



Linking Fuelwood Collection and Community Livelihoods in Satchari National Park

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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.

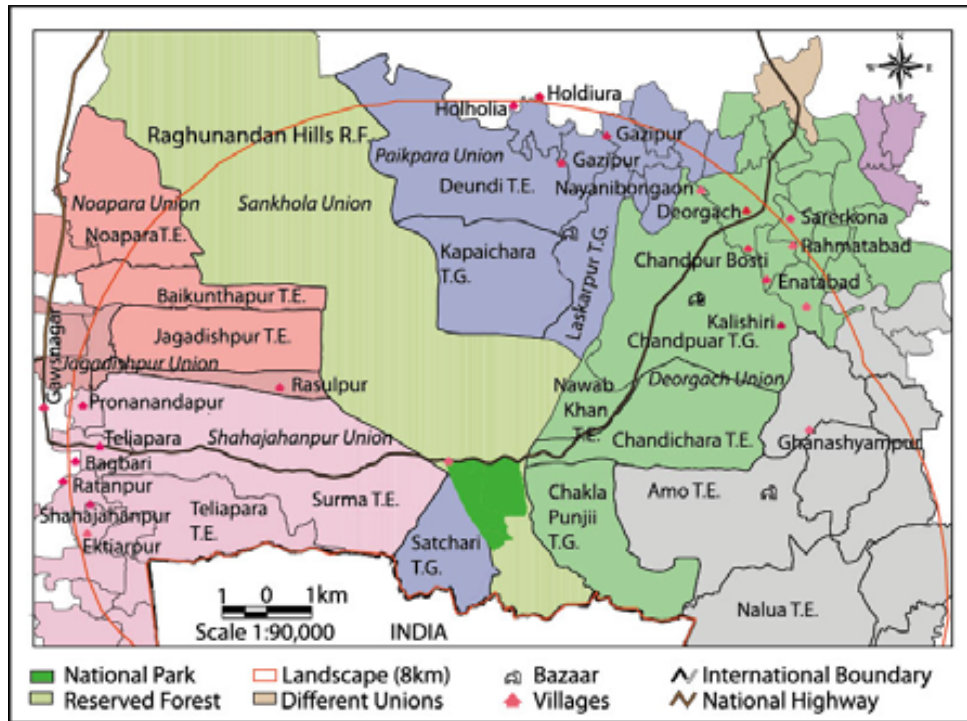


Figure 1: Map of Satchari National Park and Surroundings

(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.

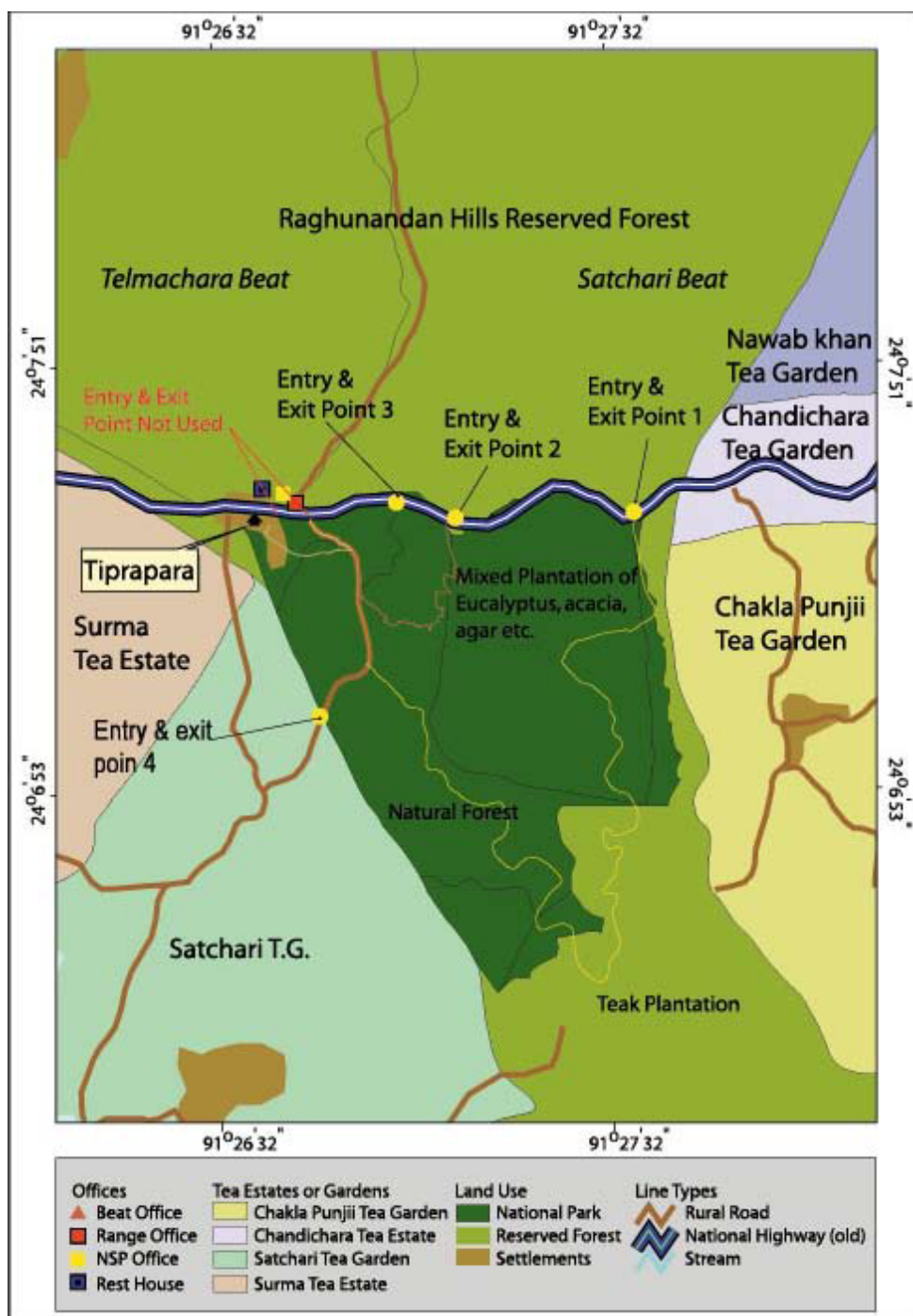


Figure 2: Location of Survey Points and Study in Satchari National Park
(Source: Nishorgo Support Project, 2006)



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.

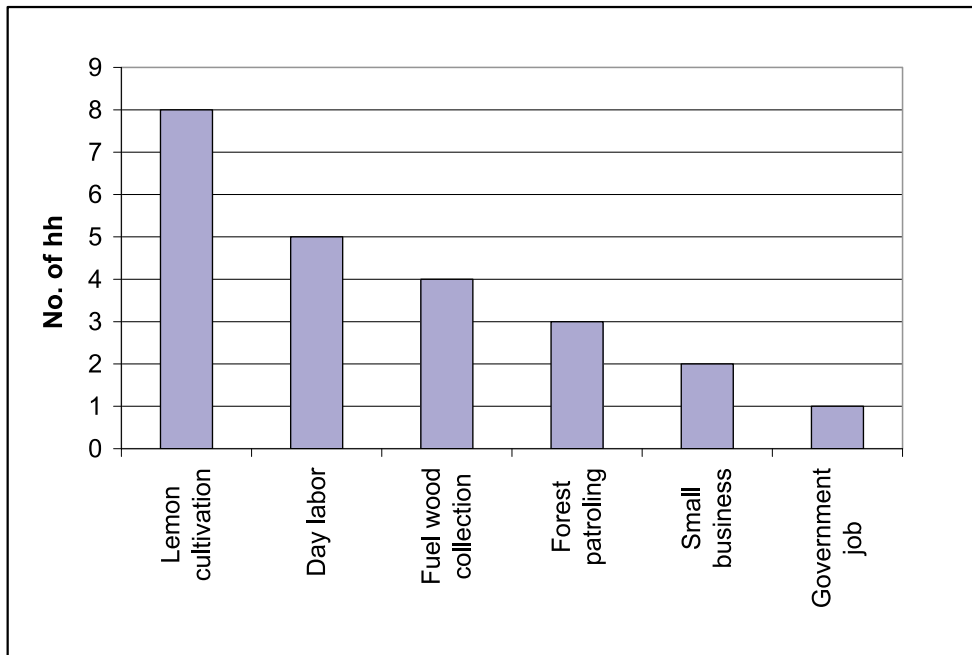


Figure 3: Primary Occupation of Households at Tiprapara Village

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 headload 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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