceae, Asteraceae, Poaceae, Cyperaceae, Zingiberaceae and Araceae families. Many orchids, ferns, epiphytes and parasites are also found in the forest. Uddin (2002) has inventoried 606 plant species in the Sanctuary, among which 82 have been identified as medicinal plants that play important roles in local livelihoods.

There are eight small indigenous groups (ethnicities) living inside and outside the sanctuary: The Tripura (or Deb-Barma), Santal, Urang, Kharia, Kurmi, Goala, Munda, and Bunargi. Among these, Tripura make up approximately 90% of the

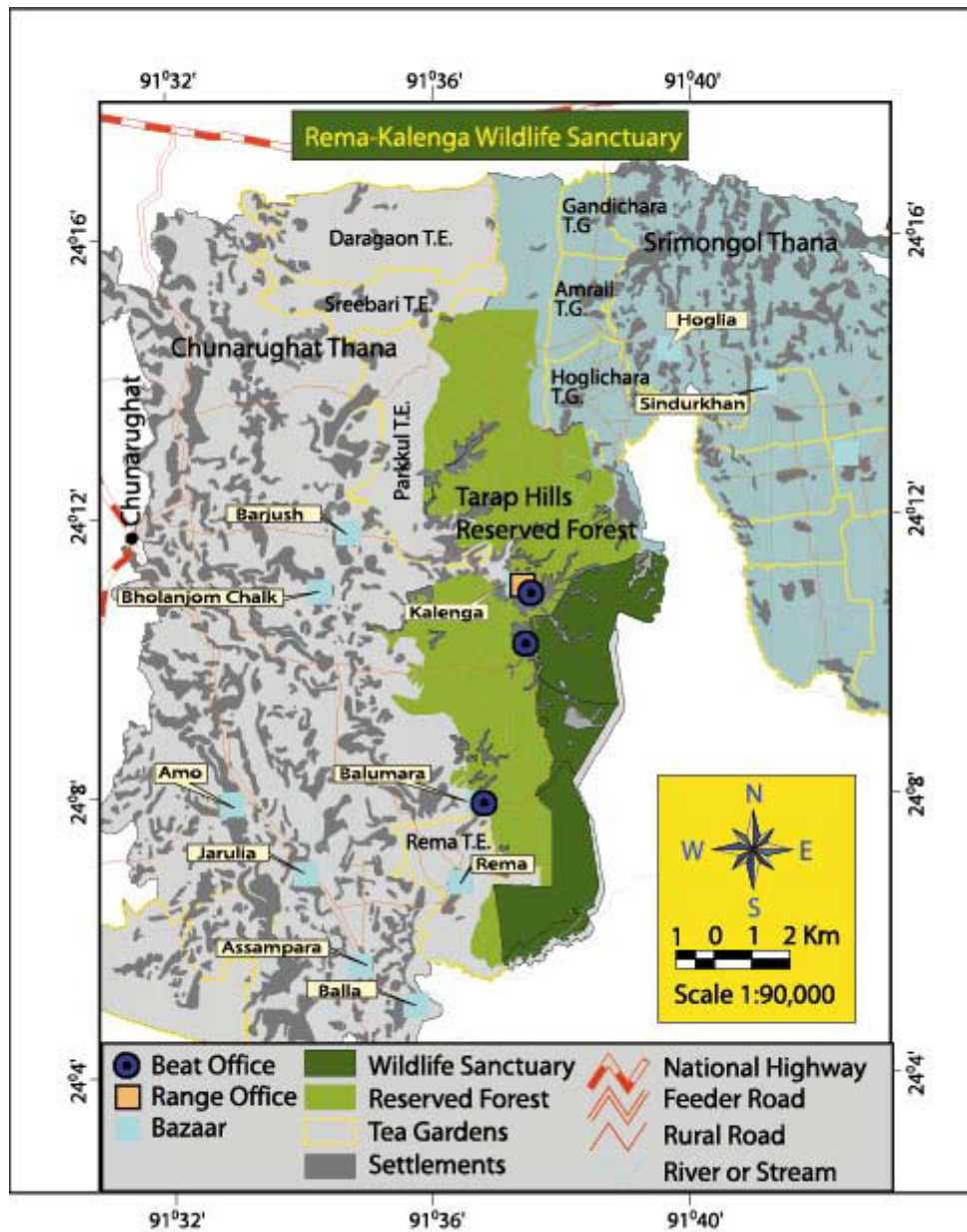


Figure 1: Map Showing the Study Area (Source: Nishorgo Support Project, 2007)

total human population found in the Sanctuary. Their languages and cultural traditions are unique, and they depend mostly on wild plants for their food and primary health care. One important Tripura group resides in a valley named Debrabari, located in the middle of the sanctuary. They cultivate vegetables and fruit crops on the hill slopes.

Three blocks of plantations - sal (*Shorea robusta*), shegun (*Tectona grandis*, or teak)



and lohakat (*Xylia kerii*) are located along the western edge of the sanctuary. There is a road on the western side that separates the sanctuary from the Kalenga Range and extends southwards to the Rema Beat Office. A watchtower was constructed near the Kalenga Beat Office by the Forest Department in 1995, to serve eco-tourists who wish to observe wildlife in nature. An artificial lake and a fruit orchard were also established near the tower to attract primates, jackals, wild boar, porcupine, squirrel and deer.

Methodology

We selected two important medicinal plants to focus on for the present study on the basis of their apparent significance to the study site:

- *Litsea glutinosa* (Lour.) C.B. Rob. Bangla name: Menda. English name: Indian laurel. Family: Lauraceae. General uses: Juice of the leaves and bark used in treatment of diarrhea, dysentery and also jaundice. Energy tonic produced from bark extract (Ghani 1998).
- *Terminalia bellerica* (Roxb.) Bangla name: Bohera. English name: Belliric myrobalan. Family: Combretaceae. General uses: The fruits possess antibacterial properties. Employed in the treatment of edema, piles and diarrhea. Also used for myopia, corneal opacity, pterygium, and immature cataracts; as well as various chronic and acute infections. The fruits also possess myocardial repressive properties (Ghani 1998).

We conducted a total of four field trips to Rema-Kalenga Wildlife Sanctuary and collected data using semi-structured questionnaires between February and June 2006. We were assisted by Forest Department personnel, local people, and some Nishorgo Support Project staff members in the field. We attempted to collect data at the main forest entry point (Kalenga Range Office), but after spending one day at the gate without meeting any collectors, we learned that the Forest Department had imposed a total ban on the collection of non-timber forest products (NTFPs), including menda and bohera, since 2005.

Accordingly, we changed our data collection strategy. We learned from local villagers that collectors use different paths to enter the forest illegally for collection. We visited five such paths on the edge of the Sanctuary to locate plant collectors. These paths were at Kalenga, Karangichhara, Chonbari, Debrabari and Krishnachhara. We met collectors at the entry points to these paths and interviewed them. We wanted to know their collection techniques, collection rates,

seasons, parts used, market prices, and perception about management techniques for the two study species. We also collected demographic data on the collectors including their age, main occupation, level of education and gender.

In addition, the collectors helped us to identify four markets where we could interview middlemen: Chunarughat, Shaeshtagonj, South Daorgach and Mirashi. However, we were only able to locate and interview middlemen at South Daorgach. Accordingly, we collected data on the number of collectors that came to each middleman per day, the amount of raw material purchased per day, the purchase price, the selling price, monthly supply, market demand, the buyers, and market chains. We also recorded the age, primary occupation, education and gender of the middlemen.

We conducted four separate group discussions in the sanctuary area. One group discussion was with Forest Department personnel, and the other three discussions were with local people and collectors. We also conducted one group discussion outside the sanctuary with the middlemen at South Daorgach village. During group discussions, we focused mainly on the threats to medicinal plants and considerations for co-management of these two medicinal plants in relation to livelihoods. Finally, we tried to find links between medicinal plants and the livelihoods of local people in Rema-Kalenga Wildlife Sanctuary.

Results and Discussion

We interviewed a total of 67 people, 64 of whom were primary collectors in Rema-Kalenga Wildlife Sanctuary. The remaining three were middlemen working outside the reserve. Ten of the 64 primary collectors provided demographic data but refused to give us any data about their menda and bohera collection practices. The average age of the collectors was 37 years. Most collectors had completed primary education but some (5 collectors) were completely illiterate. Professionally, they were mainly small farmers, day laborers and small traders. Income from these professions is insufficient to support family expenditures year-round, so they partially depend on the collection and sale of menda and bohera to supplement their cash income. All collectors we interviewed were male; no female collectors were interviewed because we did not encounter any female collectors during data collection. Both indigenous communities (Tripura) and Bengalis were involved in the collection and processing of menda and bohera. Table 1 summarizes the demographic data we collected.



Table 1: Demographics of Local People Interviewed in Rema-Kalenga Wildlife Sanctuary

	Total people interviewed	Mean age	Education	Occupation	Ethnicity	Gender
Collectors	54	37	No education (5) Primary (33) Under SSC* (16)	Small farmer (49) Day labor (3) Small trader (2)	Deb-Barma (9) Bengali (45)	All male
Middlemen	3	48	Under SSC* (2) SSC* (1)	Small trader	Bengali (3)	All male

NOTE: SSC = Secondary School Certificate

The collectors are from villages near Rema-Kalenga including Chonbari, Laturgao, Chanpara, Simailla Bosti, Huglia Tilapara, Huglia Tilagao, Nishindapur, Taltola Shibir, Adarshagram, Dakhin Tila, Hatimaragram, Kalenga, Kalishiri, Bularjum, South Daorgash, Amrul Bazar, Jamburachhara and Mongoliabari. In general, collectors live one to four kilometers from the forest. Members of ethnic communities who are involved in collection live both within and outside the Wildlife Sanctuary; all are forest villagers who have agreements with the Forest Department that allows them to live in and near the Sanctuary.

Collectors partially depend on the Sanctuary for their subsistence. In the interviews they informed us that before 2005 they could enter the forest easily to collect menda and bohera, with permission from the Range Office. This is because the Range Office issued passes for medicinal plant and other NTFP collection on a daily or monthly basis. According to the interviewees, the amount of menda and bohera collected has decreased drastically over the last five years. In 2005, the Forest Department imposed a total ban on all NTFP collection from the forest. Therefore, current collection of medicinal plants (mainly menda and bohera) is carried out illegally, without permission from the forest Range Office.

Collectors

We surveyed collectors in the Sanctuary, and the data are presented in the Table 2. We found that an average of 3 people collect from the forest every day. Bohera collection is seasonal, carried out mostly from September to November. During the harvesting season, collectors harvest approximately 2 kg of menda and 10.5 kg of bohera per person per day. Collectors recalled that five years ago they were able to harvest 10 kg and 30 kg per person per day, respectively, from the same forest. When asked to explain the differences between the two time periods, they

informed us that menda and bohera are now very rare and difficult to locate in the forest, due to over-exploitation, high market demand and unsustainable collection practices.

The average selling prices of menda bark and bohera fruits are Taka (Tk) 22 per kg and Tk 4 per kg, respectively (Table 2). On average, local people, including both ethnic Bengalis and indigenous people, earned Tk 44 per kg from menda bark collection and Tk 42 per kg from bohera collection. This is five times less than the amount they earned five years ago.

Table 2: Current and Previous Collection Rates and Market Price for Menda and Bohera

	Average number of collectors per day	Amount collected kg/person/day	Amount collected 5 years ago kg/person/day	Current market price Tk/kg	Average daily income Tk/person/day
Menda	3	2.0	10	22	44
Bohera	(Seasonal)	10.5	30	4	42

Collectors gather menda bark for the market and use the leaves for domestic purposes. To collect menda bark, collectors girdle the trees, irrespective of size and age, killing the trees. The extract from young leaves of menda can be used for various ailments, so local people also collect leaves. Collectors gather menda bark all year round, although there is some preference for the dry season as the forest is hazardous during monsoon.

Collectors sell the mature fruit of bohera in the market. They collect ripe fruits from the trees and sometimes they also collect fallen fruits off the ground. Collecting the fruit may affect the regeneration potential. Sometimes collectors also collect stems and branches of this tree for firewood. This may affect both fruit production and regeneration.

Middlemen

We interviewed three middlemen (Table 3) in South Daorgach village, located near Satchari National Park in Sylhet. This village is the focal point of the raw medicinal plant parts business in the area. The middlemen purchase menda and bohera, which originate not only in Rema-Kalenga Wildlife Sanctuary, but also from other sources including Satchari National Park, Lawachara National Park, homestead gardens, and even from India. Collectors cannot bypass the middlemen to sell their raw materials directly to consumers. We found that, on



average, three collectors sell menda to the middlemen each day. The middlemen buy an average of 24 kg per day of menda and 27.5 kg per day of bohera.

Middlemen purchase menda and bohera at an average price of Tk 25 per kg and Tk 4 per kg, respectively. They then sell the menda and bohera to owners of factories that produce herbal medicines, mosquito coils and incense sticks at an average price of Tk. 35 per kg and Tk. 10 per kg, respectively. Market demand for both NTFPs in raw form is currently very high. The middlemen supplied an average of only 0.725 ton per month to consumers (Table 3). Their monthly income from menda is about Tk. 7,250. Local collectors cannot meet the high demand for menda from protected areas, homestead gardens and neighboring countries. While this kind of business in raw medicinal plants is illegal, to our knowledge the government lacks policies for monitoring and prohibiting the sale and purchase of these products.

Table 3: Rate of Exploitation of Menda and Bohera and Market Demands.
(Data Obtained from Middlemen)

NTFP Species	Average number of collectors per day	Average amount per day (kg)	Purchase price per kg (Tk)	Selling price per kg (middleman) (Tk)	Current market demand (tons)	Average monthly supply (tons)
Menda	3	24.15	25	35	Very High	0.725
Bohera	Seasonal (Mainly Sept.-Nov.)	27.5	4	10	Very high	Seasonal supply

Market Demand and Market Chain

Currently, the crude supply from the forests of both menda and bohera is very low while the demand is high. The gap between supply and demand contributes to illicit activities in the supply market. In order to increase the amount of product, middlemen adulterate pure menda bark with sawdust. In this way they cheat both buyers and end-consumers at the same time. To meet the high market demand, the middlemen also purchase medicinal plants collected from other protected areas as well as from India through various smuggling channels.

The main buyers of the medicinal parts of menda and bohera are the factory owners of traditional medicines (e.g., Ayurveda, Unani) - namely Hamdard, Shadhana Oushudhalaya, and Shakti Oushudhalaya - and factory owners of mosquito coils and incense sticks - including Lalmai Chemical, Mortein, Eagle,

Elephant King, ACI Pharmaceuticals, and Globe. These factories are located mainly in Dhaka, Chittagong, and Comilla. Local people collect raw menda and bohera parts from the forest and transport the material to middlemen on foot, or occasionally using horses. The middlemen also purchase these materials from other sources and store them at their homes. The middlemen also have crushing machines to grind the materials prior to bagging. It is at this stage that sawdust is often added to the powdered plant material. Finally, they sell these materials to owners of traditional medicines and mosquito coil factories.

Local Perceptions of Management

We discussed management practices of menda and bohera with local people, collectors and middlemen. Most people informed us that they had no understanding before about management policies. They have no opportunity to manage medicinal plants in the protected area, since it is patrolled by the Forest Department. They would like menda and bohera to be managed in a sustainable manner in the Rema-Kalenga Wildlife Sanctuary. They recognize the high market value and demand for these two species. Local collectors indicated that they have never planted any saplings or seeds of either species. Most respondents, however, had positive attitudes toward co-management systems with equitable benefit sharing practices, and expressed a desire to work with the Forest Department. A few collectors stated that they had started to collect the seeds of menda or bohera from the forest and plant them in their home gardens. Collectors do not gather seedlings of these medicinal plants because the seedling survival rate is very low. Both species are very rare in the forest now.

Threats to Menda and Bohera

We conducted five focus group discussions with NTFP collectors, foresters, and middlemen. We focused mainly on threats to medicinal plants and co-management aspects of the two selected medicinal plants. Respondents pointed out a number of threats to menda and bohera in the forest: Middlemen suggested that the increasing demand for these species in the local market is one of the major threats. Currently herbal medicine has a growing market in Bangladesh, with many factories already established in different parts of the country. These factories need raw plant parts to manufacture herbal medicine. In addition, menda bark is used not only in herbal medicines but also in the manufacture of mosquito coils and incense sticks. Owners of these factories import a major portion of their raw materials from abroad and, according to the middlemen, only



a small portion of the factory demand for menda and bohera is met from local forests. Nevertheless, this demand is enough for local people to harvest these plants from the forest and to note that the resource is being severely depleted. As a result, menda and bohera are vulnerable to disappearing in the forest.

Although the Forest Department does not allow the harvest of menda and bohera from RKWS, collectors continue to remove these plants illegally. In group discussions, forest personnel informed us that The Forest Act of 1927 was designed for the management of forests and forest products including medicinal plants, but illegal collection of plants is difficult to stop for various reasons. These include pressure from influential people and lack of personal security for foresters wishing to enforce the law, as well as poor socioeconomic conditions and the lack of alternate livelihoods opportunities for local populations. These conditions encourage people to exploit menda and bohera. They also encourage middlemen to establish purchasing centers near forest areas. Whenever we visited middlemen they were uneasy about giving any information about medicinal plants, as they are wary of people trying to collect information, especially foresters.

Many participants in the focus group discussion suggested that population pressure and poverty are both threats to medicinal plants in the forest. According to these people, human population density threatens resources in the Wildlife Sanctuary. They also suggest that, because the number of people living below the poverty line is so high, many people cannot cover their daily expenses from agriculture, day labor or trade. For this reason, the poor seek alternate sources of income by going to the forest and collecting medicinal plants to sell for extra money.

The above-mentioned factors all represent major threats to the long-term viability of menda and bohera. Focus group discussions further revealed that a number of smaller threats also affect medicinal plants, including fire, timber-oriented forestry practices, failure to utilize local knowledge, and bureaucratic processes. Although fires sometimes occur naturally, manmade fires are a common phenomenon in the dry season, when huge amounts of leaf litter gather on the forest floor. Farmers sometimes intentionally start fires to clear out the underbrush for logging, and to facilitate loggers' free movement in the forest. Sometimes farmers intentionally start fires to promote sprouting of *Imperata cylindrica* (sun grass) in particular areas. These fires burn seeds, seedlings, propagules and bark, and interfere with regeneration dynamics of the NTFPs.

According to local foresters, timber-based forest management is another threat to medicinal plants. The Forest Department manages its forests for valuable timber species and other plants are treated as weeds in the forest. When managing forests for timber, foresters eradicate all such "weed" species annually. Because neither menda nor bohera produces timber, they are not managed under the current official forestry practices.

Both foresters and forest villagers claimed that a lack of awareness of local knowledge in the forestry planning process also threatens medicinal plants. Local villagers and field-based foresters have knowledge of specific habitats, ecology, keystone species, medicinal plants and other NTFPs. Government officials responsible for the formulation of forest management plans often fail to incorporate the local knowledge of these people in their plans. Top-down hierarchical bureaucracies, such as the Forest Department, lack mechanisms for incorporating local knowledge in planning and implementation efforts to protect locally important plants. This makes it more difficult for these plants to survive in nature reserves managed in this way.

At this point, menda and bohera are open-access resources. Whoever wishes to collect these plants can do so easily, if they can find any. Nobody manages these species in the forest, and the Forest Department treats these plants as "D-class timber" trees, having low timber value. The effective management of these two important medicinal trees will require the Forest Department to reformulate its policy so that the co-management approach currently being implemented also specifically addresses the conservation of these plants.

Co-Management: An Alternative Approach

The co-management approach for natural resource management is recognized in many areas of the world (Ostrom 1990, Bromley 1992, Narayan 1995, Connor et al. 1996, Mahanty 1999, UNDP 1999, Borrini-Feyerabend et al. 2000, Keen and Lal 2002). In our group discussion, most participants agreed that co-management of menda and bohera could reduce current threats and pressures on these plants. When properly implemented, co-management creates opportunities for local people to meet their basic needs without eroding protected areas. In this case, both the Forest Department and local NGOs can play vital roles by involving stakeholders, (resource users, forest villagers and ethnic communities) in sharing the responsibility of protecting these NTFPs. A Co-Management Committee can be formed that would engage local people in decision-making processes affecting



their living environments and their well-being. The Forest Department can give collectors technical support for capacity building, NGOs can train collectors on the proper management of medicinal plants, and donors can provide collectors with microcredit schemes to establish medicinal plant nurseries. Buffer-zone plantations of medicinal plant saplings can also be established, and sustainable harvesting methods for mature plants can then be developed for these sites. Crude medicinal plant material can be sold in the local market under the supervision of the Forest Department. Finally, benefits from the sale of these products can be distributed equitably among local shareholders (collectors) and the Forest Department by the Co-Management Committee. The Nishorgo Support Project (NSP) has already begun activities including group formation with local people and programs to support motivation, capacity building micro-credit, nursery establishment, and awareness building.

Recommendations

To reduce threats to menda and bohera, we propose the following recommendations for the management of these medicinal plants in RKWS:

- 1. Menda and bohera cultivation and collection should be incorporated into protected area planning policy.** The Forest Department should incorporate enrichment plantations of these species in the forest in their management plans. These two species are in high demand in the local market for various purposes. Like timber, menda and bohera can contribute a substantial amount of cash to the local economy. Every year, international manufacturers of herbal medicine import large amounts of raw menda and bohera from India. This fact shows the potential for earning a significant amount from the sale of these NTFPs on the global market.
- 2. Management plans should be based on local knowledge.** Field foresters should be able to contribute their knowledge to the formulation of protected-area management plans. This kind of local knowledge helps to identify dominant plants, timber plants, medicinal plants, firewood species, and NTFPs, as well as identifying stakeholders, resource users, sources of livelihood, and conflicts between collectors and the Forest Department. Such planning will promote the sustainable use of menda and bohera in the forest, among other species.
- 3. Efforts should be made to document local knowledge about medicinal plants.** Local people pass knowledge about plants and their habitats from one generation to the next. Currently, these people are losing their knowledge due to the influence of the modern culture that surrounds them. Many young people are not willing to

learn about traditional plant knowledge, since they are trying to migrate to urban areas for education and jobs. Thus local knowledge is rapidly being eroded. Surveys on local knowledge on medicinal and culturally important plants are essential. Proper recording and documentation of this knowledge can help to manage menda and bohera in the forest.

4. Collection of medicinal plants from the forests should be regulated. Wise management requires that collectors seek permission for harvesting plant products in the wild from appropriate authorities. Regulators may check harvesting techniques, availability, and public interest in medicinal plants. Under current conditions, Forest Department personnel have little control over the collection of menda and bohera. A certain section of the local people benefit from these plants, by running illegal medicinal plant businesses under the noses of the administrators. As a result, high-value plants like menda and bohera are being degraded through unsustainable harvesting.

5. Cultivate and propagate menda and bohera. These species should be propagated and cultivated to meet the growing demand for herbal medicines. Cultivation is better than collecting raw materials from the forest, since there is little material remaining there at present. In this case, local people can be trained in the propagation and cultivation of these plants. The Forest Department should offer land and micro-credit loans to local people as incentives to cultivate these species. Those who already own land should also be given incentives to cultivate menda and bohera in their fields and homestead gardens.

Conclusions

In this study we have sought to describe links between medicinal plants and the livelihoods of local people in Rema-Kalenga Wildlife Sanctuary. We found a positive link between the two target medicinal plants and the livelihoods of local people. They earn a small amount of cash income from collecting and marketing menda and bohera from the forests, which subsidizes their daily expenditure. Local collectors are not totally dependent on medicinal plant collection. They collect other NTFPs including firewood, bamboo, cane, yams, aroids, orchids, ginger, honey, wild fruits and vegetables, thatching materials, climbers, leaves, and wildlife. Thus, although they are typically classified as small farmers or day laborers or small traders, they are engaged in diverse (and sometimes unsanctioned) livelihood strategies. They live in villages near the forest and supplement their subsistence by collecting products such as menda and bohera without permission from the Forest



Department. They sell these products to local middlemen to earn extra cash for their livelihood. The middlemen, in turn, depend on the medicinal plant trade for their own livelihood. They purchase medicinal plants from primary collectors who collect from protected areas and supply at least 50 different species of medicinal plant to various factory owners.

In summary, menda and bohera are two of the most important medicinal plants in the Rema-Kalenga Wildlife Sanctuary. These species are used not only in herbal medicines but also for other purposes. Current market demand is high for both species. Our results suggest that local people, members of indigenous (ethnic) communities, and middlemen are involved in the illegal collection and sale of these species. In this way the poor earn cash income to supplement their subsistence. Group discussions suggested linkages between medicinal plants and local livelihoods. We conclude from this study that a positive link exists between the management, use and threats to selected medicinal plants (menda and bohera) and the livelihoods of local people in Rema-Kalenga Wildlife Sanctuary. Consequently, the management and harvesting of these plants should be incorporated into protected-area management policy.

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Local Perceptions of Natural Resource Conservation in Chunati Wildlife Sanctuary

Muhammad Ala Uddin

Assistant Professor, Department of Anthropology, University of Chittagong, Bangladesh

Abu Shadat Ahmed Foisal

M.Phil student, Department of Anthropology, University of Chittagong, Chittagong, Bangladesh.

Abstract

Resource managers and academics are increasingly aware of the importance of recognizing local perceptions, knowledge and participation in defining management strategies and actions for the conservation of natural resources. Despite the close historical symbiotic relationship between humans and forests, Forest Department officials planning for and managing Bangladesh's Chunati Wildlife Sanctuary have failed to solicit local participation. Consequently, because of their ignorance of the relationships between local people and their environment, Chunati Wildlife Sanctuary officials have severely impacted the livelihoods of both local peoples as well as wild animals. Today local people remain interested in playing an active role in protecting the environment so that wild animals can make a come-back. This study examines local peoples' perceptions and attitudes toward the wildlife sanctuary and conceptualizes their understanding of livelihood needs, deforestation, and resource degradation. Using anthropological research methods, such as in-depth interviews and group interviews, we investigated local peoples' perceptions toward the Wildlife Sanctuary. We found that, despite the interest local people have in the program, they have been ignored in the process of establishing the Chunati Wildlife Sanctuary. Having no other income generating sources, people are very dependent on forest resources. Furthermore, Forest Department staff members are not well-equipped to prevent illicit felling, and some are even involved in destructive practices. Emphasizing the views of the local people, we argue that, joint management is needed to make the endeavor a success. An awareness of the political economy of the wildlife sanctuary should help us better understand local perceptions of resource degradation and how best to solicit local participation in the sustainable management of the sanctuary.

Introduction

Local perception refers to local peoples' attitudes and understandings that reflect their habitual way of life, as well as their shared expectations. All societies possess a substantial body of beliefs, knowledge and practices built around their everyday life experiences and their surrounding environment. This local knowledge is handed down from one generation to the next, but individual men and women in each generation adapt and add to this body of knowledge in a constant adjustment to changing socioeconomic circumstances and environmental conditions. People who live in or near forests have a deep understanding of natural resource management (Michael 1996, Sekhar 2003). The ecological importance of such local knowledge has been widely acknowledged (Kumar 2002, Logan 2002). It has made significant contributions to the maintenance of many of the earth's most fragile ecosystems, through habitual, sustainable resource use practices and culture-based respect for nature.

From time immemorial, traditional communities have maintained a close and unique connection with the land and environment they live in (Anderson 1993, Ahamed 2004, Michael 1996, Choudhury 2003). This research suggests that local people have established distinct systems of knowledge, innovation and practices relating to the uses and management of natural resources in order to maintain the biological diversity of their environment in terms of animal diversity. Local knowledge and peoples' participation is fundamental for sustainable natural resource conservation. Therefore, it is now a major challenge of our time that we pay proper attention to protection of the rights of local peoples and their knowledge about the environment, while also outlining a scientific conservation policy for maintaining biological diversity.

In recent years, collaborative approaches commonly known as "co-management" have become a significant strategy in many conservation and development related programs worldwide (Davis 1998). In this framework, both government program officials and local people play important roles in successful development initiatives. Many experts have recognized that peoples' participation is key to ecologically sustainable development and wildlife conservation (Grimwood 1969, Choudhury 2003). Bangladesh has already lost many wildlife species during the last few years. Consequently, it is imperative that local resource users provide knowledge of traditional practices in designing or implementing innovative natural resource management approaches.



The present research documents the beliefs and perceptions concerning wildlife management among communities that have long been resident in forests. These people have developed their own culture, history, way of life, and identities grounded in the natural resources they have traditionally used. They have developed patterns of resource use and resource management that reflect their intimate knowledge of the local geography and ecosystems, and that contribute to the conservation of biodiversity. The purpose of this study is to document and disseminate local knowledge, perceptions and traditions to inform policy making. This study attempts to answer a few specific questions in order to understand the dynamic relationships between local people's understanding and natural resource management in Chunati Wildlife Sanctuary:

- How do local people perceive the political economy of people's livelihoods in the protected areas of Bangladesh?
- How do local people perceive the political economy of deforestation and degradation?
- What is the range of local peoples' traditional understanding and knowledge about wildlife conservation?

We investigated local perceptions in two villages in Chunati Wildlife Sanctuary in order to examine the potential of local knowledge to inform sustainable natural resource management plans and practices.

Background

A protected area is "an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and naturally associated cultural resources, and managed through legal or other effective means" (IUCN 1994:3). The total amount of land under protected area status in Bangladesh is about 243,677 ha, which accounts for 16% of the total area managed by the Forest Department and almost 2% of the total area of Bangladesh. The protected areas of Bangladesh include eight national parks, seven wildlife sanctuaries, one game reserve, and five other conservation sites. The Bangladesh Wildlife (Preservation) Order, 1974 Amendment defines a wildlife sanctuary as "an area closed to hunting, shooting or trapping of wild animals and declared as such under Article 23 by the government as undisturbed breeding ground primarily for the protection of wildlife inclusive of all natural resources such as vegetation soil and water" (paragraph (p) of Article 2).

The Chunati Wildlife Sanctuary was established in 1986 and is located at 21°40' north longitude and 92°07' east longitude. The sanctuary is about 70 kilometers south of Chittagong on the west side of the Chittagong-Cox's Bazaar highway. The sanctuary area is comprised of four main geological formations: Pleistocene, Pliocene, Mio-Pliocene and Miocene. The soils on the alluvial plains and valleys in Chunati Wildlife Sanctuary are mainly silt loam to silt clay loam, moderately to strongly structured, and with neutral to medium acidity in the subsoil. Locally, sandy loams on ridges and silty clay in basins occupy small areas with high acidity (Soil Survey 1971-73). The sanctuary area is generally hilly to mountainous with shallow to deep gullies and gentle to steep slopes. The average elevation is 30 to 90 meters above sea level. The area is traversed by numerous creeks, which are clear with gravelly or stony beds. They provide good drainage and supply clean water to both wild animals and people, as well as for irrigation. The creeks also serve as habitat to a good number of amphibians. The banks of the rivers and creeks and the cultivated tracts are severely eroded, especially during the rainy season. Sheet erosion and rill erosion are most prevalent (Mollah, Rahman and Rahman 2004). Box 1 summarizes some geographical and socio-economic features of the sanctuary. Figure 1 is a map of the sanctuary and Figure 2 shows the specific study areas.

Box 1: Geographical and demographic features of Chunati Wildlife Sanctuary

Forest Type: Tropical evergreen and semi-evergreen
Number of Villages: 15
Total population: 21,428 (Statistical Book 1991)
Male population: 11,062
Female population: 10,366
Number of household: 3,492

(Source: BBS, 1996)

The study was conducted at two village sites. The settlement of Villager Para of Aziznagar Beat in Lohagarah is situated mostly inside the buffer zone of Chunati Wildlife Sanctuary, although some households are situated outside the buffer zone. The settlement of Jumm Para of Puichhari Beat in Banskhal is situated totally inside the buffer zone. Both sites are developing towards the core zone of the sanctuary. We selected these sites because they are representative of protected areas in Bangladesh in terms of wild animals; and because they show distinctively different trends in terms of forest use, forest dependency and wildlife management. These samples may not be representative of all protected areas in Bangladesh, but



they may represent the Chunati Wildlife Sanctuary. The people of both sites migrated there from nearby areas and established settlements at these sites in 1953. Most people in the study areas were settled there by the official arrangements of the Forest Department and both they and their villages are officially called "villager".

Methodology

Due to time, spatial and other constraints, it was impossible to cover all of the fifteen villages surrounding the sanctuary. First, we selected five prospective villages for the study from among the fifteen villages identified through our physical visit and Rapid Rural Appraisal (RRA). Consequently, we purposively selected two villages from them to understand basic issues related to natural resource management. To get a general picture of the selected villages we prepared two community profiles emphasizing several key topics: natural resources, livelihoods, community structures, institutions, and community history. We collected primary data and consulted secondary sources. We used anthropological research tools such as in-depth interviews, focus group discussions (FGD), and key informant techniques. A semi-structured questionnaire comprised of questions on socio-economic and ethno-ecological variables was also conducted to elicit both qualitative and quantitative data from local people. To gather information on local peoples' perceptions and practices towards wildlife management, we used informal conversations, and brief interviews with people from the selected sample, keeping in mind the following four key issues: awareness, knowledge, attitudes and practices. To determine the impact of the sanctuary on wildlife, we talked with local people concerning the status of animal resources in the forest (before and after the creation of the sanctuary). Topics for the semi-structured interviews are listed in Appendix 1; the process we followed in organizing the community profile is listed in Appendix 2.

Between February and July 2006, we collected data on attributes of the local people's connections with the forest, trends of changes in forest conditions, and local peoples' perceptions of changes in forest conditions during the last few years. We collected information to characterize institutional arrangements through community profiles, interviews, group discussions, and field observation. Our research focused principally on qualitative techniques to understand the people's livelihoods, forest dependency and status of wildlife in the sanctuary. We also used

qualitative techniques to analyze historical use and the level of past forest degradation, user perceptions of changes in forest conditions, ranking of forest destruction, and the foresters' appraisal of forest conditions. Local institutions governing the forests, particularly those relating to the maintenance, monitoring and harvest of products were evaluated qualitatively on the basis of the existence of rules, effectiveness of enforcement, and level of compliance.

There are 350 households in the two study areas: 215 in Villager Para, and 135 in Jumm Para (Table 1). We used a purposive sampling procedure to select sample households based on local demographic statistics. We chose senior members of the community to be our main source of information. We first made a list of individuals (generally head of the household) ranging in age from 60 to 70 years old and then randomly chose a 10% sample from this group, including both men and women. We also sampled a few household heads (0.6 %) below 60 years of age to get some sense of how they differed from older people.

We conducted 13 in-depth interviews from Villager Para and 12 from Jumm Para, and selected one key informant from each of the two study sites. Key informants were local residents with sufficient knowledge of forest conservation and wildlife management who were also interested in the project. We conducted brief interviews on the socio-economic issues with 100 households (50 from each beat office area) (Table 2). From this survey we conceptualized their social and economic status, occupation, and forest dependency.

Table 1: Population of the Study Areas

Study Area	Beat Office	Households	Population	Gender (male/female)	Age over 60
Villager Para	Aziznagar	215	1200	650/550	153
Jumm Para	Puichhari	135	800	425/375	116

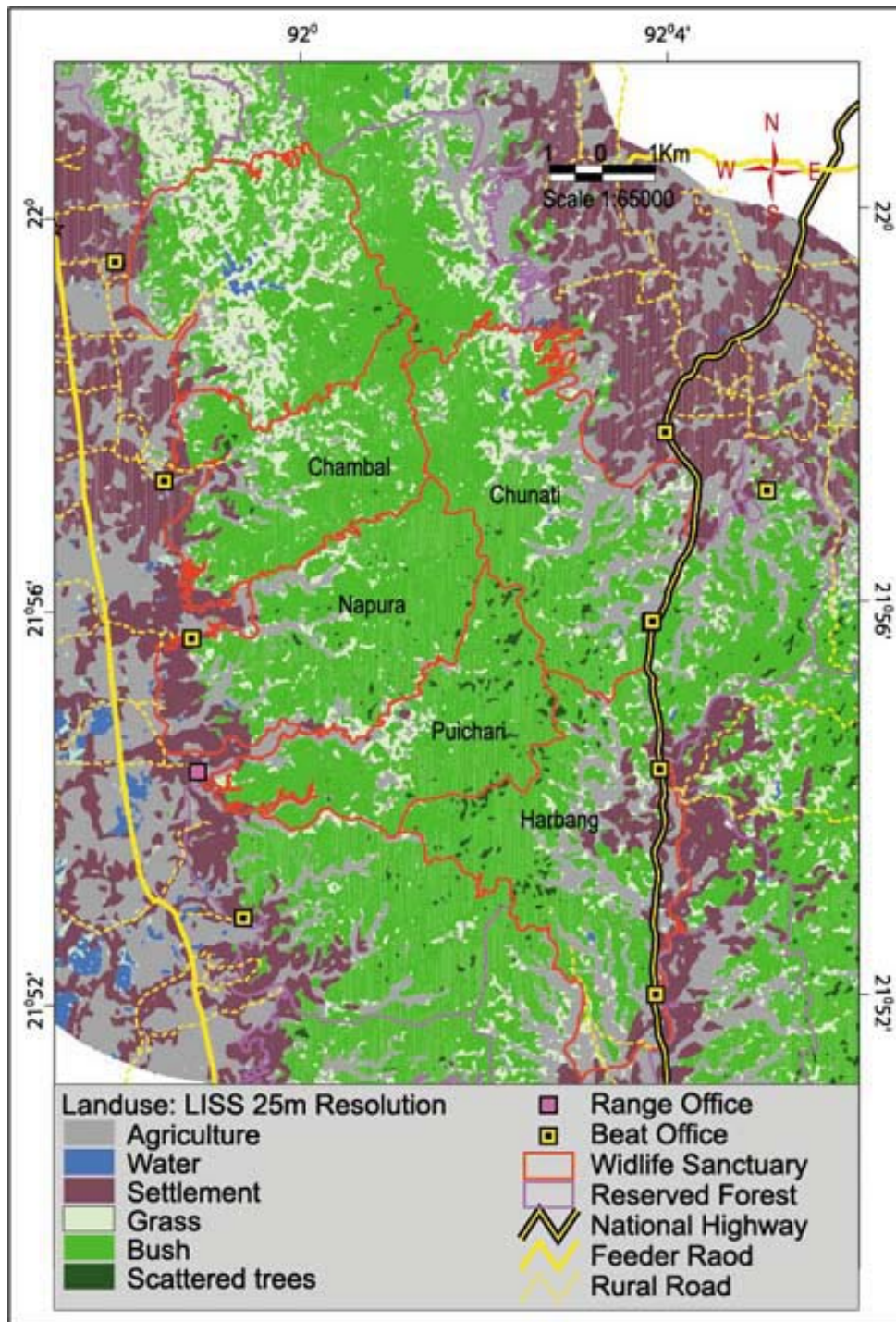


Figure 1: Chunati Wildlife Sanctuary (Source: Nishorgo Support Project 2007)

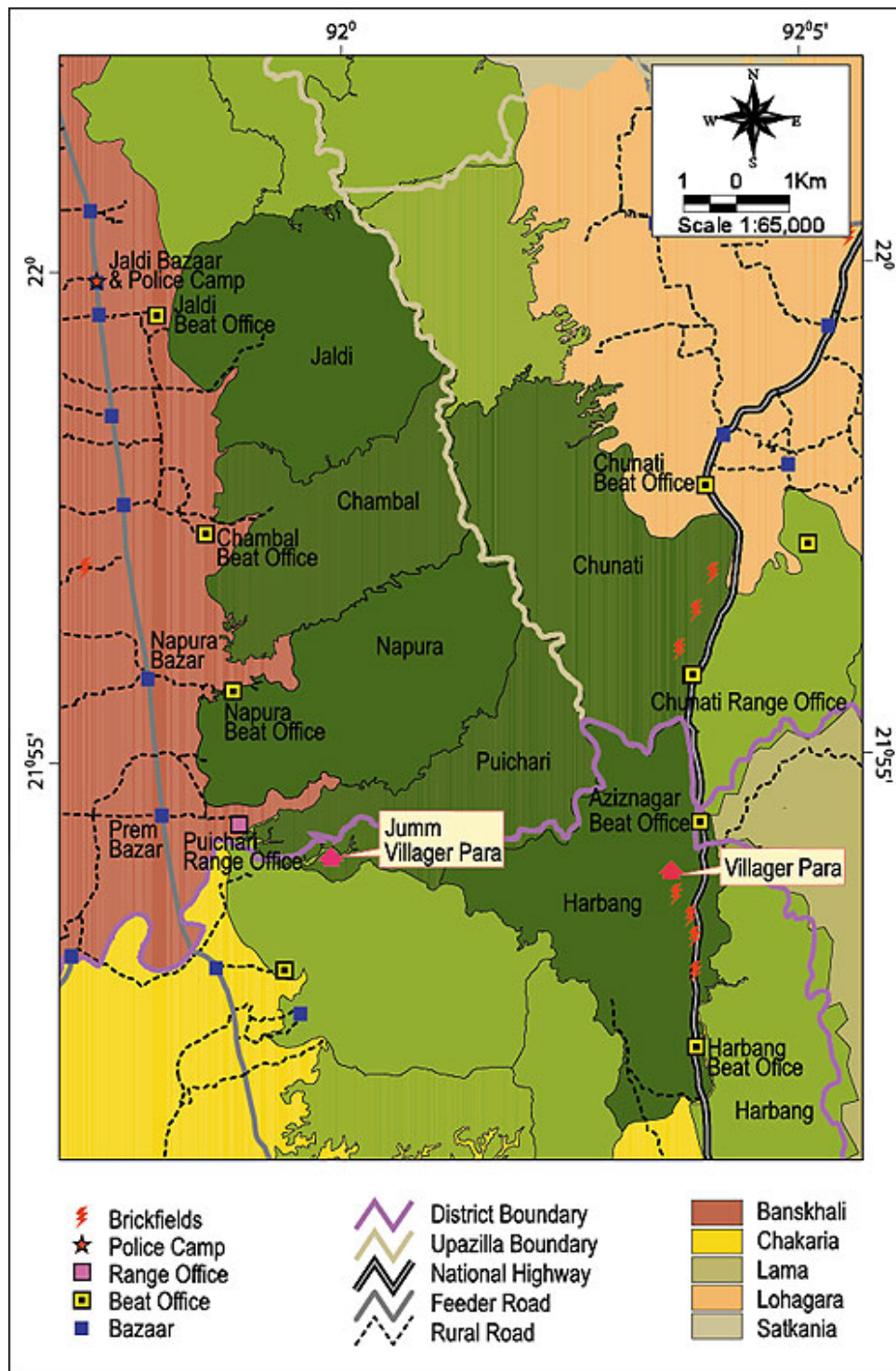


Figure 2 : Study Areas of the Chunati Wildlife Sanctuary
(Source: Nishorgo Support Project 2007)



Table 2: Sample Populations and Interviews Conducted

Study Area	In-depth Interview	Focus Group Discussion	Key Informants	Brief Interviews	Total
Villager Para	13 (8 male, 5 female)	02	01	50	66
Jumm Para	12 (9 male, 3 female)	02	01	50	65

Results and Discussion

Efforts to document and perpetuate local knowledge are of immense importance, especially where natural resources are declining, as in Bangladesh. In this section we examine local people's traditional lifestyle and their perceptions related to the forest, forest resources and wildlife. We then discuss the forest dependency of both humans and wild animals. We also consider the status of wild animals in the forest and examine local peoples' views on the causes behind the animals' disappearance, as well as their suggestions for the protection and reintroduction of animals. Finally we discuss the rationale for including local communities, and their attitudes and understanding towards wildlife, in the development of management plans for Chunati Wildlife Sanctuary.

Political economy of people's livelihoods

In the early 1950s, 70 families from nearby Aziznagar and Puichhari Beat Office were officially invited by the Forest Department to resettle in the area presently occupied by Chunati Wildlife Sanctuary. The Forest Department had insufficient guards to protect the deep forest and therefore wanted a few people to live there to help them protect the forest and to assist Forest Department officers in their daily jobs. Due to poverty and unemployment, people came in order to meet their subsistence needs from the forest and its land. The Forest Department provided settlers with nearly 1 hectare of land per household for agricultural activities to facilitate permanent residence and gain assistance to forest officials in policing and patrolling. Households are defined here as units whose members cook and take food from the same pot. Here land refers to forest land that is converted to agricultural land.

Settlers coexisted with wild animals and their families grew rapidly. Presently most of the respondents of the study do not depend on forest for their livelihoods as they did until about 10 years ago. From information obtained from local informants in Villager Para (Fig. 3) we see that a decade ago at least 40% of people were dependent on the land they had received from the Forest Department as well as forest resources; 50% were dependent only on forest resources (they did not receive

any land from the Forest Department-other than their house plot). As the human population grew, the forest gradually lost its resources. Today because of the growing population and its needs, people can no longer rely only on the forests, and are forced to engage in outside activities to earn cash incomes. Today the livelihoods of most people in Villager Para are based on agroforestry because the forest can not fully meet their livelihood requirements. "This apparently dead wasteland cannot provide animals with food, how could it provide us with our demands?" a local resident told us (personal communication, March 2006).

In Jumm Para, approximately 55% of the population was dependent on forest resources a decade ago (Figure 3). Jumm Para is comparatively isolated and people have no other sources of income other than the forest. Poor access to transportation adds to the sense of isolation and limits the ability to seek jobs elsewhere. That is why forest dependency in Jumm Para is considerably higher today than in the well-located Villager Para. Figure 3 shows the dependency of villagers in the villages 10 years ago and today. Table 3 summarizes livelihood data we collected from Villager Para and Jumm Para.

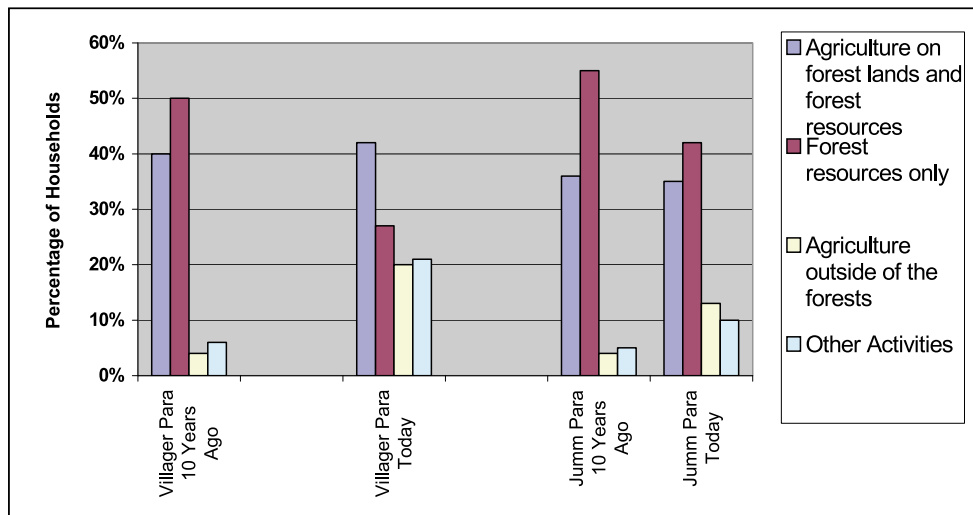


Figure 3: Forest Dependency of Households in Villager Para and Jumm Para

People of Chunati cannot think of an existence without the forest. They survive because of the existence of the forests, which provides food, fuel, fodder, medicine, shelter and housing materials, along with other products, to a variety of people. Bamboo, fuelwood and sungrass are possibly the most important forest resources for the local people and are used for both house construction and agriculture. Next to bamboo, sungrass is the most important material for house construction. Most people meet their livelihoods from the forest on a daily basis. Non-timber forest products (NTFPs) are extremely important as food supplements in the form of



edible fruits, roots, tubers, leaves, etc. Edible wild fruits, seeds and leaves regularly provide food during the lean season and during emergency periods. They depend to a large extent on wild resources of plants and animal origin for many purposes. Since modern medical facilities are not available locally, many people in Chunati - including local patients, herbalists, and other interested people - collect and use medicinal plants from the nearby forest. Agricultural laborers and others that cannot find work collect products such as firewood, poles, and bamboo from the forest for the markets. Although most use of forest products is at a subsistence level, there are good opportunities to rapidly accelerate into commercialization with a closer integration with the market in future years. Forest degradation caused by factors such as unauthorized cutting and indiscriminate felling is known to have resulted in a decrease in the number of wildlife species found in Chunati.

Table 3: Well-Being Analysis of Villager Para and Jumm Para
(Based on Group Interviews and Brief Discussions)

Village	Rich	Middle class	Poor
Villager Para (215 Households, Total Population = 1200)			
	5 HH (3%)	30 HH (14%)	180 HH (83%)
Agricultural Land	2 - 4 hectares	0.2 - 0.5 hectares	None
Number of Cattle	5 - 8	2 - 6	None
			Opportunity to seek alternative income sources due to nearby highway.
Jumm Para (135 Households, Total Population = 800)			
	5 HH (3%)	5 HH (3%)	115 HH (85%)
Agricultural Land	1.5 - 3 hectares	0.50 - 1.5 hectares	None
Number of Cattle	5 - 10	2 - 5	None
			Cannot move easily to seek alternative income sources due to lack of transportation.
Villager Para and Jumm Para			
Income source	Business	Small business	None
Political influence	Control local power, relationship of patron-client with Beat officer	Patron-client relationship with the rich	None
Allotment of forest land	Priority	Diminutive	None
Involvement in Social Forestry Program	Priority	Diminutive	None
Timber business	Yes	None	None
Lean Period & Migration	None	2 months (temporary migration rate low)	5 to 6 months (high temporary migration)
Depended on forests for:	Timber business and fuelwood for brickfield.	Subsistence, domestic needs and fuel wood to supply brickfield.	Own livelihood.
Labor	-----	Share cropping	Sell their labor for agriculture, brickfield, etc.

Political economy of deforestation and degradation

From the beginning of settlement in the Chunati area (1953), the villagers realized the value of forest resources. They lived in the forest without destroying any trees; collecting fuelwood for their own use and to sell in the nearby markets, or to the owners of brickfields. Informants told us that in the past (and even today) they could collect for their subsistence needs without using choppers and spades. The villagers were satisfied with their life. But pressure of outsiders, including the Forest Department staff and other people, hinder the pleasant life of the forest dwellers and the wild animals of the forest. Beginning in the 1980s, outside people began to harm wild animals in two ways: they destroyed the trees and plants (the animals' source of food); and they hunted animals like deer, snakes, and other species. Local people claimed that they previously lived in a harmonious relationship with the wild animals that was free of conflict. They expressed a satisfaction with such a relationship that valued the environment and acknowledged the need to limit its exploitation especially for personal profit. This changed with increasing external market influence and the gradual expansion of agricultural lands into the forests. Habitat degradation and forest fragmentation contributed to increased conflict by cutting off migratory routes and decreasing the availability of food and shelter for wildlife. There was a sense of regret for changed circumstances. Specifically locals are concerned that "animals have no place to hide if people drive them away" (Villager, personal communication, May 2006). They also acknowledged the absolute sense of dependence of wild animals on the forested habitat for shelter and foraging, and admitted that increased exploitation of forests interfered with this dependence. Appendix 3 summarizes plant and animal species occurring in Chunati Wildlife Sanctuary before 1986 and today.

Unlike humans, animals are absolutely dependent on the forest for their livelihoods. They cannot seek 'outside employment' or plant crops. They depend on the forest for their food, shelter, and foraging. Local people described the dependency of major animals in the forest as reported in Box 2. From these descriptions of animals' food and location it is easily understandable that wild animals are extremely dependent on forests for their survival.



Box 2: Short Picture of Animals and Their Life

Elephant (*Hati*)

Food: Elephants spend about 12-15 hours a day eating. Elephants are vegetarians. They eat grass, shrubs, leaves, roots, bark, branches, fruit, and water plants. They especially like to eat bamboo, berries, coconuts, corn, dates, and sugar cane. To find food elephants must roam large areas.

Habitat: Forest and where adequate quantities of food and water are available.

Lifespan: Elephants can live 50 to 60 years.

Monkey (*Banor*)

Food: Generally monkeys eat fruits, leaves, flowers, insects, eggs, and small reptiles.

Habitat: Most monkeys live in forest areas.

Lifespan: Monkeys can live up to 45 years.

Deer (*Horin*)

Food: Deer eat grass, leaves, bark, twigs, shoots, wild fruits and other plants. They also eat moss and lichens including mushrooms and other types of fungi.

Habitat: They prefer wooded and forested areas and hillsides near cultivated areas. In Chunati Wildlife Sanctuary almost all species of deer were available.

Over time, all are declining including the sambar, the special wildlife of this sanctuary, which are the main victims of hunting.

Economic hardship and environmental changes have created added pressure on the remaining common resources leading to a vicious cycle of poverty and environmental degradation. Where wood or fuel wood is scarce, impoverished local people have been known to uproot stumps and roots, further disrupting the soil and accelerating soil erosion. Unemployed local rural people are particularly dependent upon forest resources. They occupy remote locations, with virtually no education, health care facilities or alternative income opportunities. Even though the forests have now become degraded, with few resources, local people lacking any other job opportunities may still fell the remaining trees. They may also have indirect involvement in illicit felling. Thus, the creation of alternative employment opportunities may evade a crisis by generating much needed income.

With regard to the felling of trees, respondents suggested that the major perpetrators were illegal loggers followed by Forest Department officials. Figure 4 demonstrates how local people perceive the role of various actors in forest

degradation and thereby its negative impact on wildlife habitat.

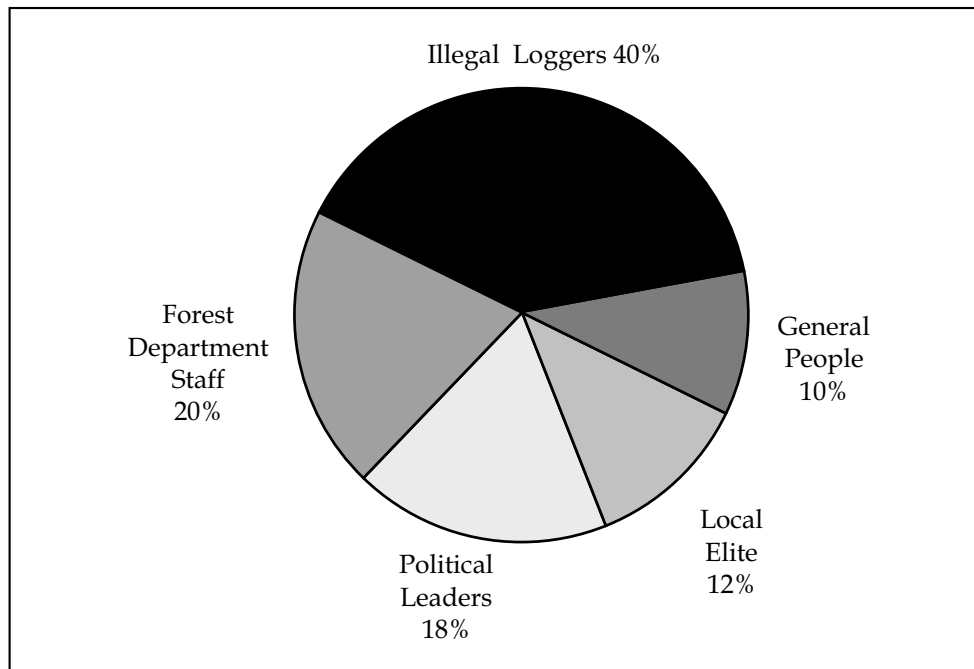


Figure 4: Villagers' Perceptions of Who is Responsible for Forest Degradation

General people: Local people of the study area are directly responsible for some forest destruction. Due to poverty and lack of other income sources, they depend on forests to meet their subsistence needs. Usually they go to the forest to collect bushes, undergrowth, etc, but sometimes they are also involved in illicit felling.

Local elite: Local elites also extract forest resources. Sometime they buy trees for their own purposes from the Forest Department, but they usually fell much more than they buy. Forest officers are reluctant to prevent or report such crimes.

Political leaders: Local political leaders are often involved in illegal felling. They cut trees to use at home and to market to nearby sawmills and brickfields. Local leaders who have good connections with central politicians can clear the forest, because local forest officers are loyal to the central administration and will not disturb these leaders.

Forest Department staff: People suggest that some officials of the Forest Department have direct and indirect involvement with illicit felling. Locals said that the *Mia Shab* (Beat Officer) seems to be the owner of the forest; access to forests and forest



resources depends on his will.

Logging from unknown quarters: Illicit logging has a major impact on the status of the forests. Armed groups from nearby areas like Banskhali enter the forest at night and cut trees prodigiously. Local people and the Forest Department officials remain passive. Local people say they do not have any weapons so they cannot prevent them. The Forest Department guards actually indulge these intruders.

Conflict and Misunderstanding

According to our informants there is conflict and misunderstanding between local people and officials of the Forest Department over the wildlife sanctuary. Local people were not involved in planning for the sanctuary and hence did not understand the plans at all. They thought that once the wildlife sanctuary was created, people would have to leave their residences. Wild animals would be set free for foraging. Some people of the Forest Department also thought that they would lose the option to sell and use forest trees. As a result immediately before and after the declaration of the wildlife sanctuary local people and some Forest Department officials cleared the forest as much as possible. Local people said that forest officers came to the villages near which trees were indiscriminately felled, blamed local people for the logging, and filed cases against them without any investigation. Sometimes they also imposed punitive fines on local residents.

The lack of consultation with local people has also led to inappropriate administrative decisions. For instance, major portions of Banskhali, Jumm Para, and Puichhari beats (under Jaldi Range Office) are administratively under Chakoria Upazila of Cox's Bazar District, but some parts are under Banskhali Upazila of Chittagong District. In this particular site, most people involved in activities under the Nishorgo Support Project, such as the nursery, come from the plains of Banskhali and are not accepted by the hill forest people of Chakoria. The hill people want to be part of all programs that affect their lives and their resources. They claimed that political influences play a role in depriving them of their rights. Local people complain that there has been virtually no dialogue between wildlife authorities and local people. Some local forest officer also state that all decisions and activities are strongly dominated by the central Forest Department. As a result, many officials do not appreciate the cultural and economic significance or conservation values of traditional resource practices.

Nishorgo Support Project is working with the Forest Department to protect and conserve the natural resources of the protected area.

Threats to the Wildlife Sanctuary

Local people of the study area identified the following threats to wildlife:

Water-body related threats: Local elite and political leaders control the main stream that runs through the protected area. They have dammed the stream to preserve water for their own needs and to sell water in the dry season for irrigation. As a result the sub-streams of the protected area that surround the Chunati Wildlife Sanctuary have become dry. Local people suggest that, because of this, Chunati Wildlife Sanctuary has suffered changes in wildlife habitat. Local elite also control the small marshes in the lowlands for fish. For want of drinking water animals come down from the hills onto the plains and enter into conflict with local households and their agricultural assets. Local people suggest that if the main stream of the forest was not dammed then the forest would have remained wet and humid and animals could obtain water even in the dry season. On the other hand, during the rainy season, the lowlands and plains around Chunati Wildlife Sanctuary become flooded because of heavy rainfall, causing miserable conditions for wild animals.

Settlement-related threats: As the human population is constantly increasing in number, the limited forestland is unable to meet their needs for agricultural land and other demands. To meet their demands, local people sometimes clear the forests for their residents and agriculture. In addition, their settlements have destroyed the animals' migratory routes and wild animals consequently appear less frequently in the plains.

Miscellaneous threats: According to the local people, the development of roads and highways in and beside the sanctuary has made life more difficult for wild animals, by fragmenting intact habitat. Likewise increased human access into the forests has increased human-wildlife conflict. Furthermore, indiscriminate collection of medicinal plants, wood and bamboos; random hunting, shooting and trapping; and natural calamities such as droughts, earthquakes and floods have also taken their toll. Ultimately, the failure to implement the existing law, and the dishonesty and indifference of the forest officials, repeatedly came up in the discussion. People suggested that if these problems were not resolved then the efforts to protect the natural resources of the forest as well as wildlife conservation would be in vain. The lack of traditional management systems and the lack of people's genuine involvement in the project were also seen in a negative light.



Indigenous Understanding of Wildlife Conservation

In Chunati Wildlife Sanctuary local people once traveled between places in groups because they feared wild animals. This is no longer true today because wild animals are scarce and never seen during the day. Local people use traditional tools for collecting trees, fuelwood, bark and other NTFPs without the use of choppers or axes. Local people cut trees during the dry months of January and February. This is scientifically sound, because during the dry season tree growth is comparatively slower than during the wet season. This means there is less starch content in the wood making the wood less susceptible to insect attack. Locals know much about how animals live in the forest-where they usually go for foraging, what foods they eat, and under which trees they prefer to take rest. They also understand the problems the animals face finding water in the dry season.

Local people claim they usually do not cut trees that are useful to wildlife. They mainly collect bushes, underbrush, and dying trees. They argue that outsiders cause deforestation by only looking at the economic value of forest resources. But as good neighbors of the wild animals they want the animals to be alive. They also asserted that they know which trees grow rapidly and which grow slowly. In case of emergency they cut trees that bear little food for wild animals. Local people want forest trees not commercial garden trees such as mangium, akashmoni, eucalyptus, and melaloca that are not good for either the forest or wild animals. They acknowledge that fast growing trees are useful, but they are not good for the long-term sustainability of the forest. Local people try to sustain an environment friendly to both humans and wild animals by neither felling trees nor killing animals. Furthermore, they usually do not clear-cut all trees because they realize their environmental importance. However, outsiders with commercial interests in the forest such as fishing boat owners, shop owners, and brickfield owners often clear-cut trees to meet their economic needs.

Local Wildlife Folklore

Local people of the study area have beliefs and myths that create esteem for wild animals and keep them from killing these animals. Local people usually do not go into the forest on Friday and Saturday. Friday is a holy day and people want to refrain from committing any sins such as tree cutting. Saturday is perceived as a bad day. If people go to the forest on Saturday, it is believed that they might encounter great troubles.

Local people also believe that, once upon a time, elephants and monkeys were human. They became animals by the curse of a religious spiritualist (*Hazrat Luhd*). They also believe that the oriole (locally called 'yellow bird') was once a woman. Her father turned her into a bird to save her from her stepmother's evil motives. The rufous treepie (locally called, *Harichacha* bird) was once a housewife. She became a bird when her husband cursed her to satisfy his mother. Because most local people believe that once most animals were human, they do not kill them or even scold them. People believe that elephant can understand what they say. They call elephants *Mamu* (maternal uncle). They also believe that elephants visit the *mazhars* (shrine) once a year.

Villagers also believe that it is not possible for extinct animals to reappear, but if proper measures are taken threatened animals can increase in numbers. Local people made the following suggestions for enhancing wildlife populations:

- **Afforestation:** Afforestation is the process of planting trees on land formerly used for purposes other than forestry. Reforestation, on the other hand is the restocking of existing woodlands that have been depleted. Local people say if they are given power and authority to protect afforested sites and the right to a share of the benefits they will be responsible for such ecosystem regeneration efforts.
- **Alternative income generating sources:** Because local people have no other sources of income, they engage in indiscriminate extraction that causes resource degradation by direct and indirect causes. Usually they collect sungrass, bamboo and fuelwood from the forest. If they were provided with alternative sources of generating income they would no longer be as dependent on forest resources.
- **Transportation:** Although some people think that modern transport may lead to deforestation, the local people have different views. As most of the residents are located in hilly areas, it is not easy to travel to town for purposes such as education, medicine, or other activities. People feel that if transportation were more developed, they would no longer be solely dependent on the forest.
- **Re-settlement of humans:** Most protected areas are subject to high levels of resource use by human populations. Space required by wild animals is occupied by human settlements in the buffer zone and even core zones. Local people and authorities must develop an understanding so that this urgent



problem can be solved.

Summarizing the local peoples' views we may mention the following steps to be taken to save the forest from further degradation:

- Plant various kind of local plants in the protected area instead of foreign species;
- Ensure space for shelter and grazing for wild animals;
- Protect water bodies and streams for both wild animals and plants;
- Stop corruption of beat and range officers;
- Ensure the punishment of illegal loggers;
- Establish administrative controls over brickfield industries;
- Create awareness among all peoples concerning wildlife; and
- Encourage local people to talk to outside organizations.

Locals also emphasized the following measures:

- Peoples' participation;
- Political will and support;
- Traditional knowledge;
- Adequate scientific research capacities to support objectives;
- Engagement of the scientific community;
- Public education and awareness at all levels;
- Economic incentive measures;
- Benefit-sharing;
- Knowledge and practice of ecosystem-based approaches to wildlife management; and
- Creation of appropriate institutional structures.

Local Participation and Sustainable Development

All people are aware of the importance of trees for the environment, but some are more interested in the short-term economic advantages of marketing natural resources than in long-term sustainability. As long as loggers are well equipped with arms, local people and Forest Department officials cannot prevent them from clearing forests. Timber smugglers often become violent if they try to stop them from felling trees illegally. Some poor local people are also involved with such heinous acts. If alternative income generating sources can be created for the unemployed, they will no longer be dependent on logging. Education is also important. If people are properly educated, they can find jobs to reduce their forest dependency. Locals must be empowered with proper authority. Their participation

will make the program a success. Training programs and visiting successful projects may also inspire them. Local people are aware that the Nishorgo Support Project has initiated such programs. They also emphasized that strengthening the implementation of existing laws would help stop resource degradation. The first and last word of local people is this: if wild animals do not get any space to hide, they will definitely disappear. To encourage wild animals to increase their populations there is no alternative but to bring back forest resources.

Local people say that they were not informed about the sanctuary. Forest Department staff members were also not informed. Local people also thought that wild animals would be set free in the forest and that people would not be allowed in the sanctuary, so they would have no place to live. But the actual situation is different. People are living in the forest as they were before. Staff members from the central Forest Department controlled and organized the planning and implementation of the wildlife sanctuary on their own, ignoring local staff members and local people. Forest Department officials thought they would lose the chance to earn income by selling trees. Therefore, they tried to sell as many trees as possible.

Although in the beginning most locals were against the wildlife sanctuary, after understanding the goals of the sanctuary they now want to be a part of the program. They want power, authority and a share of the benefits from this program, so that they can take care of the forest, prevent illegal felling, and benefit economically. Local peoples' knowledge and experience was not taken into account during the process of planning. Now, to mitigate the gap between central Forest Department officials and local people, local participation must be emphasized. Without their active participation, the wildlife sanctuary cannot succeed.

Conclusions

Protected areas play a vital role in sustainable development through protection and maintenance of biological diversity, as well as natural and associated cultural resources. As such, protected areas cannot be viewed as islands of conservation separated from the socio-economic and political context within which they are located. It is critical to recognize the importance of people in conservation and to ensure that local people are involved in management and planning activities. Local people should be integrally involved in every stage of protected area establishment and management through consultation. Therefore, local people, sanctuary officials,



and Forest Department staff members should work together to achieve the goals of the project. In many countries, plans to protect natural resources have failed to address the needs and knowledge of local forest-dependent communities.

In this paper, we have discussed key aspects of local people's attitudes and understanding, and examined the potential of local participation for sustainable natural resource management. We argue that sustainable conservation of natural resources requires the participation of local people and the recognition of their knowledge. Natural resource management is increasingly the subject of social and political conflict between groups claiming an interest in specific resources. Many studies show that the optimal formula for sustainable natural resource conservation is joint control and management by government, NGOs, and local people (see Shiva 1998 and Adnan 1992). Therefore participatory conservation must not only focus on mutual understanding between outsiders and local people, but also on the political economy of different socio-economic groups within the local context.

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Appendix 1: Topics Covered in Semi-Structured Interviews with Sampled Individuals

1. Wildlife living in the sanctuary
2. Diet, shelter, and habitat ranges of animals
3. Human-animal bonding and associations
4. Reappeared animals and animal which already have disappeared
5. Causes behind the disappearing, reappearing, etc. of animals
6. Measures that should be taken to improve the situation
7. Use and protection of wildlife
8. Oral history, myths, and stories about the animals
9. Locals' occupations and livelihoods

Appendix 2: Process for Organizing Community Profiles

1. Consult with the community leaders. Discuss purpose of the study.
2. Discuss with key informants. Identify social and economic groups.
3. Prepare a community map to establish a general picture of the community and to identify and locate key resources, social and economic groups, and institutions.
4. Conduct a transect walk to validate information from community mapping; observe resource use, social and economic groups, and institutions.
5. Conduct semi-structured interviews; focus group interviews; key informant interviews.

Appendix 3: Species Occurring in Chunati Wildlife Sanctuary Before 1986 and Today

Resources	Bangla Name	English Name	Latin (Scientific) Name	Available	
				Before 1986	Today
Timber & Non-timber	Pipul	Fig	<i>Ficus sp.</i>	3	5
	Garjan	Garjan	<i>Dipterocarpus turbinatus</i>	3	3
	Jarul	Rose of India	<i>Lagerstroemia speciosa</i>	3	
	Shegun	Teak	<i>Tectona grandis</i>	3	3
	Ashoth	Fig	<i>Ficus religiosa</i>	3	5
	Bot gach		<i>Ficus bengalensis</i>	3	5
	Shimul Tula	Silk cotton	<i>Bombax ceiba</i>	3	5
	Tetul	Tamarind	<i>Tamarindus indica</i>	3	5
	Jam	Indian black berry	<i>Syzygium</i>	3	5
	Gut-gutia		<i>Bursera serrata</i> Wall.	3	5
	Goda		<i>Stereospermum personatum</i>	3	5
	Loha	Iron wood	<i>Xylia dolabriformis</i> Benth	3	5
	Gamary		<i>Gmelina arborea</i>	3	5
	Shill koroi		<i>Albizia procera</i> Benth	3	5
	Chapalish		<i>Artocarpus chapalasha</i>	3	5
	Arjun		<i>Terminalia arjuna</i>	3	5
	Hartaki		<i>Terminalia chebula</i>	3	5
	Kaw foll		<i>Garcinia cowa</i>	3	3
	Amloki		<i>Phyllanthus embelica</i> L.	3	5
	Pahari Aam	Wild mango	<i>Mangifera sylvatica</i>	3	5
	Lotkon		<i>Bauccarea ramiflora</i>	3	5
	Botta		<i>Artocarpus lacucha</i>	3	5
	Vadi		<i>Lannea coromandelica</i>	3	5
	Bell		<i>Aegle marmelos</i>	3	5
	Boilum		<i>Anisoptera scaphula</i> Roxb.	3	5
	Bohera		<i>Terminalia bellerica</i>	3	5
Jolpai	Indian olive	<i>Eleagnus</i>	3	5	



Timber & Non-timber	Kodom		<i>Anthocephalus cadamba</i>	3	5
	Harfata Gula		<i>Strebelus asper</i>	3	5
	Bansh (pia, muli, pati etc)	Bamboo	<i>Bambusa spp</i>	3	3
	Bet	Cane	<i>Calamus spp</i>	3	5
	Kola	Banana	<i>Musa spp</i>	3	5
	Tara		<i>Amomum spp</i>	3	3
	Son/ghash	Sun grass	<i>Imperata cylindrica</i>	3	3
	Nana prokar oushodi gachh-gachhra	Medicinal creepers & plants			5
Mammals	Hati	Elephant	<i>Elephus maximus</i>	3	3
	Banor	Monkey	<i>Macaca mulattta</i>	3	3
	Shrigal	Fox	<i>Vulpes bengalensis</i>	3	3
	Kat-birali	Squirrel	<i>Callosircus erythracus</i>	3	5
	Beji	Mongoose	<i>Herpostis edwardic</i>	3	3
	Shojaru	Porcupine	<i>Hystrix hodgsonii</i>	3	3
	Khorgosh	Hare/Rabbit	<i>Caprimulgus hispidus</i>	3	3
	Sambar	Sambar deer	<i>Cervus unicolor</i>	3	5
	Maya horin	Barking deer	<i>Muntiacus muntjac</i>	3	3
	Bon biral	Jungle cat	<i>Felis chaus</i>	3	3
	Udh biral	Otter,	<i>Lutra lutra</i>	3	3
	Bonno shukor	Wild boar	<i>Sus scrofa</i>	3	3
	Khatash	Small Indian civet	<i>Viverricula indica</i>	3	5
	Bag-dash		<i>Viverra zivetha</i>	3	3
	Goyal	Gayal bison	<i>Bos frontalis</i>	3	5
	Bon Goru	Gaur/Indian bison	<i>Bos gaurus</i>	3	5
	Honuman	Langur	<i>Presbytis entellus</i>	3	5
	Ram Kukur	Wild dog	<i>Cuon alpinus</i>	3	5
	Khud-khudh Shukor			3	3
	Kala Volluk	Black bear	<i>Selenarcious thibetanus</i>	3	5
	Lozzaboti Banor	Slow loris	<i>Nycticebus coucang</i>	3	5
	Bonno Chagol	Serow	<i>Capricornis sumatraensis</i>	3	5
	Pipilika-Vok	Ant-eater		3	3
	Badur	Bat	<i>Pteropus giganteus</i>	3	3
	Chita Bagh	Leopard (before 1986)	<i>Panthera pardus</i> <i>Felis viverrina</i>	3 3	5
	Mecho Bag	Fishing cat			3
	Bor-Bag	Tiger (before 1970),	<i>Panthera tigris</i>	3	5
Birds	Hutum Pecha	Eagle Owl	<i>Bubo bubo</i>	3	5
	Vutum Pecha	Brown Fish Owl	<i>Bubo zeylonensis</i>	3	5
	Lokkhi Pecha	Barn Owl	<i>Tyto alba</i>	3	3
	Tuta	Red-Breasted Parakeet	<i>Psittacula alexandari</i>	3	5

Birds	Bon-Morogh	Jungle fowl	<i>Gallus gallus</i>	3	5
	Dhonesh	Hornbill	<i>Aceros nipalensis</i>	3	5
	Rishala			3	5
	Shokun	Vulture	<i>Gyps bengalensis</i>	3	5
	Chil	Kite	<i>Milvus migrans</i>	3	3
	Eagle	Eagle	<i>Aquila rapax</i>	3	5
	Hargila	Greater Adjutant	<i>Leptoptilos dudius</i>	3	5
	Bok	Egret/Heron	<i>Egretta alba</i>	3	3
	Mayna	Mynah	<i>Gracula religiosa</i>	3	3
	Bhath-Shalik	Mynah	<i>Acridotheres tristis</i>	3	3
	Jora Shalik	Jungle Mynah	<i>Acridotheres fuscus</i>	3	3
	Tiya	Roseringed Parakeet	<i>Psittacula krameri</i>	3	5
	Tila Gugu	Spotted Dove	<i>Streptopelia chinensis</i>	3	3
	Horial	Orange Breasted Pigeon	<i>Treronbicincta</i>	3	5
	Jalali Kobutor	Blue Rock Pigeon	<i>Columba livia</i>	3	5
	Bulbuli	Bulbul	<i>Pycnonotus cafer</i>	3	3
	Babui	Baya	<i>Ploceus philippinus</i>	3	3
	Hari-Cha-Cha	Rufous Tree-pie	<i>Dendrocitta vagabunda</i>	3	3
	Moyur	Peacock/ Common Pea Fowl	<i>Pavo cristatus</i>	3	5
	Manik Jor	White Necked Stork	<i>Ciconia episcopus</i>	3	5
	Tuntuni	Tailor Bird	<i>Orthotomus sutorius</i>	3	3
	Kat-Tukra	Woodpecker	<i>Picoides nanus</i>	3	3
	Modon-tek	Lesser Adjutant	<i>Leptoptilos javincus</i>	3	5
	Kokil	Cuckoo	<i>Cuculus fugax</i>	3	5
	Titir	Hill Partridge	<i>Arborophila atrogularis</i>	3	5
	Machh-ranga	Kingfisher	<i>Alcedo atthis</i>	3	5
Holudh-pakhi	Oriole		3	3	
Chitor			3	5	
Reptiles	Kachhim	Terrapins	<i>Morenia ecallata</i>	3	5
	Koschop	Turtles	<i>Testudi elongata</i>	3	3
	Rokto-chosha Girgiti		<i>Calatesh versicolor</i>	3 3	3
	Totteng/Tohtok	Gecko	<i>Gekko gekko</i>	3	3
	Gui-Shap	Monitor lizard	<i>Varanus bengalensis</i>	3	5
	Ajogor	Python	<i>Python molurus</i>	3	5
	Gokhra	Cobra	<i>Naja naja</i>	3	5
	Daraish/ Daraj-shap	Tar snake	<i>Coluber mucosus</i>	3	3
	Dora Shap	Water snake	<i>Amphiesma stolata</i>	3	3
	Chondro bora		<i>Vipera rusellii</i>	3	5



Linking Fuelwood Collection and Community Livelihoods in Satchari National Park

Rafiq Sultana

Assistant Conservator of Forests, Nishorgo Support Project, Forest Department, Bangladesh.

Abstract

This study discusses linkages between fuelwood collection and community livelihoods in Satchari National Park, Bangladesh, and suggests implications for park management. The park, with a total area of 243 hectares, forms part of the Satchari Reserve Forest and is also bordered by tea estates. One tribal community lives inside the park and 21 to 22 villages are located outside the reserve forest within a radius of 5 to 8 km. In this study, carried out between February and June, 2006, I found that fuelwood collection is carried out by three distinct groups: villagers living inside the park, villagers living outside of the park, and tea estate laborers. Fuelwood is the only available source of domestic energy available in Satchari and approximately two tons of fuelwood are extracted from the park by these communities daily. All collectors are fully dependent on fuelwood for their household consumption. While tea estate laborers collect fuelwood only for their energy needs, approximately 39% of households in the interior village and 100% of collectors from the villages outside the park are dependent on fuelwood for earning cash income. Villagers living in the park earn 62% of their total household income from fuelwood, whereas this activity accounts for 100% of household income for villagers living outside the park.

Introduction

There is often a strong link between protected areas and the livelihoods of local communities. Many rural populations living near to protected reserves depend on them for land, and other environmental resources and services to meet their livelihoods (Salafsky and Wollenberg 2000). However, this dependence often contributes to a state of continuous conflict between local communities who carry out subsistence extraction, and administrators trying to restrict the level of

extraction. As such, subsistence extractors in protected areas often face greater regulation, policing and fines (Nagothu 2001). A similar pattern of dependency by local communities on natural resources and conflict between local communities and government institutions exists in Bangladesh.

Bangladesh has a total of 17 protected areas (Officer in charge at Wildlife Circle, FD, personal communication 2006), all of which are under tremendous pressure from various sources, including people living within and around them. Most of these people are fully dependent on the protected areas as a source of timber, fuelwood, wildlife and other forest products vital to their livelihoods. These constant human pressures have caused major degradation and fragmentation of the natural forest. The FAO (2000) reported that fuelwood is the main forest product in Bangladesh, generating 61% of total round wood in Bangladesh. Similarly, the 1993 Forestry Master Plan of Bangladesh states that government-owned forest lands provide 57% of the timber, fuelwood and bamboo in the country. Homesteads and village woodlots cover only one-seventh the area of forests but produce 43% of these commodities. In Bangladesh, wood is the main source of fuel, used by 44% of households. Other fuels include straw (39% of households), gas (8% of households), crop residues (4% of households), electricity (0.7% of households), and kerosene (0.6% of households) (BBS 2004). Fuelwood utilization varies from region to region, and is highest in Cox's Bazaar District (90% of households use fuelwood) followed by Hobiganj District (60% of households). There are protected areas located in each of these districts.

It is estimated that forest cover in Bangladesh has fallen by more than 50% since 1970 (Forest Department 2005). If this trend continues, a serious ecological tragedy will occur, damaging the livelihoods of people in and around the forest who have historically relied on them. To better protect and manage forest resources (natural forests, protected areas, and plantations), and to accommodate the needs of local people through participatory arrangements, Bangladesh adopted a new National Forest Policy in October 1994. Among other objectives the National Forest Policy emphasizes people-oriented programs to manage the environment, preserve existing values, conserve plants and animals, and maximize benefits to local people (FAO 2000).

Satchari National Park (SNP), located in Hobiganj District in northern Bangladesh, and previously part of Satchari Reserve Forest (SRF), was recently declared a protected area. Although by law no one is allowed to collect any materials,



especially timber or fuelwood, from national parks, all kinds of illegal activities occur. Prior to the designation of Satchari as a national park, several studies were conducted on Satchari Reserve Forest (SRF). In a survey of secondary data, NACOM (2003) found that the fuelwood demands of local people living in Satchari might be a key element responsible for degradation of the reserve forests. Since the gazette notification of the park, it has now become important to re-assess the present situation of fuelwood collection activities by the local communities from the park. Also, as SNP is under a program by which the Forest Department seeks to conserve biodiversity through the active involvement of local communities, it is necessary to explore the role that fuelwood collection plays in the livelihoods of local communities in this area.

Nishorgo Support Project (NSP), a project of the Forest Department funded by USAID, has initiated co-management in protected areas with the participation of local people. Satchari National Park is one of the five protected areas in which NSP has begun its work. This study was conducted between February and June 2006 under the auspices of the Nishorgo Support Project, in order to explore linkages between fuelwood collection and livelihoods of local communities living in and around the park. The paper explores the driving factors behind fuelwood collection by local communities. No studies currently provide data on the socio-economic aspects of fuelwood extraction at the local level in Satchari National Park. There is also an urgent need to identify and quantify the economic benefits that local people derive from SNP. Nagothu (2001) stated that "empirical investigations of local resource use and management strategies can often provide more valid information and data, when compared to the superficial reports that guide the mainstream views on deforestation". Another aim of this paper is to better inform policy-making by increasing understanding of livelihoods issues in the management of Satchari National Park.

Background

Satchari National Park is situated in Paikpara Union, Chunarughat Upazila, Habigonj District, Sylhet Division. It is part of Raghunandan Hill Reserved Forest, and falls under the jurisdiction of Satchari Forest Beat, Satchari Forest Range, Sylhet Forest Division. Satchari means 'seven streams', referring to streams that flow through the forest and form important catchments areas. The semi-evergreen forests of Satchari form part of a transition zone between the Indian subcontinent and the Indo-China ecological region (Sharma 2006).

The park is located between longitude 91°25' to 91°30', latitude 24°5' to 24°10'. The climate is generally warm and humid, but is cool and pleasant during the winter. Average daily temperatures vary from 27° C in February to 36° C in June. Average daily humidity varies from 74% in March to 89% in July. The average annual rainfall is approximately 4,000 mm, with maximum rainfall between June and September from the southwest monsoon. The forest area is undulating with slopes and hillocks, locally called *tila*, ranging from 10-15 m. The forest type is mixed evergreen, with several species of timber, bamboo, grasses, fruit and fodder species. There is also a high diversity of animal species, particularly avifauna, relative to the size of the site (Sharma 2006). Bamboo, sungrass, *murta* or *maranta* (*Clinogyne* sp., used for weaving mats) and sand are among the major NTFPs collected from this forest (IUCN 2004). Wildlife diversity in the Satchari Forest consists of 197 species, out of which 149 species are birds, 24 species are mammals, 18 species are reptiles and 6 species are amphibians (Feeroz 2003). NACOM (2003) noted a higher number of bird species, listing 189. Due to its rich diversity of avifaunal species, Satchari is also known as a birdwatching paradise (Thompson, P.M. and D.L. Johnson 2003).

The park is a part of the Raghunandan Hill Reserved Forest, which was reserved in 1914 with an area of 6,205 hectares as per the Forest Act of 1878 and Assam Forest Manual of 1898. Before reservation, many trees were cleared through the practice of *jhum* (shifting cultivation), after which secondary forest regenerated from the cleared fields. At that time the main objective of the Forest Department was production forestry, and almost the entire area of natural semi-evergreen forest was converted to plantations of long-rotation species like teak, mahogany, garjan (*Dipterocarpus turbinatus*), sal (*Shorea robusta*), chapalish (*Artocarpus chapalasha*), and jaam (*Syzygium jambolanum*); and short rotation species like *Dalbergia sissoo*, *Acacia mangium*, and eucalyptus. In the 1980s, some areas were also converted to oil palm plantations. The Raghunandan Hill Reserved Forest consists of two administrative ranges, namely the Raghunandan Range and the Satchari Range. The Satchari Range covers an area of 1,760 hectares. In 2005, approximately 243 of these hectares (600 acres) were declared as Satchari National Park. The vegetation in the park comprises a patch of 120 hectares of natural forest, a short rotation plantation of eucalyptus and acacia, and an oil palm plantation (Chowdhury 2004).

The Satchari Range portion of the reserve forest is surrounded by a number of tea estates, villages, towns and cultivated fields (Fig. 1). Nine tea estates are located close to the Satchari Range portion of the reserve forest, three of which surround



the Satchari National Park. Two tea estates (Satchari Tea Gardens and Chaklapunji Tea Gardens) form the western and eastern boundaries of the park. The reserve forest surrounds the park on its northern and southern sides. On the north side, an old highway demarcates the park from the reserve forest area. A single forest village, Tiprapara, is located inside the park. Surrounding settlements are located between three and eight km away from the Satchari Range portion of the reserve forest (five to eight km from the national park). People from 21 to 22 surrounding villages, and the tea estate laborers, depend on the forest resources from both the reserve forest and the park for fuelwood, poles for construction, and non-timber forest products (NACOM 2003).

Tiprapara, the only village inside Satchari National Park, is inhabited by 23 households who are migrants or descendents of migrants from the Tripura community who came to the area in the 1950s from the neighboring country of India. The Forest Department of East Pakistan established Tiprapara as a forest village to provide laborers for planting, managing, and protecting forest plantations after the natural forests were cleared. These tribal people used to practice jhum in the forests but this was banned in the early 1980s.

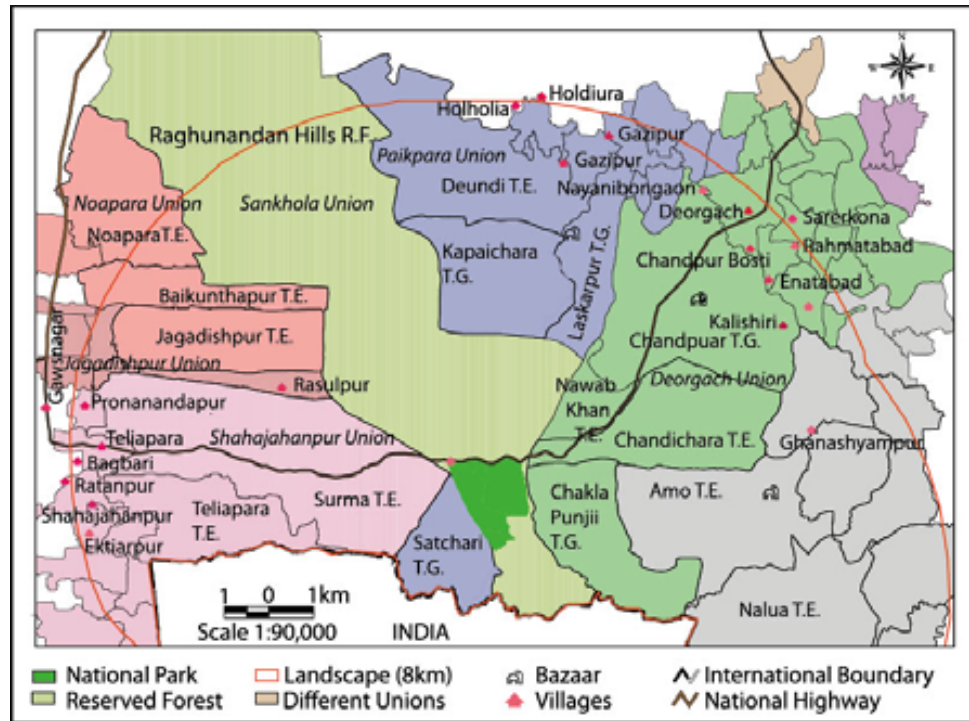


Figure 1: Map of Satchari National Park and Surroundings

(Source: Nishorgo Support Project, 2007)

Methods

A methodology consisting of both field observations and interviews was important for studying the linkages between the protected area and livelihoods of local communities. After a pilot survey in Satchari National Park in January, 2006, I collected detailed data between February and June of 2006. I began by organizing four focus group discussions in Tiprapara, at the Nishorgo Support Project's office at Satchari and at local markets in the villages of Teliapara and Madhobpur. Then, based on these discussions, I selected eight key informants as people with high levels of knowledge and involvement with the community, and I later interviewed them separately. Through the key informant interviews I was able to investigate the historical background of the area, to understand its present situation and the local community in general, and to gather basic facts about fuelwood collection. The key informants included formal leaders, local elites, and local officials.

Before starting household surveys in Tiprapara, I prepared a community map of the village through group discussions with villagers, in order to identify the settlement patterns of the village. Detailed investigations were then carried out at the household level to gain an understanding of villagers' socio-economic status, family size, occupation, education, income sources, and dependency on fuelwood. I also collected notes on the socioeconomic conditions of the villagers, amounts and uses of fuelwood collected, and the role of gender in fuelwood collection. I defined a household as a unit whose members cook and eat from the same pot.

In addition, I carried out entry point surveys to get an estimate of the amount of fuelwood collected by people living in communities outside the park and by tea garden laborers. Because it was not possible to conduct household surveys in all 22 villages surrounding the reserve at this time, I decided that a traditional entry point survey would be more efficient. A few studies have used a technique called 'footpath survey' to estimate the amount of fuelwood collected from a forest by observing the amount of fuelwood carried along forest paths by headloads, bicycle loads, or cart loads (Appasamy 1993; Ganesan 1993). Shankar et al. (1996) stated that footpath surveys could be applied to small areas where the boundaries of a forest are well defined and entry paths are limited and accurately known. Such is the case in Satchari National Park. Entry points are few and well known due to the park's small size.

To select the entry points to be used, I conducted an initial assessment by walking along most of the boundary of the park. There are at least six traditional entry



points used by those entering the park on foot (Figure 2). Five of these points are on the main road on the northern boundary, and the sixth point is located on the west side adjacent to Satchari Tea Garden. There are two points on the main road located in front of the Forest Department offices which are not used by local fuelwood collectors, so I selected three of the other entry points instead. These are preferred by the fuelwood collectors due to the proximity of the road and ease of transport. I also selected the fourth entry point, despite its comparatively greater distance from the main road (1.7 km), in order to observe the involvement of tea laborers in fuelwood collection. People carrying headloads of firewood were easily observable coming out of forests from these roadside points.

At each entry point, I made observations and interviewed fuelwood collectors entering and leaving the national park. I gathered information on the number of headloads or bundles collected, the gender and ages of collectors, occupation and uses of fuelwood by interviewing collectors at each point in the morning (9 a.m. to 11 a.m.) and observed each point in the evening (4 p.m. to 6 p.m.).

Finally, based on the discussion with key informants and fuelwood collectors, I selected two markets in the Satchari area, namely Teliapara and Madhobpur, to estimate fuelwood flows, including the weight and price of each head load. I held discussions with two trader groups at each of the two markets. To estimate the weight of wood in the headloads, I weighed differently sized bundles in the market, using the weighing scale from a fuelwood trader's shop.

Constraints on my methods included language barriers with the local tribal peoples, their reluctance to be interviewed, and my uncertainty as to the reliability of some informants. Another possible source of error is that the number of headloads or bundles stocked inside the park beyond the entry points could not be ascertained. In addition, the amount of fuelwood collected from Satchari National Park could not be distinguished from the amount collected from the reserve forest, as there is no physical demarcation between the park and the reserve forest. However, since the part of the reserved forest that borders on the national park is a teak monoculture with no undergrowth other than shrubs, as well as being farther away, it is less likely to be a fuelwood collection area.

Data Analysis and Results

I followed a comparatively simple procedure and used demographic data to analyze: a) the socio-economic condition of fuelwood collectors; b) the amount of

fuelwood collected and patterns of collection; and c) the contribution of fuelwood to the livelihoods of villagers.

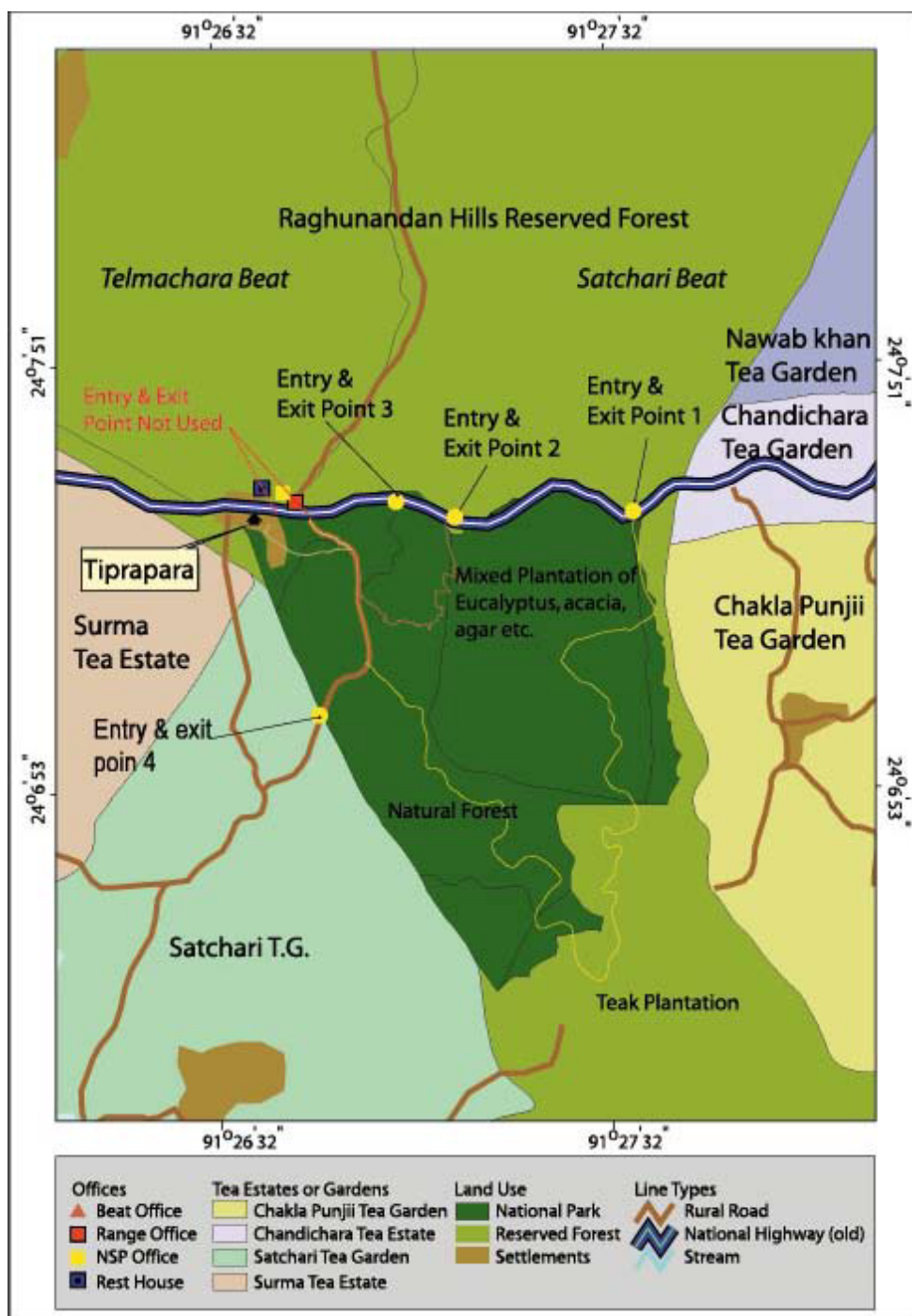


Figure 2: Location of Survey Points and Study in Satchari National Park
(Source: Nishorgo Support Project, 2006)



Socioeconomic Condition of Fuelwood Collectors

Tiprapara is located on a *tila*, or small hillock, with houses located near the top of the *tila* and fruit orchards near the bottom. Each villager owns a small portion of the land surrounding the settlement; this is used to plant small patches of lemon, banana, jackfruit and other fruit trees. There are a total of 23 households and 115 people (36 males, 36 females, and 43 children under the age of 15) in Tiprapara. There is one tube well for the entire village. Family sizes range from two to nine members. Eighty percent of the children attend primary, secondary or high school; the village has one non-government primary school. Out of 23 households, 92% are *kacha* (made of bamboo), 4% are *paka* (made of brick) and 4% are half-*paka* (brick walled, with either a tin or bamboo roof). Twenty-two households are male-headed and one household is female-headed. Approximately 87% of households raise their own animals, such as cows, goats and chickens. Only 13% of households have furniture other than a bed, table, chair or stool. Villagers have no local medical facilities. The primary income generating activities include lemon cultivation, fuelwood collection, day labor, business, government service and forest patrolling with Forest Department field staff. Eight households depend on lemon cultivation, five on day labor, four on fuelwood collection, three on forest patrolling, two on business, and the remaining household depends on government service for their primary occupation (Figure 3). All households have secondary sources of income. The average daily income overall is Taka (Tk) 100 (about \$1.40 USD), and the income range is from Tk 50 (about \$0.70 USD) to Tk 300 (about \$4.20 USD). Of the 23 households, nine households earn Tk 50 to Tk 75 per day, eleven households earn between Tk 85 to Tk 125 per day, two households earn Tk 150 to Tk 200 per day, and only one household earns Tk 200 to Tk 300 per day.

To estimate the socioeconomic conditions of fuelwood collectors from outside villages and tea garden laborers, I interviewed 20 fuelwood collectors using a short semi-structured questionnaire on issues related to fuelwood collection and demographics. I found that all households are primarily dependent on fuelwood collection, supplemented by a secondary source of income from day labor. Their daily earnings averaged Tk 70 (about \$1 USD) and ranged between Tk 30 and Tk 100.

Estimates of Amounts and Patterns of Fuelwood Collection

Most collectors are adults, both male and female. Children's involvement in

fuelwood collection is negligible. In Tiprapara females make up 55% of the collectors, males 33% and children only 12%. Other than collecting fuelwood, females have no alternative source of work that can increase domestic income. Children are engaged in school activities. Fuelwood collectors from the surrounding villages are 75% male, 20% female and only 5% children. One reason for the higher percentage of male collectors may be the distance from the park, since women may not be able to leave their household responsibilities to travel greater distances. In the case of tea-garden laborers, all collectors are female. These women come to collect tea leaves from the part of the garden closest to the park, and gather fuelwood from the park at the same time.

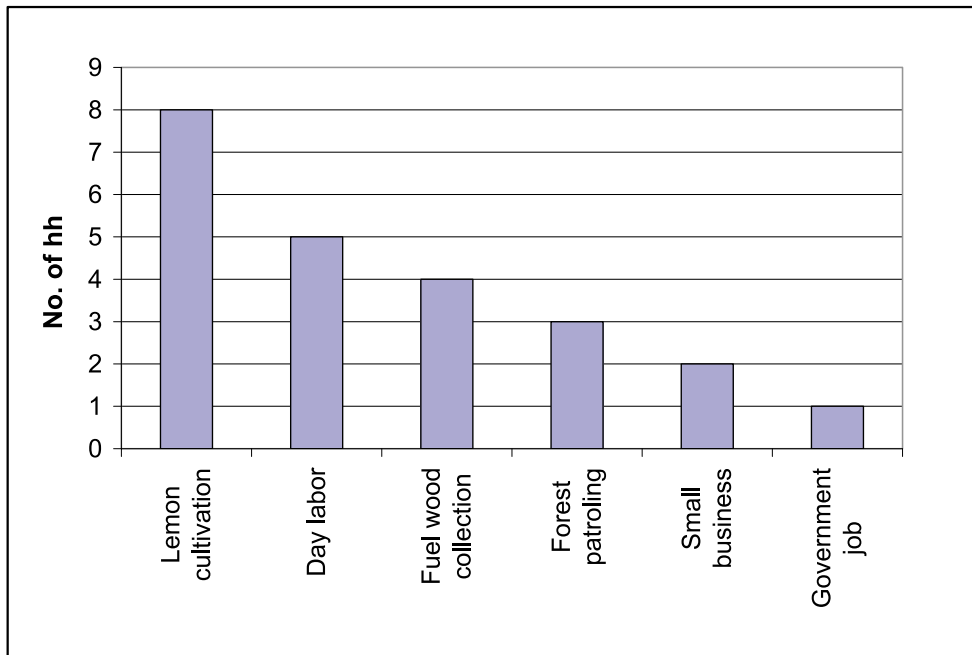


Figure 3: Primary Occupation of Households at Tiprapara Village

I followed two techniques to estimate the amount of fuelwood collected daily from Satchari National Park. In the household survey in Tiprapara, I gathered information on the number of bundles of fuelwood collected per day by each household. The women in Tiprapara collect fuelwood by using a conical bamboo basket called a *khara*, while men collect wood in bundles called *boza*. Men may carry two *bozas* on their shoulders using a bamboo stick, which is called a *bhar*.

The *kharas* collected by Tripura women could not be weighed as they are for domestic use and not sold in the market; however I estimated their weight visually to be between 10 and 20 kg. The *bozas* and *bhars* collected and sold by



Tripura men are sold in the local market, so I was able to weigh them there using the scales at the traders' shops.

In Tiprapara, 50 people (46%) from the 21 households surveyed are involved in fuelwood collection. The same 50 people do not go to the forest all at one time, but 31 people from Tiprapara collect fuelwood from the forest each day on average. Furthermore each person collects, on average, 27.1 kg of fuelwood per day, or a total of 840 kg per day for the whole village. The average weight of each bundle is 35 kg. Tiprapara as a whole takes an average of 24 bundles of fuelwood per day from SNP (Table 1). Each household's average collection is 40 kg per day.

Each household spends an average of four hours each day collecting fuelwood. Collectors go to the forest once or twice a day, about three days a week. I found that collection times are typically in the morning (9 a.m. to 12 p.m.), afternoon (1 p.m. to 3 p.m.) or evening (4 p.m. to 6 p.m.). On average, ten males (32% of total collectors), seventeen females (56% of total collectors) and four children (12% of total collectors) collect fuelwood each day. The ages of collectors range from 30 to 75 years for males, from 18 to 60 years for females, and from 10 to 15 years for children.

Table 1. Information on Fuelwood Collected by Tiprapara Villagers and Households

Primary Occupation of the Collectors	Total No. of Households	Average No. of Households Collecting Fuelwood	Average No. of Persons Collecting Fuelwood Daily	Average No. of Fuelwood Bundles Collected Daily	Average Mass of Fuelwood Collected Daily (kilograms)
Lemon cultivation	8	7	9	6	210
Day labor	5	5	6	5	175
Fuelwood collection	4	4	8	8	280
Forest patrolling	3	3	4	3	105
Business	2	1	2	1	35
Government service	1	1	2	1	35
TOTAL	23	21	31	24	840

In the entry point survey, I estimated the number of headloads or bundles leaving from each of four selected entry points daily. Collectors were either local villagers, members of communities located outside the park, or people from the surrounding tea estates. I found that males collected fuelwood using headloads or pairs of bundles (*bhar*), while females collect wood using headloads or bundles (*boza*). All of the collectors used medium to large-sized machetes or sickles (locally called *da*) to cut down the fuelwood. Most people collect green saplings

and green branches, though some dead wood and dry branches are also collected. By weighing the different sizes of bundles separately at the fuelwood market, I found that the weight of a typical large bundle is about 50 to 60 kg, medium bundles weigh about 35 to 45 kg, and small bundles weigh about 10 to 20 kg.

On average, I observed a total of 20 collectors from outside the park leaving entry points 1, 2 and 3 each day. Of these, typically 15 were male (75%), 4 were female (20%), and one was a child (5%). They collected an average of 59.5 kg of fuelwood per person per day. The average weight of each bundle was 35 kg, and on average 34 bundles was carried out per day, for a total of about 1,190 kg per day. All collectors from outside the park were ethnic Bengalis (rather than Tripura) and so were readily identified; they entered the forest between 9 a.m. to 11 a.m. and left between 3 a.m. to 6 p.m. These collectors only kept drinking water with them and would spend six to seven hours inside the forest. They would leave the park in the evening with headloads or bundles, deposit their headloads at the entry point, and then wait for a vehicle to take them to the market. Collectors take either local buses or small trucks called trolleys; sometimes only part of a group will go to the market while the rest wait with the bundles.

The fourth entry point borders a tea estate. All fuelwood collectors at this point were female tea laborers. An average of 9 collectors leave the site with one head load or bundle per collector per day, weighing about 10 kg each, for a total daily amount of about 90 kg per day. Tea laborers carry smaller loads of fuelwood because they carry them together with their tea leaves. All collectors using this entry point entered the forest between 9 a.m. and 4 p.m. to collect fuelwood and spent one to two hours before or after collecting tea. Collectors at Point 4 collected fuelwood four days a week on average.

For the four entry points together, a total of 29 collectors leaving the site per day with an average of 43 headloads or bundles, which gives a total average of 1,280 kg of fuelwood leaving the park daily through the four points surveyed, after accounting for the three size categories of bundles (Table 2).

To estimate the total amount of fuelwood collected per day by all collectors, I added the estimated average daily weight of fuelwood collected by Tiprapara villagers to the total weight of fuelwood leaving the park from the four entry points each day. Including Tiprapara villagers, the average number of fuelwood collectors in the national park is 60 collectors per day. The total amount of fuelwood collected from the park is approximately 2,120 kg, or just over 2 metric



tons per day, by all collectors from inside and outside the national park. Of this amount, 40% (840 kg) was collected by villagers from the interior village, about 56% (1190 kg) was collected by villagers living outside the park, and the remaining 4% (90 kg) was collected by the tea garden laborers (Table 2).

Table 2: Information on Daily Fuelwood (FW) Extraction by Villagers Surrounding SNP

Location of Entry Point	Fuelwood collectors per day	Head loads and bundles collected per day	Average amount of fuelwood collected per day (kg)	Average use of FW by collectors (kg)		Average daily income from sale of fuelwood (Tk)
				Cooking	Selling	
Entry point 1	8	14*	490	98	392	588
Entry point 2	7	13*	455	91	364	546
Entry point 3	5	7*	245	49	196	294
Total (A)	20	34	1190	238	952	1428
Entry point 4	9	9**	90	90	-	-
Total (B)	9	9	90	90	-	-
Total (A+B)	29	43	1280	328	952	1428

NOTES: * Average weight = 35kg, ** Average weight = 10 kg

Impact of Fuelwood on Livelihoods

To estimate the impact of fuelwood on livelihoods inside and outside of the park, I interviewed villagers to find out what amount of fuelwood is used for cooking and what amount is sold each day. To calculate daily incomes from fuelwood, I surveyed fuelwood traders at two markets to collect information on the prices of differently sized bundles of fuelwood. I found the average price of a large bundle (50 to 60 kg) is Tk 75 (just over \$1 USD), a medium bundle (35 to 45 kg) is Tk 52 and small bundle (10 to 20 kg) is Tk 30. I determined the average price of one bundle (35 kg) to be Tk 52.

Out of the 23 households in Tiprapara, I found that only two households do not collect fuelwood at present, not even for cooking. Instead, they use branches from their lemon trees and sometimes they buy fuelwood from other households. Twenty-one households (91% of homes) collect an average of 840 kg of fuelwood daily (Table 1). Of this, 465 kg (55%) are used as fuelwood for cooking, and nine households sell the remaining 375 kg (45%) at the market to meet their livelihood demands. Each of the nine households daily earns an average of 62 Tk (less than \$1 USD) from the sale of fuelwood. This constitutes about 62% of their total income. They sell the fuelwood to the nearest markets and to other households in the village. Mohalders (local fuelwood traders) sometimes come to Tiprapara to

collect fuelwood, and occasionally the villagers sell fuelwood to local roadside restaurants. The remaining 38% of their daily earnings (about Tk 38) is from other sources such as lemons, daily labor, and forest patrolling.

At entry points 1, 2 and 3, I found that, on average, collectors use about 20% (238 kg total) of the fuelwood they collect for cooking and sell the remaining 80% (952 kg total) at the market. At entry point 4 (adjacent to the tea garden) women tea-garden laborers collect about one small bundle (about 10 kg) of fuelwood from the Park per day. These women told me that they do not get sufficient fuelwood from the tea garden, so they collect it from the park to use for cooking. Most of them collect dead wood and dry branches, but some collect live branches from green trees. Data from my survey suggests that, at the four entry points, about 29 people collect an average of 1,280 kg fuelwood per day, of which they use about 328 kg for cooking and sell 952 kg to the market. However, out of the 29 people, 9 people (tea garden laborers) do not sell any of their collected wood, while 20 people (from three entry points) earned an average of 1,428 Tk per day or 71 Tk (about 1 USD) per day per person - 100% of their cash income (Table 3).

Table 3: Daily Collection of Fuelwood (FW) for Household Consumption and Market Sale

Type of community	Average No. of persons collecting FW	Average weight of FW collected per day (kg, % of total)	Use of FW by weight (kg) as a % of total FW collected		Average daily household income from FW and other sources (Tk and as a % of total income)	
			Domestic	Sale	Fuelwood	Others
Tiprapara village	31	840 (40%)	840 (40%)	375 (45%)	62 (62%)	38 (38%)
Surrounding Villagers*	20	1,190 (56%)	238 (20%)	952 (80%)	71 (100%)	-
Tea garden	9	90 (4%)	90 (100%)	-	-	35**
Subtotals for 4 entry points	29	1280	328	952	70	35
Grand total for all collections	60	2120	793	1327	35	36.5

NOTES: *excludes tea gardens, ** tea garden laborers receive subsidies for their living costs.

Discussion

The average daily income of each household in Tiprapara is Tk 100 (about \$1.4 USD), and ranges between Tk 50 to Tk 75 per day to Tk 300 or higher. When villagers are classified by economic status, my results suggest that 39% are



extremely poor (earning Tk 50 to Tk 75 per day), 48% are poor (earning Tk 76 to Tk 100 per day), 9% are middle class (earning Tk 101 to Tk 175 per day), and 4% are rich (earning Tk 200 to Tk 300 a day). This is slightly different from the classifications used by NACOM (2003), which reported that in Tiprapara 12% of households are extremely poor, 65% are poor, 2% are middle class, and only 1% are rich, as defined by the Poverty Reduction Strategy Papers of Bangladesh (ERD 2002).

The villagers are dissatisfied with the situation, and some even said that relocation out of the park is preferable to the level of poverty that they live with presently. They claimed that since the banning of jhum or shifting cultivation in the 1980s, their livelihoods have deteriorated as they cannot grow enough food, nor have they received any land for settled agriculture as compensation. In addition, there are no medical or educational facilities in their vicinity. The ban on jhum cultivation in the interest of biodiversity conservation means that the villagers have no fixed income generating activities. They claim primary occupations such as lemon cultivation (35%), day labor (22%), fuelwood collection (17%), forest patrolling (13%), business (9%), and government service (4%), but on top of this, 39% of all households also supplement their incomes with fuelwood collection. For example, the households who grow lemons do not have sufficient land for large orchards, which would sustain them year-round. For this reason they collect fuelwood three or four days a week, or work as day laborers or forest patrollers.

Thirteen percent of households named forest patrolling with Forest Department staff members as their primary income source. Forest patrolling is not an official function of the Forest Department at this stage, so members of village patrols cannot claim to be employed by the Forest Department. In the settlement period of the 1950s, the forest villagers were required to patrol the forest under the terms of their agreement with the Forest Department. In exchange for this service, they were given land within the forest where they could practice jhum cultivation. Local Forest Department staff members claim that villagers are not interested in forest patrolling even though they were originally brought in for this purpose. However villagers argue that they no longer have a fixed source of income and cannot afford to take part in patrolling under the current situation. The villagers claim that if the state wants them to help protect the forest, then it should also take steps to provide them with alternative sources of income.

Before Satchari was declared a national park, villagers from Tiprapara were

allowed to collect dead or dry wood as fuelwood from the reserve forest. However, local Forest Department staff members allege that local communities girdled live trees, felled them, dried them and claimed them as dead wood for collection. Forest Department staff members maintain that local households are primarily responsible for forest degradation in Satchari. After the national park was notified and Nishorgo Support Project (NSP) began its co-management program in the Satchari area, the villagers of Tiprapara were no longer allowed to collect dead wood, so they began to face even greater obstacles from local Forest Department staff in continuing their livelihood activities.

Fuelwood collection is very common in the national park. My results suggest that on average 60 people (representing 50 households) collect 2,120 kg (over 2 metric tons) of fuelwood in the park daily. Each collector gathers an average of 35.3 kg per person per day. Some of this wood may also come from the part of the reserve forest that is adjacent to the southern boundary of the national park, as there is no physical demarcation. These results differ slightly from studies by Chemonics (2002) and NACOM (2003). Chemonics (2002) found that about 150 to 200 people entered the reserve forest every day to collect fuelwood, with an average load of about 40 kg per person per day, representing about 6 tons of fuelwood per day. NACOM (2003) identified three major stakeholder groups, including fuelwood collectors, as playing major roles in forest degradation. They reported that about 100 to 150 people from the surrounding tea estates and nearby villages enter the reserve forest daily for fuelwood collection. On average, males carry about 2 maunds (1 maund = 37.5 kg) and females carry about 1 maund per day.

When we compare results from these three studies, it appears that about one-third of all collectors enter the national park or reserve forest on a daily basis. Fuelwood collectors may prefer the national park as it contains a greater percentage of natural forest, and it is nearer to the road and nearby villages. The local Forest Department has only eleven staff members (including the official in charge) to supervise the entire reserve forest area of 1,760 hectares. This is an insufficient number of people to patrol the park and reserve forest. However, Forest Department staff members also said that after the area was declared a national park fuelwood collection activities have decreased, even if they have not ceased completely. Salafsky & Wollenberg (2000) suggest that in the case of protected areas, local people often continue to use resources in the core reserve even if prohibitions are posted or otherwise made public.



My results indicate that most people who collect fuelwood are mostly or partially dependent on fuelwood for their livelihood. In Tiprapara, 13% of households are entirely dependent on fuelwood for their daily livelihoods, 26% use it to supplement their household incomes; and 91% are dependent on fuelwood for domestic consumption. Collectors from surrounding villages (excluding tea-garden laborers) earn all of their cash income from fuelwood collection, although they sometimes supplement their household incomes from other sources, and all of them are dependent on fuelwood for their domestic energy. Tea-estate laborers collect fuelwood from the park to supply their domestic fuel needs. It appears that fuelwood is the major source of energy for household consumption as well as market sale for the local community.

I observed that collectors were usually the same people on each survey day and predominantly came from Gawsnagar, Teliapara, Bagbari and Ratanpur villages, which fall under the neighboring Madhobpur Upazila (sub-district) and the neighboring Satchari Tea Estate. Collected fuelwood is transported by trolley and bus to local markets at Teliapara and Madhobpur, and then sold to fuelwood traders. The largest proportion of fuelwood went to Madhobpur market, even though Teliapara market is nearer to the park. Fuelwood traders in Teliapara informed me that they bought most of their fuelwood from teagarden laborers who were selling illegally felled shade trees from the tea garden, and that only a small portion came from villagers living near Satchari forest. On the other hand, fuelwood traders in Madhobpur informed me that they purchased most of their fuelwood from villagers living near Satchari forest. The traders claimed they could tell the wood that comes from Satchari because it consists of acacia and teak. Traders stated that today the fuelwood supply is less than the demand: these two wholesale markets supply fuelwood to local tea stalls, restaurants and households.

Conclusions and Policy Implications

Satchari National Park is the only patch of natural forest remaining in all of the surrounding reserve forest. It is important to protect this patch by completely restricting entry to all unauthorized people as defined by the protected area statutes. Local communities, however, are exploiting forest to meet their daily living needs. Several conflicts divide local people and Forest Department staff members, many of which stem from these livelihoods issues. For example, to conserve biodiversity in Satchari Forest, the state has prohibited jhum or shifting

cultivation but has not initiated any livelihoods programs for the communities since jhum cultivation was prohibited.

Legally, protected areas like Satchari National Park have strictly defined borders that unauthorized people may not cross. A common approach to protecting biodiversity has been to create parks and protected areas that exclude livelihood activities. It seems that a key feature of many protected area strategies is that local livelihoods are assumed to conflict with conservation (Salafsky and Wollenberg 2000). However, managers of protected areas must consider the basic needs and status of people living in and around the area. Sustainable management of any protected area requires the involvement of communities in identifying and implementing alternative livelihood activities. Machlis (1993) states that, "the management of protected areas is necessarily the management of people," and that the social sciences have an essential role to play in protected areas management. The state has recently recognized the importance of involving local communities directly in protected area management. As a result, the Forest Department has started this work through the co-management program of the Nishorgo Support Project.

This study was carried out to examine the present situation of fuelwood collection, the roles played by men and women, and the impacts of fuelwood on livelihoods of local communities in and around Satchari National Park. The study found that villagers who live both within the park and around the park, as well as tea-estate laborers, collect fuelwood in the park even though they are not legally allowed to do so. Furthermore, because most fuelwood collectors are poor and unemployed, they must exploit forests to meet their daily livelihood needs. Collectors suggested that if they were provided with alternative sources of income they would not come to the forest. However, they currently have no alternatives. The Nishorgo Support Project has begun to support the development of alternative income generating activities within the Satchari area, but these are insufficient to meet the needs of Tiprapara villagers, who are fully dependent on fuelwood for their livelihoods. Some of the surrounding villages are also involved in income generating activities supported by a local NGO, but these are also insufficient to meet their livelihood demands.

Women from Tiprapara and tea estate laborers collect wood for household consumption, and women from surrounding villages collect for both household consumption as well as market sale. Women's involvement in fuelwood collection



is 55%, 20% and 100% in Tiprapara, surrounding villages, and the nearby tea estate, respectively. Therefore, I suggest that conservation-oriented alternative income generation activities that provide for both interior and surrounding villages should include females according to the varying levels of female involvement in resource extraction. These alternatives should provide sufficient income to meet the needs of local people, and should match their interests. If villagers receive sufficient benefits from alternative conservation-oriented activities, they will no longer have incentives to practice livelihood activities that damage the forest. Laborers from the two tea estates around the park should also be included under Nishorgo Support Project activities. Currently the project does not work with the tea estate laborers.

Collectors are currently taking about 2 tons of fuelwood daily from the park to the market by trolley (small truck) or bus, right in front of the local Forest Office. This rate of extraction is clearly not sustainable as the national park area is only 243 hectares in size. Therefore, fuelwood collection is a major factor in habitat degradation with strong implications for the wildlife of the protected area. Conservation of protected areas requires that government officials work to meet the needs of local livelihoods, since a clear linkage exists between the conservation of protected area and the livelihoods of local communities. This study shows that all of the collectors are entirely dependent on the fuelwood for their household fuel. In the interests of the protected area, the first measure should be to introduce alternative sources of fuel energy for household consumption.

The state maintains legal control over the reserve forest, including the national park, but the Forest Department does not have the administrative capacity to prevent exploitation of the reserve forest or the protected area. The entire Forest Department staff consists of one range officer, two foresters and six forest guards assigned to oversee the 1,760 hectares of forest - the entire reserve forest, including the national park. This study also found that, in the areas surveyed alone, an average of 60 people enter the national park daily, seeking to meet their basic needs of fuelwood, bamboo and building materials with products gathered in the forest. It is suggested that adequate staff should be designated separately for administration of the national park. The park should also be physically demarcated from the reserve forest, as well as from the tea estate boundary.

I would also like to propose that villagers from Tiprapara be relocated outside the national park boundary as per their own suggestion. Because it is only one community, relocation should not present such a large problem. In the future, if the

population of this village continues to increase, they will occupy a larger area and it will be more difficult to relocate them. This is not the only solution, however. The large number of fuelwood collectors from outside the park suggests that relocating Tiprapara will not halt degradation from fuelwood collection. Therefore, other measures must be implemented. In addition, further research should be conducted to assess the potential for a successful co-management program in the park under the Nishorgo Support Project.

Wood production from the forest areas is continuously declining, and most of it is consumed within the country. A large quantity is imported to satisfy domestic consumption. The continual change in species and reduction of the average age of forests is adversely affecting the sustainability of existing forest ecosystems. The country annually requires about 9.4 million cubic meters of fuelwood against a supply of about 6.18 million cubic meters (FAO 2000). The Forest Department reported that production of timber and fuelwood from forest areas has fallen by more than 50% since the felling ban in 1988-89. If this trend continues then the country's natural forests will be in great danger.

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Perceptions of Tourism by Indigenous Communities Living In and Adjoining Lawachara National Park

Md. Modinul Ahsan

Assistant Conservator of Forests, Wildlife Management and Nature Conservation Division,
Sylhet, Bangladesh

Abstract

This paper discusses the overall perceptions of tourism and the benefits received by three communities living in and adjacent to Lawachara National Park. The study was conducted in villages populated by three different ethnic groups during February to May 2006. Two out of the three villages received benefits from tourism activities. These activities included the sale of handmade clothes, eco-tour guide services and cultural shows. On the other hand, the community receiving the fewest benefits from tourism, the Khasia, encountered the most problems caused by tourists coming to the park. The study revealed that the local ethnic communities have a general understanding of tourism, but not all of them benefit from tourism activities. The existing institutions (formal and informal) should be more actively involved in order to give more benefits to the local people, particularly those who are negatively affected by it.

Introduction

The World Tourism Organization defines tourism as moving from one's usual place of residence for less than one year and more than 24 hours for reasons that are not related to income earning activities (Kumar 1995). Tourism is an increasingly essential element of economic, social and cultural development and it has become one of the largest global economic activities (Western 1993). Today both developed and developing countries realize economic and social benefits from tourism and constantly strive to gain a larger share of its benefits (Sultana 2001).

Sekhar (2003) states that, until recently, tourism had not been viewed as a potential income generating activity by the governments of South Asia. Bangladesh, a South Asian nation, is a land of rivers, wetlands known as haors, hills, forests,

mangroves, sandy beaches, and the diversified cultures of the Bengali people and its numerous indigenous communities. The 1994 Bangladesh Forest Policy placed great emphasis on eco-tourism. The policy states that eco-tourism is recognized as a forestry activity that should be promoted within the carrying capacity of nature. Every year the numbers of tourists increases, although this sector has not yet flourished. The total number of foreign tourists in Bangladesh was a little more than 244,000 in 2003, which marked a positive change of 18% from the previous year (Hassan 2006). National parks have played significant roles as tourist attractions in many countries since their establishment (Butler and Boyd 2000). Protected areas with their landscapes, flora and fauna as well as their cultural elements form attractions for tourists (Ceballos-Lascurain 1993). Tourism, however, is highly dependent upon natural capital (e.g. wildlife, scenery) and culture (Roe and Khanya 2001). Wildlife tourism in South Asia is not very old when compared to many African countries, where wildlife based tourism is more active and has been promoted by the governments for a number of years (Sekhar 2003).

One of the most common uses of protected areas is tourism. Wildlife tourists have recognized the protected areas of the developing countries as a source of generating benefits for local people and as a source of income (Walpole and Goodwin 2001). As Lindberg (1993: p.101) states, benefits from protected areas are generated for at least three reasons:

First, it is equitable insofar as conservation of the area designated for eco-tourism may reduce or eliminate traditional resource use. Second, the eco-tourists as consumers may support the importance of tourism benefiting local residents (Eagles et al.1992). Third, when residents receive benefits they are more likely to support tourism and conservation, even to the point of protecting the site against poaching or encroachment.

Lindberg et al. (1996) found that tourism related benefits were an important basis for positive attitudes towards adjacent natural areas (Wunder 1996; 1998). Conversely, if residents bear the costs without receiving benefits, they may turn against tourism and conservation, and may intentionally and unintentionally damage the site.

People live both inside and outside of Lawachara National Park. Members of Khasia, Manipuri and Tripura indigenous groups live inside the core area of the park as well as outside but adjacent to the park. No study has been done on tourism in the protected areas of Bangladesh. The purpose of this study is to understand the perceptions of tourism by indigenous communities and to document the benefits they receive from tourism.



Background

The study was conducted at Lawachara National Park (24°30'-24°32'N and 91°37' - 91°39'E) (Fig. 1). The park was founded in 1996 with a total forest area of 1,250 ha. It forms part of West Bhanugach Reserved Forests, which is under the area of Sylhet Forest Division. It is one of 17 protected areas in Bangladesh. Lawachara National Park (LNP) lies between the Dholoi River on the east and the Manu River on the north. A number of sandy bedded streams and *nallahs* (channels) pass through the park, forming a riparian ecosystem. Located in a high rainfall area with evergreen and semi-evergreen forests, LNP is a mega biodiversity region with many floral species. Hoolock Gibbon and Capped Langur are keystone species located in the park (Nishorgo 2006). The park also serves as the home of several indigenous communities. Members of the Khasia, Manipuri, and Tripura indigenous groups reside within and around the forests. These communities depend on the forest resources for their livelihood opportunities (Nishorgo 2006).

Lawachara National Park is situated in Kamalganj Sub-district, Moulvibazar District. It is nearly 160 km northeast of Dhaka, approximately 60 km southwest of Sylhet, and about 8 km northwest of Sreemangal. The park is very well connected by rail, air, and road transportation systems. Visitor surveys recently showed that the park received 3,874 visitors during a 45-day period. The survey was conducted during two periods. From March 24 to April 05, 2006 there were 1,504 visitors, and from May 17 to June 15, 2006 there were 2,370 visitors (Pasha 2006, telephone interview). It should be noted that the survey was done during the off-tourist season.

Lodging facilities are the heart of any protected area. A well-maintained lodging facility with quality food can attract many tourists. Studies in Latin America and Thailand show that additional revenues can be earned by developing infrastructure and services to nearby tourism attractions (Boo 1990; Dixon and Sherman 1990). These might include lodges, restaurants or snack bars, souvenir shops, visitor centers, cultural performances, etc. (Lindberg and Huber 1993). Lawachara National Park offers tourists both attended and unattended services. Attended services include local eco-tour guides. And on the other hand unattended services include signage, nature trails, information brochures, leaflets, and guidebooks. Currently authorities are taking steps to build a visitor interpretation center and a souvenir shop in Lawachara. The park has no lodging facility exclusively for the tourists, but the nearby town of Sreemangal offers a good number of lodging

facilities. Other facilities like transportation are also available in Sreemangal. Lawachara National Park has 26 villages in and around it, and approximately 4,000 households reside in those villages (Mollah and Kunda, 2004). Two indigenous *punjis* (villages) composed of Khasia people, are located inside the core area of the park. Lawachara Punji named after Lawachara stream has 23 households. The other village, Magurchara Punji, consists of 40 households. Both of the villages are on hillocks. Forest Department personnel settled people in these villages in the 1950s to assist with forestry related activities.

The Forest Department gave each household 3 acres of forestland. Most people cultivate betel leaves for their livelihood. The Khasia are a matrilineal society and most people

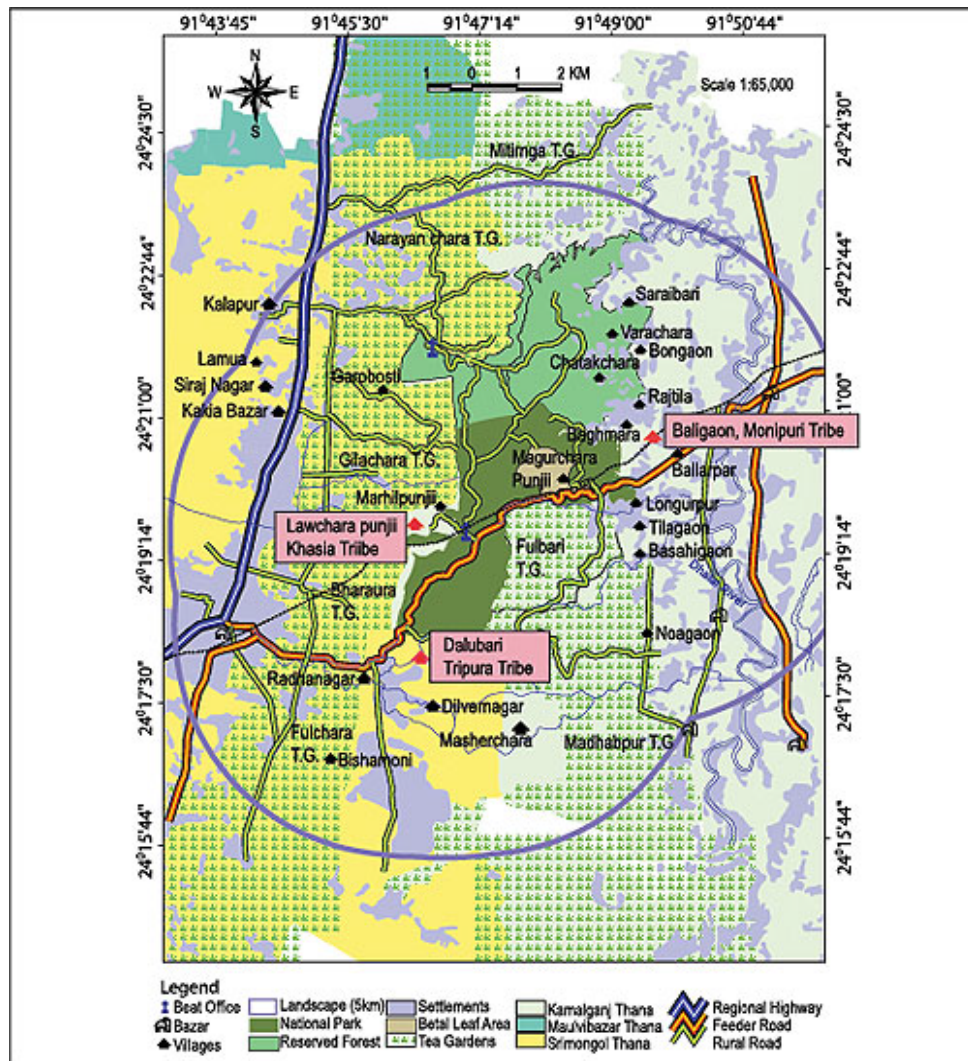


Figure 1: Map Showing the Study Area (Source: Nishorgo Support Project, 2007)



have converted to Christianity from Hinduism. The second indigenous group, the Tripura, have lived in Daluchara (under village Dalubari) for many years. Daluchara is in Sreemangal sub-district and consists of 72 Tripura households. The Tripura mainly cultivate pineapples and lemons on their own land. They are patrilineal and Hindu. The third indigenous group, the Manipuri, have been living in North Baligaon, Kamalganj sub-district, for many years. There are 68 Manipuri households in North Baligaon. They mainly cultivate paddy on their own land. The Manipuri are Hindu by religion and Bishnupriya by caste.

Lawachara National Park has many entry points. During my visits I did not observe anyone exerting any control over tourists and an entry fee was not required. The Forest Department has not yet prepared a separate management plan for tourism nor have forest workers received any training on managing tourists. Moreover, either the department has been allocated a very limited budget for tourism or it has not been allocated to the concerned authority. Forest officials recently prepared a draft management plan for the park, still under consideration, that fails to define a tourism zone.

In order to use a Forest Department bungalow in the core area of the park, visitors have to get permission from the Divisional Forest Officer (DFO) whose office is in Sylhet. Tour operators, however, bring visitors into the park without informing the local forest officials. Local people, who have been trained to serve as eco-tour guides to the forest and its landscape, are frequently deceived by this use.

Methods

I did my fieldwork between February and May 2006. My data collection methods included key informant interviews, community mapping, transect walks, household interviews, and review of official documents and published literature. I used a semi-structured questionnaire as the basis of my household data collection. I interviewed 39 family heads from a total of 163 households. The overall sampling intensity was 24%.

I followed simple random sampling for Khasia (10 from 23 households); systematic sampling for Manipuri (14 from 68 households). I interviewed the first household and then I took every 5th number household for interview. I did purposive sampling in Tripura village (15 from 72 households) because all the randomly selected respondents were working in the field at that time and I had to interview whoever was present. From household survey I collected demographic data related

to gender, occupation, education, etc. These questions were followed by others related to dependency on forest resources, perceptions of tourism, information on handicrafts, benefits from tourism, problems caused by tourism, housing pattern and toilet conditions, and willingness to be involved in home stays. Some of the questions were closed-ended and respondents were asked to answer with either YES or NO. I used MS Excel to analyze the collected data.

Results and Discussion

The study reveals that 88% of sample households are engaged in earning a livelihood, while 12% of households are unemployed. The most common sources of earning a livelihood are agriculture (78%), daily labor (5%) and small business (5%). Most of the unemployed respondents were retired from either agriculture or teaching. The study also found that 90% of the Khasia, 80% of the Tripura, and 64% of the Manipuri are farmers. Approximately 35% of the Manipuri are unemployed, whereas the Khasia and Tripura communities do not have any significant unemployment.

The Khasia mainly produce betel leaf. It is their traditional profession. The Tripura are dependent on cultivating lemons and pineapples. Survey results reveal that 80% of the Tripura community depends on this form of agriculture. Approximately 64% of the households in the Manipuri community are engaged in agriculture and paddy for their livelihoods. All three communities are more or less dependent on nearby forest resources. Among respondents 58% of Manipuri, 10% of Khasia and 7% of Tripura households said that they are highly dependent on forest resources for fuelwood. Normally, these people do not directly collect fuelwood from the park, but rather purchase it from illicit fellers.

Members of these indigenous communities do not have much formal education. The survey results reveal that 73% of the Tripura respondents have education up to the primary level. On the other hand, among Manipuri respondents, 71% have education up to high school level (Table 1).

Table 1: Education Level in the Three Communities

Education Level	Khasia	Tripura	Manipuri
No formal education	40%	-	8%
Primary Level (class I - class V)	20%	73%	7%
High school Level (class VI - SSC)	30%	27%	71%
College level /HSC	-	-	7%
Graduate	10%	-	7%

Note: SSC = Secondary School Certificate; HSC = Higher School Certificate.



The people live in their own houses in the villages; they are not tenants. The type of the houses they live in are of three categories, namely *kacha*, *semi-pucca* and *pucca* (see glossary for definition of these terms). Approximately 70% of Khasia, 79% of Tripura and 50% of Manipuri live in *kacha* houses. Similarly, most people do not use hygienic toilets, as 73% of Manipuri, 60% of Khasia and 36% of Tripura use *kacha* toilets (Figure 2).

People from these three villages usually dispose of their garbage in an open area, a pit, or in a nearby stream. The study depicted that 80% of Khasia households dispose of their kitchen garbage in a pit, and 73% of Manipuri and 67% of Tripura households dispose of their garbage in open areas and nearby streams, respectively.

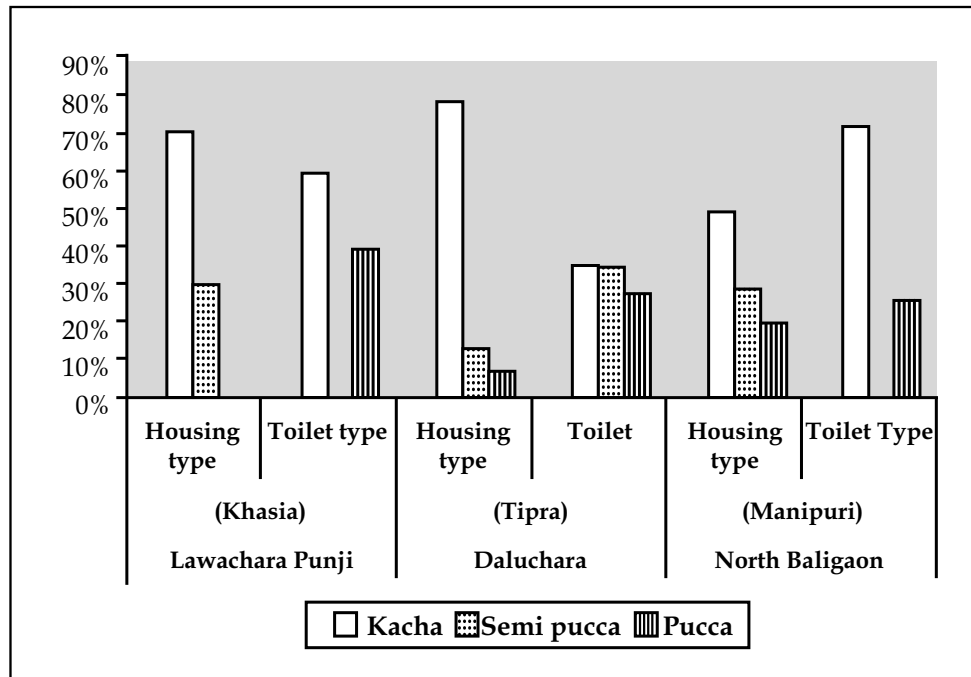


Figure 2: Housing and Toilet Types

Formal and Informal Institutions

Formal and informal institutions play a vital role in the life of people of a community. Local institutions include a wide diversity of organizational forms for resource management. These institutions have rules and a common understanding of problems and their resolution in a particular community. Sometimes they are formally established, with electoral procedures for selecting officials, specified dues for members, and rules that also outline the rights and

define duties of the members. Sometimes institutions are not formally constituted but can regulate the use of resources over long periods of time (Ostrom 1997).

The community profile of the three villages revealed that numerous formal and informal institutions exist. These institutions may be able to play a significant role in the development of tourism and eco-tourism in LNP. In the following section, I describe these institutions. The Greater Sylhet Indigenous People's Forum (GSIPF) support members of any indigenous group in the Greater Sylhet District. The forum seeks to support education, health, and legal rights, agriculture, and cultural preservation. It is a legal entity registered as a joint stock company. The forum has a constitution and consists of two bodies, namely a general committee (101 members), and an executive committee (21 members). Member can be a member of any indigenous community in Greater Sylhet Region. The general committee normally sits once a year. The executive committee sits two or three times in a year. The general members select the members of the executive committee. The committee has linkages with other NGOs. There is a provision of subscription fees for both executive and general members.

The Khasia community recognizes an informal institution known as the Darber Committee. The village head (*myntry*) chairs the Darber Committee and has control over social, traditional and religious issues. The Darber Committee seeks to work on social issues, maintain relationship with the Forest Department, develop village infrastructure, and supervise religious and traditional festivals. The head of each household is a member of the committee. The myntry calls for a meeting whenever he feels one is required. Each household is supposed to subscribe (contribute) to the committee's fund. Villagers select the myntry and the ruling myntry is the son of previous myntry. There is no fixed period of service for the myntry - he can remain myntry as long as he wants. The Khasia community is also supported by the Khasia Welfare Trust (KWS), a formal institution for Khasia living in Greater Sylhet District. This institution seeks to perform cultural shows, develop and conserve Khasia handicrafts, work for the educational development of the community, and provide legal support for Khasias. The Trust was established in 1996. It consists of three bodies: a general council, an executive council, and an advisory council. The trust has a constitution and has been registered as a joint stock company. Each household of every Khasia village in Greater Sylhet District subscribes to the committee. Some people have alleged that the Trust is not working properly because leaders of the Khasia communities lack initiatives. Moreover the trust suffers from a lack of funds, lack



of democratic practices, and irregular subscription fees. The trust has linkages with other organizations. The myntry of Lawachara Punji is a member of KWS by the virtue of his post.

The Tripura community in Daluchara has a formal committee, which does not have a name. The headman of the village, the *chowdhury*, leads the committee. He is vested with the responsibility of resolving social, traditional, and other related problems in the community. The committee seeks to determine social policy and rules, to look after religious taboos and traditional festivals, to organize social functions like marriages and funerals, to rectify values, norms and taboos in meetings if any deviation occur; and to resolve problems that arise in the community. Committee members are notified when meeting are scheduled. All of the households in the community pay a mandatory subscription fee. When someone dies, the collected money pays for the funeral and the grieving family is given a donation from the fund. Normally the chowdhury or another reliable person is entrusted with the money. Women normally do not participate in meetings. Unresolved issues can be raised in either the Greater Sylhet Indigenous People's Forum (GSIPF) or in the Adibashi Forum (Another formal institution of indigenous communities in the country).

Tripura Juba Sangstha (TJS) or Tripura Youth Organization is a formal institution in Daluchara village established in 2000. This institution consists of 20 general members, all of whom must be males over 18 years old. TJS has prepared a constitution but is not yet recognized as a legal entity. TJS seeks to conserve the Tripura culture, organize Tripura cultural shows, develop and conserve Tripura handicrafts, and work for the educational development of the community. The TJS does not have a fixed meeting time; whenever it is necessary the committee sits for it. The members pay a nominal subscription fee each month. The institution is not sustaining and is currently not functional.

The Manipuri community has an informal committee known as the Singloop. The executive body of this informal (and invisible) committee consists of 12 to 15 members. The Singloop seeks to control and develop customary rules; determine social policies and rules; look after the religious taboos and traditional festivals, organize social functions like marriages and funerals; and rectify values, norms, and taboos in meetings, if any deviation takes place.

The Adibashi Manipuri Cultural Development Organization (AMCDO) was established in the year 1996. This institution consists of 35 general members, of

whom 20 are male and 15 are female. The Executive Committee consists of 7 members, of whom 4 are male and 3 are female. The AMCDO seeks to conserve Manipuri culture, organize people for cultural shows, develop and conserve Manipuri handicrafts, support Manipuri weaver families, work for the educational development of the community, and support the community in legal issues. The AMCDO is not currently recognized as a legal entity but efforts to make it one are now underway. The AMCDO sits once a month and minutes of the meeting are recorded. Meetings are announced both verbally and in writing. Members pay an entry fee to join AMCDP and a monthly subscription fee.

The Indigenous Manipuri Welfare Trust (IMWT) is a visible institution that seeks to assist the unemployed, support sports and games, advance education, and promote the health of Manipuri people. The Trust consists of 25 members and has an Executive Committee of 7 members. The Trust does not have any subscription fees nor is it recognized as a legal entity, but efforts are underway.

The Nishorgo Support Project (a project of Forest Department) promoted the establishment of the Co-Management Council for Lawachara National Park. The Council has 58 members. An executive committee called the Co-Management Committee and consisting of 19 members, assists the council. This Council is a formal institution and is recognized as a legal entity. Representation from Daluchara (Tripura) and North Baligaon (Manipuri) has been ensured. But no representative has yet been ensured from Lawachara Punji; rather a representative from another Khasia village (Magurchara Punji) has been ensured. The Council seeks to work with local stakeholders to manage the park collaboratively with the assistance of the Forest Department.

Tourism in Lawachara National Park

Tourists usually come to Lawachara National Park to see forests, wildlife, natural beauty and for picnicking. They also see the surrounding tea gardens and visit indigenous communities. Native and foreign tourists have visited the people of the three surveyed villages for many years but no data are available on how many tourists visit these villages every year.

Tourists to these villages usually come to see various aspects of people's daily life - their homes, clothing, betel leaf cultivation, betel leaf sorting, pineapple and lemon gardens, weaving, and handicrafts. I asked the respondents about their general perceptions of tourism and requested them to explain to me their ideas or concepts regarding tourism and their feelings about it. I did not direct discussions



towards "good" or "bad" perceptions of tourism, but rather I wanted to get their overall impressions.

The survey result reveals that almost all of the respondents (97%) have ideas about tourism and that they feel good about the tourists and tourism. In both the Tripura and Manipuri villages, all respondents (100%) said that they have perceptions of tourism. In the Khasia community only 93% of respondents reported that they have perceptions of tourism.

Though almost all of the respondents (97%) from these indigenous communities have perceptions of tourism, not all of them are receiving benefits from it. The data reveals that only 19% of households surveyed in the three indigenous communities receive benefits from tourism (Table 2).

Table 2: Benefits received from tourism in three communities

Responses	Khasia	Tripura	Manipuri	Total
Benefits	-	13%	43%	19%
No Benefits	100%	87%	57%	81%

The study also reveals that among households, who received benefits from tourism, 12% were from performing cultural shows, 7% were from weaving, and 2% were from eco-tourism guiding services (Table 3).

Table 3: Percentage of Each Community Who Benefit from Tourism-Related Activities

Items	Khasia	Tripura	Manipuri	Total
Weaving	-	7%	14%	7%
Eco-tour guide service	-	7%	-	2%
Cultural Show performance	-	-	36%	12%

The Manipuri community received benefits from their cultural show performances and from selling their handicrafts. They produce cloth on their handlooms, not in power loom. Almost all of the households of Manipuri have this inherited practice, but not all of them sell their woven cloth to tourists. Normally they weave their cloth for their own use; they do not usually weave for commercial purposes. The survey shows that 51% of the weavers of Manipuri sell their products. If a visitor indicates an interest to buy a piece of clothing, and if they have additional piece of that product available, then they sell. The Manipuri usually weave clothes for women. The name of their woven clothes are *mathaa*

(bed sheet), *lango* (skirt for women). The mathaa includes *nayanamuna* (bed sheet) and *lashingfi* (bed sheet made by cotton), *chaakchabi* (good quality lango), *inapi* (scarf). During discussion with the respondents, they informed me that problems include shortages of raw materials, insufficient capital, lack of linkages to markets, and a lack of show rooms. The Manipuri received Tk 19,200 by selling homemade woven clothing to the visitors, both domestic as well as foreigners (Table 4).

Table 4: Monetary Benefits from Tourism Earned by the Communities

(December 2005 to May 2006 - Amounts in Bangladeshi Taka)

Activity	Khasia	Tripura	Manipuri	Total
Eco-tour guide	-	11,100	-	11,100
Weaving	-	1,000	19,200	20,200
Cultural Shows	-	-	3,000	3,000
Total	-	12,100	22,200	34,300

The Manipuri are well known throughout the country and outside as well for their lively dancing. The Manipuri community performs shows in their village and also goes outside if they are invited. "We have been performing our cultural show since 2004" (Sinha 2006, personal communication). The Adibashi Manipuri Cultural Development Organization (AMCDO) based in the village organizes the village's cultural performances.

The Tripura weave clothes only for women. They had their benefits from selling hand-woven fabrics (Tk 1,000) and one eco-tour guide trained by Forest Department earned Tk 11,100 within a 6-month period (Table 4). Most weaving is done for domestic uses, not for commercial purposes. The main goods they weave include *rikotoo* (long scarf), *renai* (skirt), *risha* (a small piece of cloth used by women) and *kaithamri* (three piece suit of clothing for women). The Tripura weave their clothes in a handloom, which is made from locally available materials like bamboo and timber. The weavers face problems such as lack of investment funds, shortages of raw materials, lack of credit support, and lack of market linkages.

The Khasia community did not receive any benefit from tourism during the study period. The Khasia have handicrafts, which they use in their daily activities. They make such things as *khoh* (baskets), *chot* (small baskets), and *khara saboon* (soap cases). These products are not sold. The Khasia in Lawachara Punji do not have any weaver families. This is consistent with Patam's (2005) claim that the Khasia of Bangladesh do not weave. The traditional dress of Khasia women includes a



diakorcha (top) and *diakiangh* (skirt), which they purchase from the market. Though the Khasia did not receive any benefit from tourism, they are rather happy and feel good and proud that tourists are coming to their village. Furthermore, they are ready to receive tourists.

I asked interviewees about their willingness to be involved in home stay programs. Among respondents, 93% answered that they are ready to receive tourists in their homes if they are given the chance to do so.

Among Khasia community members, 80% of respondents showed interest in home stays. They felt, however, that they couldn't let tourists stay in their homes and have food together until there is a unanimous decision of the Darber Committee. Moreover, they do not have any training on catering, or good water and sanitation facilities. In Khasia Punji only 40% of the households have pucca toilets, but the maintenance is not good enough for the tourists. If these things are taken care of, and if security is provided, then home stays could become a good source of income for the Khasia. Khasia Punji is suitable for home stays since it is within the forest and one has to walk through the forest to reach it. Moreover the traditional home of Khasia attracts tourists. I spoke with several visitors from England during one of my household interviews. They told me that they "would love to stay at [that] house for one night" (March 2006, personal communication). A female member of Khasia Punji stated that her community would allow visitors, especially foreigners, to stay at their traditional homes if they were paid, and if their Darber Committee permitted it (Pothmi, S. personal communication, 2006).

All of the respondents (100%) from the Tripura community expressed that they would love to host home stays. One owner, who still has a traditional Tripura house in Daluchara, reported that foreigners sometimes requested to stay in his home, but this depended on the committee's decision. If people received some training in taking care of guests, and if some infrastructure facilities such as sanitation facilities, roads, and security were improved, these communities could benefit greatly from home stays and tourism in their villages. All of the respondents from Manipuri village also reported that they favor home stays. Their village is outside but adjacent to Lawachara National Park and lacks a good road. They do not have any training in catering, tourism, or other forms of taking care of guests.

I asked the respondents about the problems they faced from tourism activities. Most respondents (90%) told me that they have not faced any problems caused by

tourists' activities so far. In Manipuri and Tripura all of the respondents (100%) said that they have not seen any problems caused by tourism or tourists activities. Among the Khasia interviewed, 30% of them stated that they face problems with parties of picnickers that come from different areas of Bangladesh. Problems they face include people picking plants and plant parts, noisy conversations, and people entering unauthorized into the bathing pool of Khasia women. "We really feel disturbed when we see members of picnic parties picking our flowers and fruits, and talking aloud" (Phila Pothmi, personal communication 2006).

Recommendations

Based on the study I make the following recommendations for park management.

- **Management plan:** A separate management plan should be prepared and tourism zone should be clearly identified.
- **Build capacity:** The forest officials and the members of co-management council members should be trained in tourism management.
- **Involve institutions:** The formal and informal institution should be involved in elaborating effective ways to give more benefits to the people.
- **Linkage with other tour operators:** Locally-trained eco-tourism guides should be linked with other tour operators throughout the country in order to enhance their business opportunities.
- **Build eco-friendly infrastructure:** Eco-lodges should be built at the entry point of the park and should incorporate environmentally friendly design and practices.
- **Support weavers:** The weaver families of the indigenous communities should be provided with micro-credit services for purchasing raw materials and updating looms.
- **Link with market:** Market linkage for the handicrafts should be established for the weaver families. In this regard a show room can be established in a suitable place.

Conclusion

Tourism in Lawachara National Park is a very new development. In order to develop this sector further, separate management plan and an action plan for



tourism should be developed. Numerous people come to Lawachara National Park every year to see forests, wild life, and natural beauty, and to visit the surrounding attractions. The park has a good potentiality for tourism and eco-tourism even though it does not offer any lodging facilities. Tourists are also eager to visit the villages of the indigenous people that inhabit or live nearby the park-the Khasia, Tripura and Manipuri. These communities have lived in or near the park for a long time

Most of the respondents in my survey have perceptions of tourism. Most households, however, do not currently receive any benefits from tourism. To the extent that they receive benefits, these benefits come from cultural show performances, selling of homemade clothing and providing eco-tour guide services. The Manipuri receive the greatest amount of monetary benefits from their cultural shows and homemade weaving. The Tripura receive benefits from selling fabric and from providing eco-tour guide services. Ironically, the Khasia, who are the only people who actually live inside the park, did not receive any benefits at all. Among all the indigenous groups, the Manipuri derived the most benefits from selling handicrafts.

A home stay program offers good hope of being successful in all three villages since most of the people interviewed were positively inclined towards receiving home-stays. Members of indigenous communities feel good and proud when they see visitors coming to visit them and to learn about their culture and livelihoods. The Manipuri and Tripura respondents had not been affected by problems caused by tourists. The Khasia, the community that lives in the forests, however, did report problems of people picking their plants, talking loudly, and inappropriately entering a bathing place reserved for Khasia women.

The formal institution, Adibashi Manipuri Cultural Development Organization, played a positive role in the Manipuri community. On the other hand the formal and informal institutions of the Khasia and Tripura communities do not seem to have played any meaningful role in developing incomes from tourism for their communities. Since local institution can lead to a better management of natural resources (Udaya Sekhar 2000), these institutions should be involved in the tourism sector. The involvement of both indigenous and Bengali communities in the tourism is currently insignificant. In order to enhance livelihood benefits, their involvement in this sector should be ensured. This will also provide future dividends in biodiversity conservation.

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Comparing the Impacts of Local People and Rohingya Refugees on Teknaf Game Reserve

Mohammed Salim Uddin

Mohammed Abu Sayed Arfin Khan

Department of Forestry, Shah Jalal University of Science and Technology, Sylhet, Bangladesh.

Abstract

This paper compares the dependency, livelihood activities, and impacts of local people with those of Rohingya refugees on Teknaf Game Reserve (TGR). An exploratory survey was conducted in two villages, inhabited by both local people and Rohingya refugees, during February to June 2006. We collected primary information through community profiles and household interviews using a semi-structured questionnaire focusing on socio-demographic, livelihood activities and overall impacts on TGR. A total of 106 households out of 686 were interviewed, within which 70 households were local people and 36 households were Rohingya refugees. Data analyses show that overall, 57% of households, including all Rohingya refugees are totally dependent on forest for their livelihoods. We explored 21 livelihood activities in which both local people and Rohingya refugees were engaged. Four of these activities namely fuelwood collection, sungrass collection, illicit felling, and brickfields have major impacts on the game reserve and pose a high risk to it, while five have medium impacts. Results indicate that Rohingya refugees are comparatively more dependent on the forest than local people. Both local people and Rohingya refugees desperately need alternative income generation activities; and both groups want to collaborate with national and international organizations to resolve the refugee situation in a timely and congenial manner and to repatriate Rohingya refugees to their country. We found one case where local people who were given opportunities in participatory forestry programs successfully produce rich and productive forest gardens. To restore the game reserve, the co-management system at TGR should incorporate suitable policies that will involve more landless local people in joint forest management.

Introduction

People all over the world depend on forests for their livelihoods. Refugees and the

rural poor are no exception. When people are forced to live in crowded and possibly unfamiliar situations - not of their own making or choice - they often are left with no option but to depend directly on natural resources for their livelihood activities. These activities place forests under threat. If we do not restrict such activities or find alternative solutions, low-level resource gathering activities can quickly turn into wide-scale, often irrevocable, forest degradation.

Protected areas are increasingly subject to human occupation by refugees of wars, civil conflicts, and natural disasters. In Rwanda for example, approximately 50% of the civilian population was displaced during a civil war into camps within the eastern regions of the Republic of Congo. Of these, approximately 860,000 refugees were concentrated in the vicinity of Virunga National Park, with another 332,000 encamped in Kahuzi-Biega National Park (Prunier 1995). Migrations of refugees and local inhabitants into protected areas have several impacts: greatly increased rates of elephant poaching and habitat encroachment; widespread environmental degradation and habitat destruction; forest degradation by fuelwood over-harvesting (Fell and Bader 1997, Formoli 1995, Hart and Hall 1996, Hall et al. 1997, Said et al. 1995). Over the past several years, the wildlife populations of reserves (e.g. Garamba National Park, Kahuzi-Biega National Park, Okapi Wildlife Reserve) have been severely depleted as the result of poaching by refugees (Plumptre *et al.* 2000).

The United Nations Environmental Program formally recognizes that a broad range of environmental disasters can also generate refugees (Westing 1992). Such refugees are the victims of long-term mismanagement of nature by humans, including soil erosion; global warming; toxic contamination of air, water, soil and the food chain; deforestation and desertification (Kreimer and Munashinghe 1991, Gadgil and Guha 1995, Leiderman 1995).

We define "refugees" as persons who are forced to live outside the country of their nationality or native region (within country) because of war, civil conflicts, or environmental disasters (Goodwin-Gill, 1983). The term "livelihood" refers to peoples' way of living and working, as well as the conditions under which they live, produce and reproduce. Livelihood is a complex concept and is constantly being discussed and reformulated. However, a commonly used definition that finds favor with policy makers is: "A livelihood comprises the capabilities, assets (including both materials and social resources) and activities required for a means of living" (Carney 1998). The livelihoods of millions of people living in rural areas



depend on accessing forest products and services. These actions can have positive or negative impacts on forests and their conservation. For this reason it is important to understand forest dwellers' livelihoods, their perceived needs, and their development strategies.

We conducted our study in Ledha and Kerontoly, two villages within the Teknaf Game Reserve in southern Bangladesh. We explored the various livelihood activities of local peoples and Rohingya refugees and compared their overall impacts on the game reserve. Rohingyas are Arakanese Muslims who were forced to migrate from Myanmar to Bangladesh in 1991 by the Myanmar army (Mollah *et al.* 2004). Local Bengali people and Rohingya refugees inhabit both our study villages. They use forests for various purposes such as subsistence, livestock rearing, fuelwood collection and as a source of goods to sell in the market. These communities place various and different pressures on forests for maintaining their livelihoods, depending on the nature of the forest area and the economic resources available to them. Their impacts on the game reserve consequently vary according to their resource-use patterns. This study seeks to improve our understanding of the situation and to provide insights that would be useful to the Forest Department and relevant non-government organizations (NGOs) in their efforts to support forest dependent people and reduce pressures on Teknaf Game Reserve.

Background

The Teknaf Game Reserve (TGR) is located within the Teknaf peninsula in the southeastern part of Bangladesh, bordered on the east by the Naf River and on the west by the Bay of Bengal (Fig. 1). The northern end of the reserve lies 48 km south of Cox's Bazar District headquarters. The reserve measures roughly 28 km north to south and 3 to 5 km east to west, and lies between 20°52' - 21°09' N latitude and 92°08' - 92°18' E longitude (Rosario 1997). The current reserve is part of the former Teknaf Reserve Forest, and was formally established through a gazette notification in 1983 under the Wildlife Act of 1973. It covers a comparatively large area of 11,615 ha (Mollah *et al.* 2004). The reserve was established purposely to preserve a habitat for a large diversity of wildlife (Bari and Dutta 2004).

The Teknaf Game Reserve lies in the hilly range that forms the backbone of the narrow Teknaf peninsula, located in the far southeastern corner of the country, adjacent to Myanmar. It encompasses three representative geological series - Surma Series, Tipam Series and Dupi Tila Series (Choudhury 1969). Soils are

primarily clay loam on level grounds and from sandy loam to coarse sand on hilly land. The climate of the game reserve may be classified into three seasons: spring (March to April), monsoon (May to October) and winter (November to February). Rainfall is frequent and heavy during the monsoon season (May to October) ranging between 130 mm to 940 mm. Temperature associated with the three climatic seasons ranges from 15°C (average minimum) to 32°C (average maximum). Humidity ranges from 27% (average minimum) to 99% (average maximum) (Bangladesh Meteorological Department 2004).

Cox's Bazaar South Forest Division manages the Teknaf Game Reserve, which consists of three forest ranges namely Teknaf, Whykong and Shilkhali. These are divided into 11 forest beats. Approximately 40 Forest Department staff members are responsible for the area. This includes an Assistant Conservator of Forest (ACF), a range officer, and two forest department laborers based at the Teknaf Range Office. The reserve is managed with routine silvicultural management practices - i.e., clear felling followed by artificial regeneration of valuable species on long rotation (40 years) and short rotation (18 years) and very short rotation (6 years). Bamboo appears either as pure stands or as understory and is managed under the culm selection system with a felling cycle of 3 to 4 years.

Teknaf Game Reserve consists of 115 settlements or villages, locally called paras within 5 Unions of Teknaf Thana, namely, Baharchara, Hnilla, Sabrang, Teknaf and Whykong (Mollah et al. 2004). Teknaf and Ukhia are the most important thanas (smallest administrative unit) of the reserve, consisting of 274,071 people. Approximately 52% of the population is male and 48% female. By age group, the population break-down is 19% children (5-9 yrs), 12% youth (10-17 yrs), and 69% adults (18 + yrs). The large adult population provides a viable source of labor for the game reserve's development projects. The percentage of literacy is 17% and the level of education is also low. Only about 9% of the population have attended school through the primary level; while 3% have completed secondary education and less than 2% have received a higher secondary education. Most people living on the Teknaf peninsula are poor to very poor. Nearly 70% of the households have a total income in the range of Tk 15,000-45,000 per year, which is equivalent to about USD 288-865 per household, or USD 50-150 per capita (Bari and Dutta 2004). There are 14 major Rohingya villages inside the reserve; among these villages Ledha and Kerontoly are most important. Ledha is located in Mosuni Forest Beat in Teknaf Range within the reserve, and is comprised of 597 households or about 4,000 people. Kerontoly is in Teknaf Sadar Beat, and is comprised of 89 households



or about 800 people. The local (meaning Bengali) people of these two villages have been living there since time immemorial. Rohingyas migrated from Rakhine State in Myanmar to Bangladesh in the early sixties (Mollah et al. 2004). By 1993 about 233,000 Rohingyas had been resettled in Myanmar and some 30,000 remained in Cox's Bazar, most of them in Teknaf (Bari and Dutta 2004). At present, about 22,000 refugees were reported waiting at Kutupalong and Nayapara camps in Cox's Bazar district for repatriation. There are two camps (Nayapara refugee camps 1 and 2) located inside the reserve, which support a population of 12,617 Rohingyas (Ashad 29th May 2006). Large populations of Rohingyas also live outside the camp in the south and southeastern parts of the country. Representatives of non-governmental organizations place the figure at anything between 100,000 to 350,000 people (Sajjad 2003). They are not recognized as refugees and are seen by the UNHCR and the government of Bangladesh as illegal immigrants (Sajjad 2003).

The largest Rohingya exodus from Burma occurred in 1972 and 1991-1992 when large numbers fled to Bangladesh. Experts believe that many among this non-camp population returned to Bangladesh after being repatriated to Burma. The Rohingya who came to Bangladesh after the large exodus of the early 1990s have been denied entry to the camps and are not recognized as refugees by the government. These Rohingya refugees have settled in various villages and have encroached on forestlands. Most local people consider the Rohingyas to be a burden because they share in every aspect of their livelihood activities and job markets. A villager of Ledha said, "without any barrier Rohingyas have entered our country, move freely and do what they want" (Ashad, personal communication, 2006). Local people do not tolerate them and do not employ them if there is any alternative. So there are many unwanted conflicts between local and Rohingya people. Mollah et al. (2004) reported a number of Rohingya settlements, mostly located in Jahajpura, Shamlapur and Teknaf. Rohingyas are perceived to be totally dependent on forest areas for their livelihood.

NGOs including those specializing in microcredit finance have direct links with people living in Ledha and Kerontoly. The major NGOs and banks that operate in these localities include Bangladesh Rural advancement Committee (BRAC), Society for Health Extension and Development (SHED), Coastal Association for Social Transformation (COAST), Association for Social Advancement (ASA) and Grameen Bank. NGO activities concentrate on education, health, micro-credit for women, and alternative income generating activities. NGO banks provide micro-credit to local people to promote their livelihood activities, including agricultural activities,

small business, poultry, livestock etc. Credit services are mainly targeted toward women. In the study site community-based organizations (CBOs) such as local clubs were found in Uttar Ledha. NGO activities are insufficient to support the livelihoods of the people. Micro-credit activities have not been very successful because there is a lack of willingness among group members to return credit on time. It should be noted that micro-credit is not an income generating activity in itself, but a means for promoting of other income generating activities, based on agricultural production, NTFPs, value-added products, etc. We also found a lack of coordination and motivation by the NGOs working in the locality. More alternative income generating activities are essential for better support of the villagers in and around the study site.

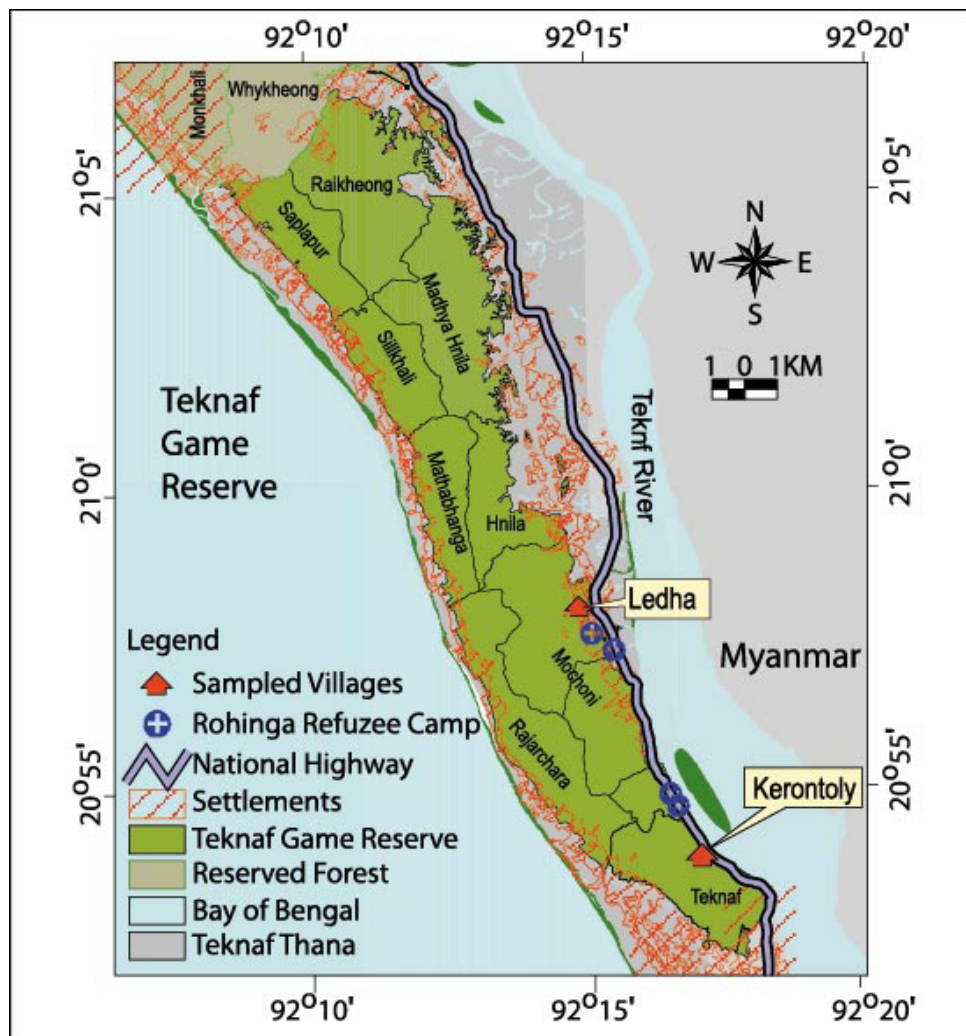


Figure 1: Map of the Study Area (Source: Nishorgo Support Project 2007)



Methodology

We conducted our exploratory survey during February to June 2006. Out of 14 villages inside the Game Reserve inhabited by both local and Rohingya refugees, we purposely selected two villages -- Ledha and Kerontoly. We initially selected only Ledha because we believed there were many Rohingya refugees. We later learned that Rohingyas represented only about 18% of the population in Ledha and hence we also selected Kerontoly where Rohingyas represent about 88% of the population. We began our study by preparing community profiles to learn details of the two communities. We then collected primary information from key informants, drew community maps, conducted transect walks, and engaged in focus group interviews. We conducted five focus group discussions to learn about the livelihoods and social conditions of both Rohingya refugees and local people. Out of 686 households within the two villages, we selected 106 households for interviews. We used a semi-structured questionnaire in our household interviews that focused mainly on livelihood activities, age, income, education, dependency on the forest, collection of forest products, land holding patterns and impacts on forests, etc. A brief outline of our households' selection method is given in Table 1.

Table 1: Location of the Villages and Numbers of Households (HHs) Sampled.

Village	Location	Total HHs Present	Number of Households Sampled
Ledha	Inside game reserve	Local HHs = 487 Rohingya = 110	Local HHs = 59 Rohingya = 23
Kerontoly	Inside game reserve	Local HHs = 11 Rohingya = 78	Local HHs = 11 Rohingya = 13
Total:	-	686	106

Results and Discussion

Our research revealed that the total number of households in our study site was 686. Local people and Rohingya refugees live in both villages. The status of households for these two villages is given in Table 2. Family sizes were comparatively big, from two to fourteen people, since most of the families were combined (brothers, sisters and their families living in one household). Average household size of local people and Rohingya refugees was eight and six people, respectively. We found the literacy rate to be 21%. One reason is that parents do not send their children to school during working hours. Parents keep children home to work and help provide for the household's livelihoods. Among people who have

some schooling, the highest percentage is primary level (17%) followed by secondary (3.5%) and higher secondary (0.5%) (Fig. 2).

Table 2: Local vs. Rohingya Refugee Household Number and Average Size

Community	Household	Average household size
Local people	498	8
Rohingya refugees	188	6

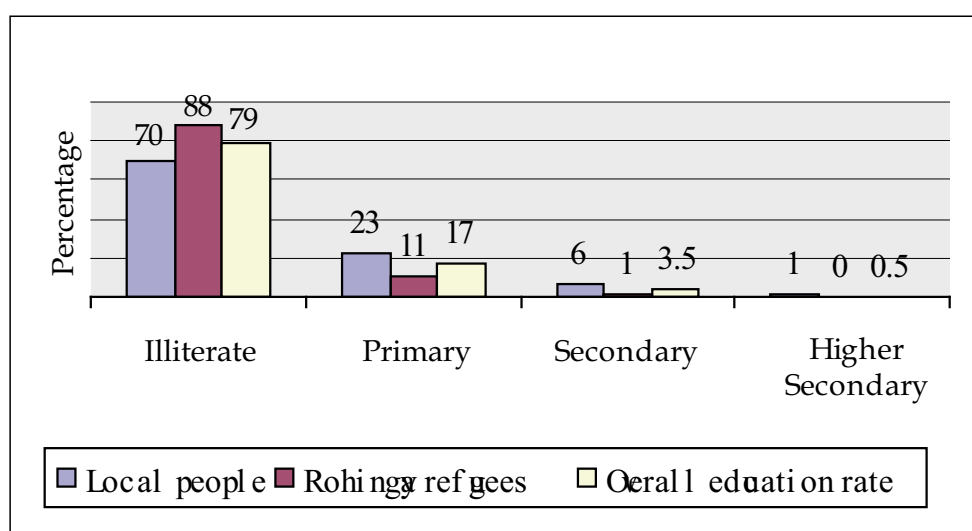


Figure 2: Household Education Status

Local people and Rohingyas depend on forests for their livelihoods. On the basis of the community profiles and household interviews, we classified villagers according to their degree of forest dependency: totally dependent, moderately dependent, less dependent. We found 57% of the people to be totally dependent, 37% to be moderately dependent, and 6% to be less dependent (Fig. 3). Comparing local people and Rohingyas, Figure 3 suggests that 41% of local people and 100% of Rohingya refugees are totally dependent on forest resources. Of the remaining local people, 50% are moderately dependent and 9% are less dependent. All of the households living within and on the margins of the game reserve depend on the forest directly or indirectly for fuel wood, house building materials, fruits, vegetables, bamboo, cane, medicinal plants, fodder, and other products. We found that they depend on forests for many daily household needs and that they also rely on forest products as a source of additional income.

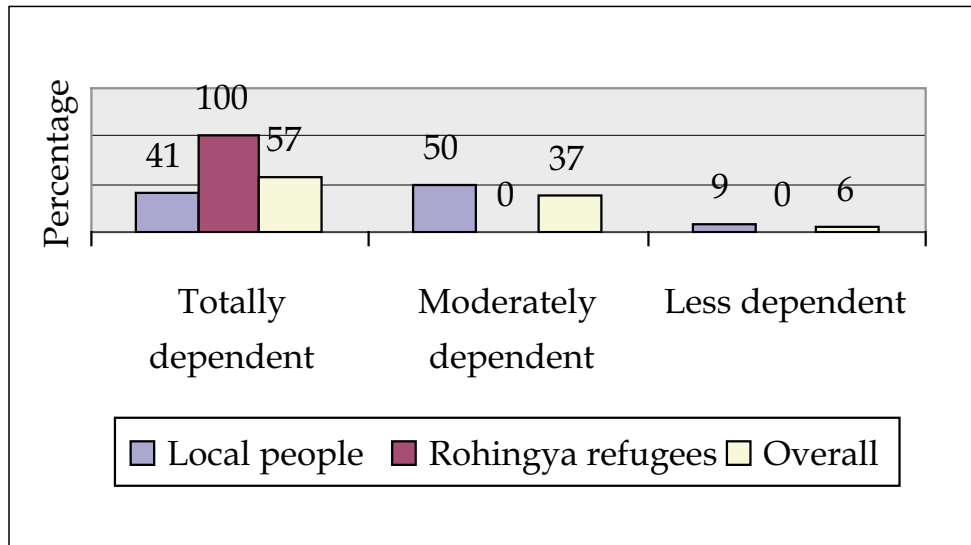


Figure 3: Comparative Dependency Study

It was revealed that 100% of Rohingya refugees and 60% of the local people are landless. Most of the local people and Rohingya refugees live in areas that are officially part of the game reserve. Some local people have even encroached on preserve land and then leased it to newly arrived Rohingya refugees. Approximately 25% of local people have their own agricultural land. Among local people who farm, the average household has 0.22 ha of land that they own legally, and 0.45 ha of encroached land. Among Rohingya refugees who farm, the average household has only 0.09 ha of encroached land (refugees arriving between 1960 and 1970 were able to encroach land), and 0.06 ha of encroached land that they lease from local people (Table 3). Among people that farm, we found that 55% of local people and 17% of Rohingya refugees grow one crop per year.

Table 3: Land Holding Pattern among the Households (Hectares Per Household).

Community	Self-Owned	Encroached	Rent
Local	0.22	0.45	-
Rohingyas	-	0.09	0.06

People in our study sites make their homes from tin, mud, bamboo, sun grasses, and other products. We classified housing into five patterns (Table 4). Most homes of both local people and Rohingyas were made of sun grass and bamboo, 32% and 40% respectively. In our study we found that local people and Rohingya refugees preferred (5-10 years ago) to make their homes with sungrass and bamboo. But in

recent times local people and Rohingya refugees preferred category no.2 and category no. 3 respectively.

Table 4: Housing Pattern Among the Households

No	Category	Local people	Rohingya refugees
1	Tin shed + mud	21%	8%
2	Tin shed + bamboo	26%	15%
3	Sun grass + mud	16%	33%
4	Sun grass + bamboo	32%	40%
5	Other	5%	4%
Total		100%	100%

Most of the households in our study site are poor to very poor. We divided households into three categories - poor, middle and rich - according to their income. We then asked respondents about their income from different activities, and calculated the monthly income of each household. We came up with categories for poor households (monthly income range Tk 1,500-4,000), middle households (Tk 4,001-8,000) and rich households (Tk 8,000+). We found that overall 88% of people in the study villages were poor, including 100% of Rohingyas and 84% of local people. Furthermore, approximately 14% and 2% of local households were classified as middle and rich, respectively (Fig. 4). Furthermore, household interviews indicated that for most people, monthly expenditures exceeded income.

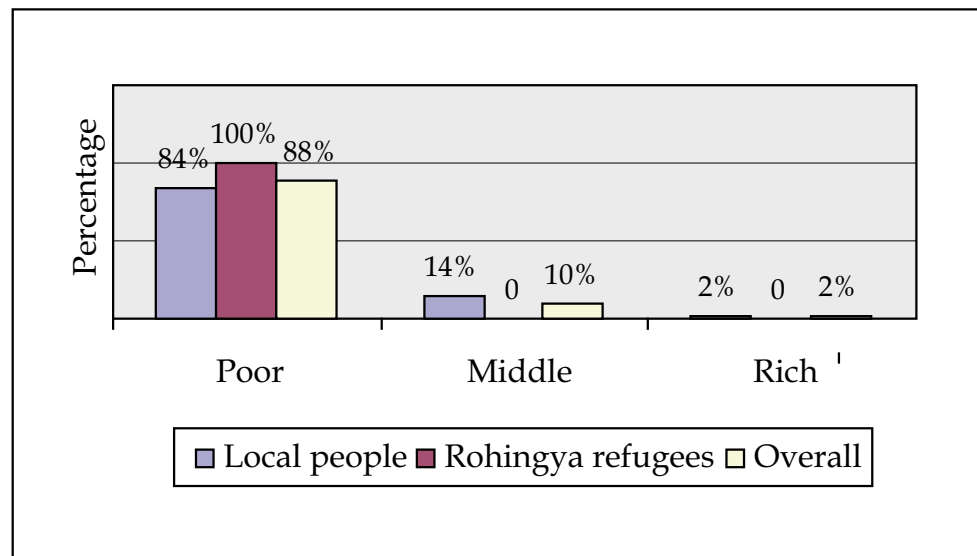


Figure 4: Economic Status of Households



Comparative Study of Livelihood Activities of Local People and Rohingya Refugees

Forest-related activities are an integral part of villager's livelihood activities and strategies. Both local and Rohingyas are engaged in various livelihoods activities such as fuelwood collection and extraction of NTFPs. During our study most of the older local people said that previously they were totally dependent on forest for their subsistence income, but they now depend on the forest, river and sea when they have no work. Rohingya refugees, however, depended solely on the forest for their livelihoods. A seasonal calendar of different livelihood activities in the study is given in Appendix 1.

Both local people and Rohingya refugees engage in diversified livelihood activities in our study area, but there are differences in their livelihood patterns. We found local people and Rohingya refugees engage in 19 and 17 livelihood activities respectively. Overall we found that 52% of households are engaged in fuelwood collection, 34% in sun grass collection, and 18% in illicit felling. These activities as well as brickfield operations have major impacts on the game reserve and we classify these as having high risk. We further found that 17% of households collect bamboo and extract cane, 14% collect building materials, 9% graze livestock and collect fodder, and 5% cultivate betel leaves and conduct other agro farming activities on forest lands. We ranked these activities as having medium risk. We considered collecting medicinal plants as well as various types of green and dry leaves, extracting fruits and vegetables, hunting, and honey collecting as having low risk (Table 5).

We found that 87% of Rohingya refugees and 35% of local people collect fuelwood. We also found that Rohingya households are more active than local people in collecting sun grass (47%), providing day labor (45%), collecting fruits and vegetables (25%), extracting bamboo and cane (22%), catching shrimp fry (20%), and collecting medicinal plants and house building materials (17%). Local households are more engaged in agro-farming (55%), salt production (46%) (from September to March each year), fishing and small businesses (25%), illicit felling (20%), and cattle grazing (15%). We found that Rohingya refugees are not engaged in cattle grazing, betel leaf cultivation, or salt production. A schematic diagram of livelihood activities and their environmental impacts is provided in Fig. 5.

Table 5: Comparison of Livelihood Activities of Local and Rohingya Households

No.	Livelihood Activity	Local People (%)	Rohingya Refugees (%)	Overall Households (%)	Level Of risk
01	Fuelwood collection	35	87	52	+++
02	Sun grass collection	27	47	34	+++
03	Illicit felling	20	15	18	+++
04	Brickfield owner	3 in Ledha (8 in Teknaf GR)			+++
05	Grazing and fodder collection	15	-	9	++
06	Bamboo and cane extraction	15	22	17	++
07	House building materials collection	13	17	14	++
08	Betel leaf cultivation	8	-	5	++
09	Medicinal plant collection	6	17	9	+
10	Green and dry leaves collection	4	13	7	+
11	Fruits and vegetables	12	25	16	+
12	Hunting	2	12	5	+
13	Honey collection	2	5	3	+
14	Agro farming	Own land	-	41	-
		Encroached land	30		17
15	Rickshaw pulling	-	8	3	-
16	Grocer	10	5	7	-
17	Fishing	25	16	23	-
18	Shrimp fry catching	17	20	18	-
19	Small business	25	13	22	-
20	Day labor	23	45	30	-
21	Salt production ¹	46	-	30	-

Note: "+++" = High, "++" = Medium, "+" = Less, "-" = No risk

¹Mid September to March each year a large number of local people are engaged in salt production. During this period local people do not go to the game reserve and the pressure on the forest declines.

Box 1: Livelihood Activities with High Impact on Teknaf Game Reserve)

Fuelwood collection

Fuelwood collection is a major and very visible activity in the game reserve. Fuelwood collection provides primary and secondary occupation for many households. Fuelwood is collected for household consumption and also for commercial purposes. The mean fuelwood consumption is 6 kg/family/day. Overall, 52% of households collect fuel wood from Teknaf Game Reserve; the others meet their demands from buying and from collecting in their home gardens. Fuelwood collectors usually work individually but sometimes they



go in groups. Local people claim that sometimes fuelwood collectors pay Tk. 5 to Tk. 10 as levy to Forest Department staff members to enter the forest. Each household made 2 to 10 trips per week to the game reserve to collect fuelwood, and the trips lasts from 2 to 6 hours; they collect one headload or approximately 23 kg per trip. Our observations suggest that 45% of the fuelwood collected from the game reserve is green wood and the rest is dry. Only 12% of the dry wood is naturally dried; collectors leave the felled trees on the forest floor, and then carry the wood out when it is dry. Fuelwood is collected all year round, but major extraction occurs during the dry season. The collectors of both communities include children and adults, both male and female (see plate 1 and 2). Most collectors supplement their income by selling fuelwood. In our household interviews, people suggested that children, women, and men sold bundles of fuelwood weighing approximately 10-15 kg, 20-25 kg, and 30-35 kg respectively. The average price of fuelwood is Tk. 2 per kg. No rules or regulations govern collectors and fuelwood collection remains unrestricted. Fuelwood extraction from the reserve is for both household consumption and sale in the market. Household interviews suggest that overall 42% of the households sell fuelwood in the local market. We confirmed this by field observations and visits to local market. Middlemen transport large quantities of fuelwood to other areas (see plate 3); local brickfields burn substantial quantities; and local tea stalls and restaurants also burn fuelwood. In most cases middlemen buy fuelwood from the local market and carry it to the market for sale.

Sungrass collection

Both local poor people and Rohingyas collect sun grass as a building material for commercial purposes and for household consumption. Overall 34% of households collect sun grass during the months of March to June, with the highest percentage collected in May. Poor people, especially young men and women, are the main collectors of sun grass.

Illicit felling

Widespread illicit felling was carried out in the past at Teknaf Game Reserve and continues to date. Many people living inside and outside of the game reserve, including a number of Rohingya refugees as well as members of armed gangs, are directly involved in the illegal extraction of timber from the

forest. Overall 18% of the households we interviewed are directly employed in illegal felling as day laborers (see plate 4). This activity provides cash income of Tk. 100-300 per day per person. Some trees are also felled for building homes. Most of the time this activity is carried out during the rainy season, government holidays, or at night. However, in some cases influential tree fellers dare to cut trees during the daytime in the dry season. Both legal and illegal timber is sold in the local market.

Brickfields

Eight brickfields are located in and around the Teknaf Game Reserve; of these three are located in Ledha (see plate 5). Each brickfield consumes a huge amount of fuelwood every day during the seven to eight months that they operate annually. The operation of such brickfields violates the Forest Act. These brickfields purchase fuelwood from the local market. Sometimes Rohingya refugees and people from poor local households are hired as day laborers to collect fuelwood for these brickfields.

Box 2: Livelihood Activities with Moderate Impact on Teknaf Game Reserve

Livestock grazing and fodder collection

About 15% of local people graze their livestock in the game reserve. Grazing cattle, buffalo, goats and sheep kills seedlings and prevents natural regeneration in the game reserve. Local villagers, especially young boys, collect grasses and fodder for their livestock from the forest during the dry season. Rohingya refugees do not graze livestock or collect fodder.

Bamboo and cane extraction

Overall 17% of households collect bamboo and cane to supplement their income. In addition to their use as raw materials in home construction, bamboo and cane support many cottage industries in and around the game reserve. The natural regeneration of bamboo and cane has become limited and their future viability is threatened due to over-exploitation.

House building materials

Overall 14% of households collect house-building materials from the forest to



use as fencing, poles, and posts. They also collect sand and stone illegally from the game reserve in the dry season, to be sold for use in commercial road and building construction.

Agro-farming on encroached land

Sixty percent of local peoples and 100% of Rohingya are landless. As reported in Table 3, an average local household farms approximately 0.45 ha of encroached land and a refugee household farms approximately 0.15 ha of encroached land.

Betel leaf cultivation

Betel leaf cultivation is the newest form of land encroachment in the reserve. This activity provides the only source of cash income for 5% of the households we interviewed; other households cultivate betel leaves to supplement their income. Betel leaf cultivators cut small trees and bamboo, especially *molibansh* (*Melocanna baccifera*), and other young plants to erect fences that provide shade and support for betel vines to grow on. Farmers burn the undergrowth for preparation of the betel vine beds. After the vines are grown they burn and fence the covered areas to protect them from weeds.



Plate 1: Sungrass and fuelwood collection by Rohingya women and children in Ledha.

Box 3: Livelihood Activities Which Have Low Impact on Teknaf Game Reserve

Medicinal plants collection

We identified a total of 34 plant species belonging to 28 families (Appendix 2) including herbs, shrubs, trees and climbers as medicinal plants. Approximately 6% of local peoples and 17% of Rohingya refugees use medicinal plants for curing ailments. Local traditional healers (known as boiddah, kabiraj or hakim) collect these plants.

Green and dry leaves collection

Overall 7% of households collect dry and green leaves from the game reserve. They collect dry leaves mainly for consumption as biomass fuel. Green leaves are used for packing various goods, transporting fish and giving shade to houses. Sometimes Rohingya households sell dry and green leaves in the local market at the rate of Tk. 8-12 per sack.

Fruits and vegetables collection

Local people and Rohingyas, especially women and children, collect wild fruits and vegetables (Appendix 3) from the forest. A few people sell these products to their neighbors or in markets for additional income. About 16% of the households are involved in this activity.

Hunting

Hunting was a common practice in the game reserve in the recent past. Now, however, hunting occurs on a very limited scale. A few wildlife species from the game reserve are hunted by about 5% of the households (Appendix 3).

Honey extraction

Overall, 3% of households collect honey from the forest. Honey is used as food and medicine, and is collected for commercial and domestic consumption. Sometimes honey collectors damage young plants at the time of extraction. Honey collectors also carry fire to ward off bees, which can cause forest fires.

Evidence of Forest Destruction

The Teknaf range had almost 100% forest cover in 1980. By 1990 it had dropped to 55%. Current data shows only 8% of natural forest remaining in the reserve (Nishorgo 2006). In contrast, the Whykong Range still has 65% natural forest cover.

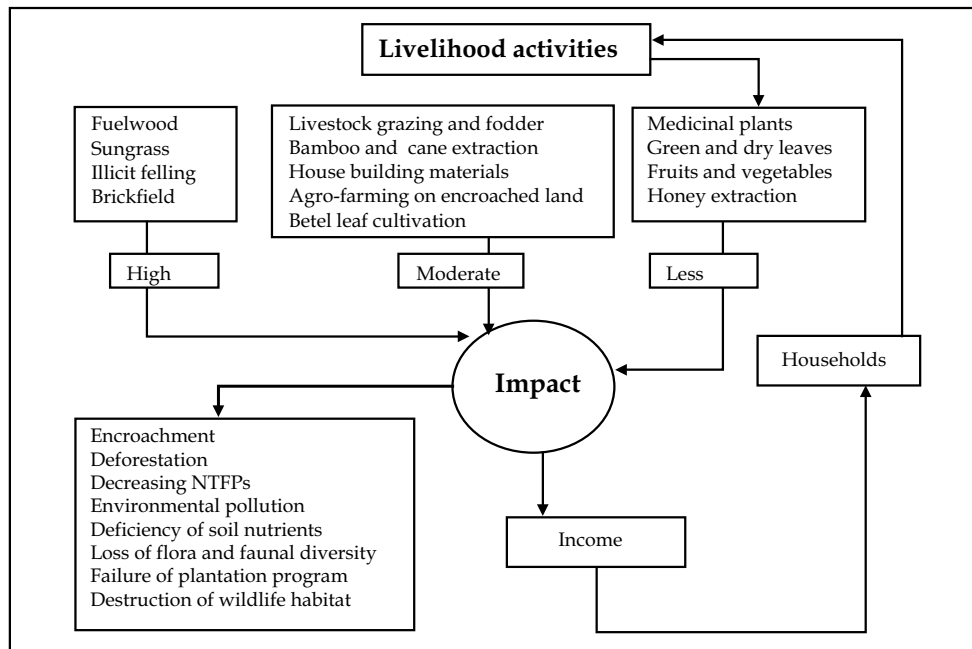


Figure 5: Schematic diagram of livelihood activities and impacts

Previously, the game reserve supported the highest biodiversity in the country 290 plant species, 55 species of mammals, 286 species of birds, 56 species of reptiles, 13 species of amphibians, and 8 of the 10 primates living in the country (Nishorgo 2006). In our study, we asked villagers about extinct and threatened floral species in the reserve. According to these villagers, threatened floral species include baitta garjan (*Dipterocarpus scaber*), jam (*Syzygium spp.*), telia garjan (*Dipterocarpus turbinatus*), shimul (*Salmalia malabarica*), dhuila garjan (*Dipterocarpus alatus*), bandarhola (*Duabhangra sonneratiodes*), bailum (*Anisoptera glabra*), batna (*Quercus spp.*), shil koroi (*Albizia procera*), champa (*Michelia champaca*), koroi (*Albizia lebeck*), kadam (*Anthocephalus chinensis*), chakua koroi (*Albizia odoratissima*), gamar (*Gmelina arborea*), chapalish (*Artocarpus chaplasha*), jarul (*Lagerstoemia speciosa*), telsure (*Hopea odorata*), bahera (*Terminalia beleric*), chandul (*Tetrameles nudiflora*), harina (*Vitex glabrata*), pitraj (*Ammora wallici*), goda (*V. pinnata*), and toon (*Cedrela toona*).

The main objective of game reserve management is to conserve wildlife, but due to human interferences this has become difficult. One villager noted, "Once Teknaf Game Reserve was famous for Asian elephants (*Elephas maximus*), but now Asian elephants are few in number" (Ashad, personal communication 2006). From the study, we found that local people and Rohingya households are well aware of the decline in wildlife populations in the area. They reported that a large number of

wildlife could be seen in the recent past, but that many species are now gone. According to villagers, the following species have now disappeared: python (*Python molurus*), wild pig (*Sus scrofa*), monitor lizard (*Varanus bengalensis*), rhesus monkey (*Macaca mulatta*), kingfisher (*Alcedo atthis*), squirrel (*Calloscirus erythracus*), little egret (*Egretta alba*), sambar deer (*Muntiacus muntjak*), hornbill (*Anthracoceros albirostris*), rabbit (*Caprimulgus hispidus*), dove (*Streptopelia chinensis*), common langur (*Presbytis entellus*), black drongo (*Dicrurus adsimilis*), jungle cat (*Felis chaus*), magpie robin (*Copsychus saularis*), fox (*Vulpes bengalensis*), woodpecker (*Blythopicus pyrrhotis*), porcupine (*Hystrix hodgsonii*), jungle fowl (*Gallus gallus*), cobra (*Naja naja*), lapwing (*Vanellus vanellus*), common mongoose (*Herpestis edwardsi*), myna (*Acridotheres tristis*), and mud turtle (*Trionyx nigricans*).

From our study, we found that 100% of the Rohingya refugees and 60% of the local people are landless and are forced to encroach upon land in the game reserve (see plate 6). On average, local people and Rohingya refugees' encroach on 0.45ha and 0.15 ha of the reserve per household, respectively. We also found that 7% of local people engage in betel-leaf cultivation on encroached forest land.

Many of the households we surveyed collect NTFPs in the reserve. They collect primarily bamboo, cane, medicinal plants, honey, sun grass, fruits, vegetables, fodder and various house-building materials. These NTFPs are decreasing at an alarming rate in the game reserve due to unsustainable collection rates and practices. Through the study, we found that, a few years ago, all kinds of NTFPs were available within a short distance from most households, but now people have to collect these products at a longer distance, inside the reserve.

Box 4: Minor Forms of Forest Destruction

The forest floor should be rich in humus and mineral nutrients when complete cycling of nutrients occurs. However, women and children from both local and refugee families collect litter from the forest floor, preventing this natural process from occurring. Removal of litter has no immediate effect upon site quality, but in the long run it lowers the quality of the site and ultimately leads to a decrease in soil nutrients and tree growth.

Both local people and Rohingya refugees cultivate root crops such turmeric and ginger in the forest. In addition, they sometimes burn whole areas after collecting sun grass. These activities cause serious soil erosion during the rainy season, which removes topsoil and further degrades the site (see plate 7).



Hope for the Future

In 2001, the Forest Department started a participatory forestry program in Kerontoly village where department staff members and local people jointly planted 15 ha of land with cane and bamboo. In 2004 and 2005 Forest Department staff members again involved local people in a participatory tree plantation program covering 10 ha, where every participating household was allocated 1 ha. We found 36 households in the two villages that managed their allocated plantations very well; the plantations were undisturbed and growing well. Participants manage and protect their plantations by working as a team. Outside of the participatory plantations and some other patches near the range office, we saw no other examples of successful plantations during our research. Therefore, involving local people in game reserve management can have significant positive results.

Recommendations

Based on our research and findings, we can make the following recommendations for enhancing management of wildlife reserves such as Teknaf:

- Poor and forest dependent people need to be identified and diverted from forest degradation. Their livelihood activities need to be monitored through close interaction, capacity building, community mobilization and motivation. Existing NGOs should be involved in awareness creation and community mobilization.
- Forest Department and the local people should jointly manage the forest resources under agreement. Accordingly, co-management models need to be developed with suitable policies to involve local people in joint forest management. People are interested in participatory forestry programs.
- The unregistered Rohingya refugees should be repatriated to their home land through a bilateral agreement jointly with international organizations. The United Nations High Commissioner for Refugees (UNHCR) should be allowed immediate and complete access to newly arrived refugees who are staying in villages in the game reserve. Without UNHCR access, refugees will not be able to have their protection needs assessed and will not be able to receive humanitarian assistance.
- Encroachment is a major problem in the game reserve. Forestlands are being encroached upon by influential people, and it is impossible to regain all of the

encroached land from local elites. The Forest Department should introduce community forestry on this land. Encroachers accept community forestry, because community forestry promotes sustainability, and utilization of land through combining agricultural and forest crops.

- Illegally established brickfields near the forest remain the main threat to the viability of forests and wildlife populations. Legal actions need to be taken against the owners to remove brickfields from the game reserve.
- Illicit felling is another major problem. Armed criminals often enter the forests in groups and commit illegal felling. In such cases, field patrols are difficult without the assistance of the military or police force. This creates problems for effective and rapid action against the illicit fellers. Administrative decentralization of the Forest Department may help to resolve this problem.
- Alternative income generation activities are needed, such as the cultivation of bamboo, cane, and *murtha* plantations; participatory agro-forestry activities in the buffer zone; development of small scale enterprises such as nurseries, the cultivation, collection and processing of medicinal plants, beekeeping and honey processing, fishing, poultry farming, dairy farming and goat farming.
- Teknaf is famous for tourism in Bangladesh, due to its natural beauty. The reserve has immense scope to develop eco-tourism in the long series of hills along the Naf River. Eco-tourism can be a development tool for the region that could not only provide benefits for nature conservation, but also pave the way for revenue generation and the creation of more job opportunities.

Conclusion

This article summarizes a comparative study of the diversified livelihood activities of both local people and Rohingya refugees, which have impacts on the Teknaf Game Reserve (Appendix 4 provides photographs of the study site). These impacts are affected by seasonal fluctuations in climate, by the availability of natural resources, and by various environmental, socio-economic and political shocks and stresses. Though the Rohingya refugees are involved in various destructive activities, they have no other clear options for income generating activities. Local people do not support the Rohingya, as they are perceived as an unwanted burden. Both local people and Rohingya refugees desperately need alternative income generating activities. Both groups want to collaborate with national and



international organizations to resolve the refugee situation in a timely and congenial manner, and to repatriate Rohingya refugees to their country. By dividing the game reserve into various management units, local people can become involved in co-management systems. Our research suggests that local people who have been given an opportunity to be involved in participatory forest plantations have managed their plantation well and have produced rich and productive forest gardens. Our study of two villages is a small sample of livelihood activities and their impacts on the game reserve. There is a great need to study the other villages both within and outside the reserve in order to explore their impacts, because livelihoods and impacts vary from village to village. We highly recommend further research to better understand the actual situation, and to highlight new forms of co-management that may help to save Teknaf Game Reserve.

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Appendix 1 : Schematic diagram of livelihood activities and impacts

Livelihoods	Bai	Jai	Ash	Sra	Bha	Asw	Kat	Agr	Pau	Mag	Fal	Cho
General livelihoods												
Agro farming		Y	Y	Y	Y	Y	Y					
Salt production Betel leaf cultivation					Y	Y	Y	Y	Y	Y	Y	Y
Brick field	Y	Y						Y	Y	Y	Y	Y
Rickshaw pulling	Y	Y	Y	Y	Y	Y						
Day labor	Y	Y					Y	Y	Y	Y	Y	Y
Grocer	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y
Fishing	Y	Y	Y				Y	Y	Y	Y		
Shrimp fry catching	Y		Y	Y	Y			Y	Y	Y		
Small business	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y
Livestock grazing and fodder collection	Y	Y					Y	Y	Y	Y	Y	Y
Illicit felling			Y	Y	Y	Y	Y	Y				
Hunting							Y	Y				
House building materials collection								Y	Y	Y	Y	Y
Sun grass collection	Y	Y									Y	Y
Fuel wood collection	Y	Y					Y	Y	Y	Y	Y	Y
Medicinal plants collection	Y	Y									Y	Y
Bamboo and cane extraction			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Honey collection	Y											Y
Green and dry leaves collection			Y	Y	Y			Y	Y	Y		
Fruits and vegetables collection	Y	Y	Y	Y	Y							

Notes: Bai = Baisak (April 14-May 14), Jai = Jaistha (May 15-June 14), Ash = Ashar (June 15-July 15), Sra = Sraban (July 16-Aug 15), Bha = Bhadra (Aug 16-Sept15), Asw = Ashwin (Sept 16-October15), Kar = Kartik (Oct 16-Nov14), Agr = Agrahayan (Nov 15-Dec14), Pau = Paush (Dec15-Jan13), Mag = Magh (Jan 14-Feb12), Fal = Falgun (Feb13-Mar 14), Cho = Choitra (Mar15-Apr13)

Appendix 2: Medicinal Plants in the Teknaf Game Reserve and Their Use

Local Name	Botanical Name	Family	Parts used	Traditional use	Habit
Assam pata	<i>Mikania cordata</i> Rob.	Compositae	Green leaves	Anti-hemorrhoid	Sh
Assam lata	<i>Eupatorium odoratum</i> L.	Compositae	Green leaves Flowers	Anti-hemorrhoid, narcotic, influenza, fever, cough and diabetes	Cl
Arjun	<i>Terminalia arjuna</i> Bedd.	Combretaceae	Bark	Heart disease, dysentery, diarrhea, piles, bone fracture and cough	Tr
Ada	<i>Zingiber officinale</i> Roxc.	Zingiberaceae	Rhizome	Cough, cold, constipation, diarrhea, vomiting, tonsil, Teeth ache and ailments	H
Amoloki	<i>Phyllanthus emblica</i> L.	Euphorbiaceae	Fruit	Dysentery, cough, cold, vomiting, jaundice, dyspepsia, skin diseases, hair falls, digestive problem	Tr
Anaras	<i>Ananas sativus</i> L.	Bromeliaceae	Fruit	Jaundice	H
Akanda	<i>Calotropis calycinum</i>	Aslepiadaceae	Leaf, latex	Gout pain, Constipation, cough, worms, asthma, fever, urinal problem	H
Bohera	<i>Terminalia bellerica</i> Roxb.	Combretaceae	Fruit, bark	Constipation, anemia, hepatitis, cough, stomach trouble, dysentery, rheumatism, astringent and eye disease	Tr
Bel	<i>Aegle marmelos</i> L.	Rutaceae	Fruit	Weakness, colitis, diarrhoea	Tr
Bakul	<i>Mimusops elengi</i> L.	Sapotaceae	Fruit, bark	Chronic dysentery, astringent, tonic and fever	Tr
Basak	<i>Adhatoda vasica</i> Nees.	Acanthaceae	Fresh green leaves	Cough, cold ailments, malaria, asthma, bleeding of piles and phthisis	Tr
Banana	<i>Musa sapientum</i> L.	Musaceae	Root, fruits	Dysentery, Diarrhea and stomach trouble	H
Chatim	<i>Alstonia scholaris</i> Br.	Apocynaceae	Leaf, bark	Fever, astringent, tonic, anthelmintic, febrifuge and antiperiodic	H
Durba grass	<i>Cynodon dactylon</i> L.	Gramineae	Tender leaves	Tooth ache, cut and wounds	H
Donkalos	<i>Leucas aspera</i> Spreng	Labiatae	Whole plant	Cold ailments, snake bite, chronic, skin disease and rheumatism	H
Gila lata	<i>Derris trifoliata</i> Lour.	Papilionaceae	Whole body	Not specified	Cl
Harzora	<i>Vitex quadrangularis</i> Wall.	Vitaceae	Whole plant	Bone fracture	h
Horitaki	<i>Terminalia chebula</i> Retz.	Combretaceae	Fruit	Dysentery, headache, painful menstruation, jaundice, constipation, fever, heart disease, cough, urinary problems	Tr



Holud	<i>Curcuma longa</i> L.	Zingiberaceae	Rhizome	Skin ailments	H
Jambura	<i>Citrus acida</i> L.	Rutaceae	Fruit	Jaundice	Sh
Keora	<i>Sonneratia apetala</i> Buch.Ham.	Sonneratiaceae	Leaves, bark	Fever, stomach problem	Tr
Lebu	<i>Citrus limon</i> (L) Burm. f.	Rutaceae	Fruit, Leaf	Digestive, fever, appetizer, cough and bronchitis	Sh
Mendi	<i>Lawsonia inermis</i> L.	Lythraceae	Leaves, bark, seed and flower	Skin disease, jaundice, spleen disease, headache, hair falling and rheumatism	Sh
Narikel	<i>Cocos nucifera</i> L.	Arecaceae	Tender fruit	Refresher and hair falls	Pa
Neem	<i>Azadirachta</i> <i>indica</i> A. Juss.	Meliaceae	Leaves, seed, bark	Skin diseases, chicken pox, antiseptic, eczema, ulcer, fever, dysentery, diabetes	Tr
Nishinda	<i>Vitex negundo</i> L.	Verbenaceae	Leaves	Skin disease, rheumatism, cough, intestinal worms and headache	H
Papeya	<i>Carica papaya</i> Linn.	Caricaceae	Fruit, latex and seed	Stomach trouble, asthma and skin disease	Sh
Paan	<i>Piper betle</i> Linn.	Piperaceae	Green leaves, roots	Constipation, sex stimulant, digestive, ear disease, diarrhoea, fever and stomachache	Cl
Shegon	<i>Tectona grandis</i> L.f.	Verbenaceae	Roots, flowers, fruits	Hair growth, urinary problems	Tr
Sajna	<i>Moringa oleifera</i> Lamk.	Moringaceae	Bark, leaves, roots	Paralysis, intermittent fever, epilepsy, hysteria, rheumatism, articular pains, cold ailments, affection of liver and spleen	Tr
Shimul	<i>Bombax ceiba</i> L.	Bombacaceae	Bark, roots	Diarrhoea, dysentery, cough, leucorrhoea and fever	Tr
Supari	<i>Areca catechu</i> L.	Palmae	Fruit, leaves	Ulcer, rheumatism, sex stimulant, constipation, digestive, teeth disease	Tr
Thankuni	<i>Centella asiatica</i> L.	Hydrocotylaceae	Whole plant	Dysentery, brain tonic, cardiac tonic and diarrhoea, gastric	H
Ulatkambal	<i>Abroma augusta</i> L.	Sterculiaceae	Bark, root	Dysmenorrhea	H

Note: Tr-Tree, H- Herbs, Sh- Shrubs, and Cl-Climbers.

Appendix 3: List of Vegetables, Fruit and Wildlife Collected from Teknaf Game Reserve

Vegetables	Bamboo shoots, arum, dekhishak, haichhashak, tarashak, maminnashak, terishak, etc.
Fruits	Lata mangoes, litchi, olive, banana, cowgola, chapalish, kanthat, dewa, bakumgola, chalta, amloky, hartoki, bohera, etc.
Wildlife (hunted)	Mammals: deer, elephant, black deer, monkey, tiger, wild dog, wildfowl, wild boar, goyal, wild cow, etc. snakes (reptiles): python, daras, kalantor, kachupaitta, ain hap, dudraj, cobra, monitor lizard, etc. Birds: dove, parrot, myna, cuckoo, heron, kingfisher, nightjar, vulture, wild fowl, hornbill, peacock etc.

Appendix 4: Photographs



Plate 2: A local fuelwood collector.



Plate 3: Fuelwood, sungrass transportation.



Plate 4: A local illicit feller coming from the game reserve.



Plate 5: A typical brickfield inside the game reserve in Ledha.



Plate 6: A forestland encroached by Rohingya refugees



Plate 7: Degraded forestland in Teknaf Game Reserve

GLOSSARY

beat - the smallest administrative unit in forest management in Bangladesh

boza - a bundle (as in fuelwood)

bibhag - one of the six major administrative units into which Bangladesh is divided; a division. These are further divided into zila (district) and upazila (subdistricts)

bhar - a pair of bundles tied together to be carried over the shoulder

chhora - stream

jhum - shifting cultivation

paan or paan pata - betel leaf vine, *Piper betle*

pati pata - mat palms belonging to various species

superi - areca nut, *Areca catechu*

paka - "finished"; (of a building) made of brick, concrete as a permanent structure

kacha - "unfinished"; (of a building) makeshift, using bamboo, wood, thatch and /or mud rather than more durable materials

khara - a conical bamboo basket

maund - a weight measure equal to 37.5 kilograms

mohalder - local trader or middleman

murta - *Clinogyne sp.*

range - one of the administrative units of forest management in Bangladesh, typically made up of 2 smaller units called beats.

seer or sher -

sungrass or chhon ghash - *Imperata cylindrica*

tila - small hillock

union parishad or union porishod - small administrative unit

upazila - a rural administrative subdivision of a district or zila; a subdistrict

zila - a major administrative subdivision in Bangladesh; a district

Bangladesh is among the poorest and most densely populated nations in the world. The difficulties that Bangladesh Forest Department officials face in promoting the conservation of flora and fauna are among the most severe found anywhere. The papers included in this book point to several important conclusions about linkages between rural communities and conservation in protected area management. First, they suggest that strategies to link rural livelihoods and conservation are not a universal panacea for conservation problems. Promoting the management and even domestication of non-timber forest products may give local communities incentives for protecting these species, but this may have little or no impact on overall habitat conservation. Second, the papers suggest that no one strategy will work everywhere and indeed, probably no one strategy can work on its own at any given site.

Generally, the case studies illustrate the importance of developing constructive ways of involving local stakeholders in conservation and sustainable resource use practices based on the goals, interests, and understanding of the people living in and around the protected areas. The studies confirm that protected areas cannot be managed successfully on the basis of simple and incorrect assumptions about how local people use natural resources. Rather, the authors of the case studies unanimously argue for incorporating local people and their knowledge into park management decisions through some type of co-management system.

This joint applied research project of the East-West Center and the Nishorgo Program of the Bangladesh Forest Department encouraged students, lecturers, professors, and Forest Department officials to conduct field research on the impacts and implications of protected areas on the livelihoods of people living in and around protected areas. The papers in this volume are the results of this initiative. The applied research process was led by Dr. Jefferson Fox of the East-West Center of Honolulu, Hawaii, in collaboration with the Nishorgo Program of the Bangladesh Forest Department. Researchers were selected based on a competitive grant award process. The research effort was coordinated by the Nishorgo Support Project, a Project of the Forest Department, with financing from the Government of Bangladesh and USAID. The Nishorgo Support Project receives technical assistance from IRG of Washington DC/USA and its partner NGOs, CODEC, RDRS, NACOM and IUCN/Bangladesh.

