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# Socioeconomic Factors of Forest Dependency in Developing Countries: Lessons Learned from the Bandarban Hill District of Bangladesh

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## ABSTRACT

Forests provide direct and indirect economic benefits to forest dependent communities in the world, especially in the developing countries contributing to the national economy. The present study aims with the socioeconomic status and factors favoring forest conservation and influencing people's dependency on forest resources in the Bandarban hill district of Bangladesh. The study was based on Focus Group Discussion (FGD) and socioeconomic survey through semi-structured questionnaire. The study revealed that peoples' income from forest and forest-related occupations were positively related to their forest dependency. However, respondent's education level significantly reduced their dependency on forest resources. Thus, educating the forest-dependent people and supporting alternative livelihoods may be an option for effective forest management and conservation. This study represents an important pioneer step in taking a holistic view of the peoples' dependency on forest resources which might be helpful for policymakers in future to ensure sustainable forest management and conservation in developing countries like Bangladesh.

**Keywords:** Forest dependency, Forest income, Livelihoods, Bandarban, FGD, and Socio-economic factors.

## INTRODUCTION

People's dependency on forest resources is a multi-dimensional phenomenon due to the evidence that forests give diversified benefits to humans being. The total forest area of Bangladesh is about 2.53 million hectares (Hossain, 2016; Hossain, 2015) of which 84% has been classified as natural forest and 16% as plantation forest (Hossain and Hoque, 2013; Rahman *et al.,* 2010). Bangladesh occupies diversified forest types (FMP, 2016) ranging from wetlands, evergreen, semi evergreen, moist deciduous and mangrove forests comprising with diverse plants in each forest types (Bhuiyan *et al.*, 2014; Hossain *et al.*, 2019). Among these forest types, the evergreen and deciduous forests are mostly distributed in the hilly districts of Bangladesh. The Chittagong Hill Tracts (CHT) in Bangladesh supports almost 80% of the country's total biodiversity (Hossain, 2016; Nishat and Biswas, 2005), and is inhibited by people from 12 ethnic groups (Rasul, 2007; Rasul and Thapa, 2006; Miah and Chowdhury, 2004; Chowdhury and Miah, 2003) who depend largely on forest resources to fulfill their livelihoods (Misbahuzzaman, 2015; Miah *et al.,* 2012; Rasul and Karki, 2006; Rasul, 2007; Miah and Chowdhury, 2004).

Forests contribute a significant portion of the economy (46%) at local and national levels, followed by crop/fruit production in the region (Rasul and Tripura, 2016; Ahammad and Stacey, 2016). From the beginning of forest management, Bandarban hill dis-

trict of Bangladesh was designated for forest resources, particularly as a source of timber both from the natural forests and also from the plantations (Ahammad and Stacey, 2016; Hossain, 2016; Masozera and Alavalapati, 2004). But in course of time, most of the forestlands are becoming barren, covered with grass or with scattered trees, bamboos and weeds due to destruction of natural habitat of plants, over exploitation of natural green cover, conversion of large areas into non-forestlands, faulty management, jhum cultivation, invasion by exotics, land tenure ownership conflicts and so on (Akhtaruzzaman *et al.,* 2016; Hossain, 2016). Traditionally, people have access to government forests in some cases yet their secure tenure rights have not yet been properly addressed (Barkat *et al.,* 2010).

There have been many studies that have demonstrated the role of forest resources in strengthening the economic condition of forest dependent communities in both developed and developing countries of the of the world (Shackleton *et al*., 2008; Asfaw *et al*., 2013; Adam *et al*., 2013). However, very few studies were conducted to evaluate the socioeconomic factors that favour forest conservation along with influencing the livelihoods of forest dependent communities. Therefore, we conduct the present study to explore the socio-economic factors that favour forest conservation and affect people's dependency on forest resources and livelihood in Bandarban hill district of Bangladesh.

## MATERIALS AND METHODS

Socio-economic condition of the people of Bandarban hill district has been assessed through interview of the marginal dweller and Focused Group Discussion (FGD). Preliminary information about location, accessibility, communication means, and demography was collected from Conservator of Forest (CF) office of Bangladesh Forest Department (BFD), CHT Regional Council, different NGO's, literature and reconnaissance survey to the study area.

**Description of the study area** -The Chittagong Hill Tracts (CHTs) of Bangladesh is situated at the southeast region of the country (21°25 N to 23°45 N latitude and 91°54 E to 92°50 E longitude) and comprises three districts: Rangamati, Bandarban, and Khagrachari. This hilly forest region is traditionally resided by 12 ethnic groups, all with distinct cultures, languages, and traditions. We have selected two villages (Renikhayong para from Bandarban Sadar Upazila and Babu Para from Rowangchhari Upazila) under Bandarban district of Bangladesh (**Fig. 1**).

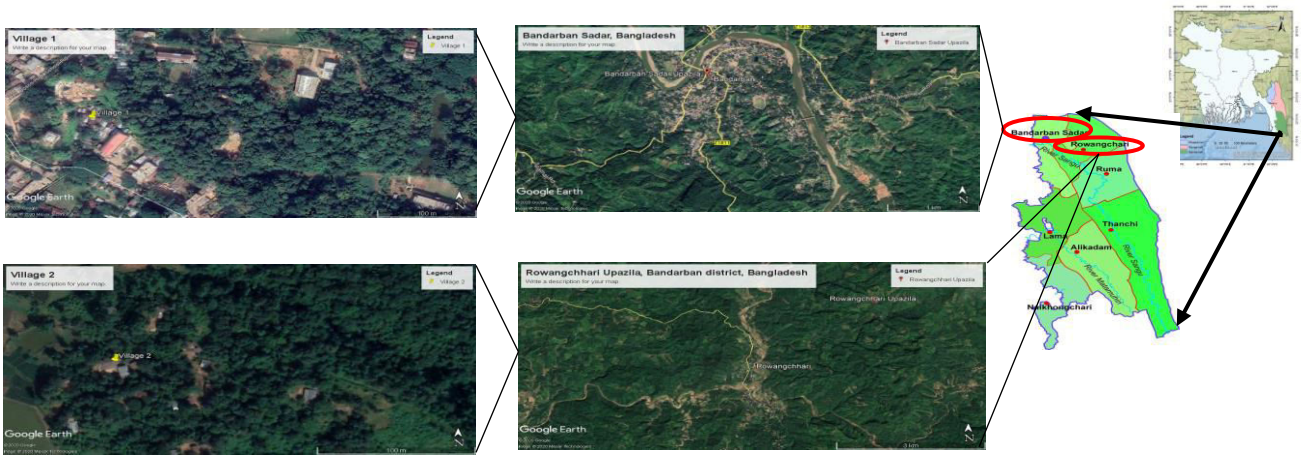


**Fig. 1**: Location map of the study area.

**Focus Group Discussion** - Before starting for data collection from local people, a focused group discussion was conducted involving with the concerned NGO and *Karbari*. *Karbari* is the village head in each para that usually collects the tax from villagers and adjudicate disputes at village level and considered as the most powerful person in the village social structure. Both male and female members participated actively in the FGD. We conduct 2 FGD from two villages (1 FGD for each village) to collect necessary information related to the forests and the dependency of local communities on forests from the view of several socio-economic factors.

**Interview of marginal stakeholder -** A semi-structured questionnaire was used for interview of the local stakeholders in order to conduct socioeconomic survey. The questionnaire was designed to explore socio-economic status of the local people. Detail data on forest resource extraction and corresponding monetary income was collected from 60 respondents (30 respondents from each village) to assess their forest dependency.

**Quantitative framework**

**Logistic regression model**: Generalized linear model (GLM), popularly known as logistic regression model was used in the present study to evaluate how people socioeconomic conditions affected their dependency on forest resources of CHT. GLM has been used in many socioeconomic studies. Mehta and Kellert (1998), Sah and Heinen (2001) and Holmes (2003) have used GLM to determine impacts of demographic and economic variables. Holmes (2003) has used logit model to identify the factors that determined people's forest dependency. Logistic regression has also been used by Ellis and Porter-Bolland (2008) to associate the socio economic reasons to deforestation in Mexico. However, generalized linear models (GLM) are made up of three components: Random, Systematic and Link Function. The random component identifies the dependent variable (Y=0 or 1) and its probability distribution, the systematic component identifies the set of explanatory variables (Xi), and link function identifies a linear relationship between the explanatory variables and their probability function. That is,

$f(\text{Pi(Xi)}) = \alpha + \beta i Xi$ ……..(1)

Where, Xi is the vector of socioeconomic attributes of the respondents, Pi (Xi) indicates the probability of respondents' dependency on forest resources of CHT for their livelihoods (yes = 1, otherwise = 0) for a given value of Xi and βi is the vector of parameters to be estimated.

In generalized linear model, a logit link function can be defined as follows:

$$f(\text{Pi(Xi)}) = \log\left(\frac{\text{Pi(Xi)}}{1-\text{Pi(Xi)}}\right) \text{ ……..(2)}$$

Combination of equations (1) and (2) gives equation (3).

$$\text{Pi (Xi)} = \frac{e\alpha + \beta i Xi}{1 + e\alpha + \beta i Xi} \text{ ……..(3)}$$

Now, if Xi is binary, equation (1) yields the following outcomes:

If Xi = 1, f(Pi(1) = = α + βi and if Xi = 0, f(Pi(0) = = α

Thus, $\beta i = f(\text{Pi}(1) - f(\text{Pi}(0) = \log\left(\frac{\frac{Pi(1)}{1-Pi(1)}}{\frac{Pi(0)}{1-Pi(0)}}\right)$ ……..(4)

Where odds of Xi, = 1 and Xi = 0 are defined respectively as, $\frac{Pi\ (1)}{1-Pi\ (1)}$ and $\frac{Pi\ (0)}{1-Pi\ (0)}$

The ratio of the two is called the odd ratio which represents the Odds that an outcome will occur (the probability of people's dependence on forest resources) given a particular exposure (Xi = 1) compared to the odds of the outcome occurring in the absence (Xi = 0) of that exposure. Thus,

$$\text{Odd ratio} = \left(\frac{\frac{\text{Pi (1)}}{1-\text{Pi (1)}}}{\frac{\text{Pi (0)}}{1-\text{Pi (0)}}}\right) \text{ ……(5)}$$

Equation (6) can be obtained by combining equations (4) and (5).

Bi = log (Odd ratio)
So, Odds ratio = $e^{\beta i}$

Similar relationship can also be established if Xi is continuous.

**Identification and definitions of variables:** From focus group discussions and relevant literature explanatory variables have identified that might have leverage on the degree of people's dependency in the forest resources of Bandarban. To evaluate the factors affecting people's dependency in the forest resources of Bandarban, the dependent variable was Dependency. Dependency = 1 if the percentage of total household income was 20% and above from the forest resources and 0 otherwise. The associated explanatory variables were Forest income, Education level, Family size, Age and Occupation. Forest income= Forest income in thousand BDT, Education level = Number of schooling year, Family size = Number of family member per household, Age = Age of respondents in year and Occupation = 1 if respondents occupation is Jhum, 3 if Gardening (Practicing horticulture in the hills) and 2 otherwise (not related to forestry).

## RESULTS AND DISCUSSION

### Socio economic conditions of the respondents

**Demographic and educational status:** The study revealed that on an average age of the respondents was (39.75± 3.59) years and illiteracy rate is about 56.3%. Most of the respondent's education level is up to secondary level (**Table 1**).

**Family size and income:** The demography showed that on an average more than 6 people live in each family (calculated value 6.4 ± 0.46 individual) and monthly average income of the respondent is about (BDT 6,937.5 ± 1374.26) in the study area (**Table 2**).

**Occupation of the respondents:** Jhum or shifting cultivation in the nearby hills is the major occupation of the respondents in Bandarban district. Jhum or shifting cultivation (Jhum cultivation is also known as the slash and burn agriculture, is the process of growing crops by first clearing the land of trees and vegetation and burning them thereafter) followed by mixed fruit gardening were the main occupations of the respondents of Bandarban. About 75.0% of the respondents are associated with Jhum and crop cultivation of that area. They cultivate various crops in the nearby occupied hills. The lands are kept fallow for one or two years after harvesting of the cultivated crops. Mixed fruit gardening appeared as a prominent sector for income generation since 19.0% people mentioned it as primary occupation (**Table 3**).

A small portion of the respondents (6.0%) in this district is associated with non-forestry professions such as daily labor, teaching, engineer, business and service holder (**Table 3**).

**Table 1**: Demographic and educational status of the respondents.

| Name (District) | Age (Years) | Education level | | | | |
|---|---|---|---|---|---|---|
| | | Illiterate (%) | Primary (%) | SSC (%) | HSC (%) | B.Sc. (%) |
| Bandarban | 39.75± 3.59 | 56.3 | 6.3 | 31.3 | 6.3 | 0.0 |

**Table 2:** Family size and monthly average income of the respondents.

| Name | Family size (No./HH) | Monthly average income (BDT/HH) |
|---|---|---|
| Bandarban | 6.4 ± 0.46 | 6,937.5 ± 1374.26 |

**Table 3:** Primary occupation of the respondents.

| Name | Jhum (%) | Fruit gardening (%) | Agriculture (%) | Others (%) |
|---|---|---|---|---|
| Bandarban | 75.0 | 19.0 | 0.0 | 6.0 |

Forests are the source of livelihoods for hundreds of millions of people worldwide especially in developing countries (FRA, 2010). Forest has always played a vital role in the economy of the indigenous people of CHT (Chowdhury *et al.,* 2007; Rasul, 2007; Halim and Roy, 2006; Miah and Chowdhury, 2004; Chowdhury and Miah, 2003). Household fuel-wood, food, medicines, shelter building materials and agricultural implements are common uses of forest resources in Bangladesh (Jannat *et al.,* 2018). Shackleton *et al.* (2007) mentioned that millions of South Africans derived direct benefits from forests and the contribution is approximately 20% of their livelihood. They also noted that forest resources are not a means of alleviating poverty for millions of people, but rather that they provide resilience in their livelihoods, thus preventing intensification of poverty. Bahuguna (2000) found the differences in rural communities' forest dependency in the Madhya Pradesh, Orissa, and Gujarat states of India which has similarities with the present study.

Kamanga *et al*. (2009) stated that the poorest segment depends more on forest than the least poor group. Miah *et al.* (2012) reported that degradation of forest resources is constantly associated with deepening poverty and livelihood vulnerability. Miah *et al.* (2012) found that dependence on the forest resources was influenced by easier forest access, the number of foragers from a household and family size.

**Socioeconomic factors affecting people's forest dependency and livelihoods**

For the management and conservation of forest resources i.e. timber, fuel wood, Bamboo, Broom stick, medicinal plants, fish and other NTFPs (Non-Timber Forest Products) of Bandarban hill district, it is important to address the needs of the people whose livelihoods are heavily dependent on the forest resources. Thus, one of the major aims of this study was to identify the major socioeconomic factors that governed people's degree of dependency on forest resources. **Table 4** shows how the socioeconomic forces determined the local people's degree of dependency on forest resources. Of the six factors under consideration, Occupation, Forest income and Education level were found significantly contributing to a respondent's dependency on forest resources. The parameter estimate of Occu3 was 4.2438, which was significant at 5% level (**Table 4**). The result indicates that respondent's forestry related occupation is positively aligned with their degree of dependency on the forest resources of Bandarban district. As expected this finding indicates that, the log (Odds) of forest dependency of a respondent with a forest related occupation (Gardening/Horticulture/plantations in the hills) was greater than that of a respondent with a non-forestry occupation by 4.2438. Thus, we conclude that people were more likely to depend on forest resources if they worked in professions that required forest resources as inputs. Forest conservation is almost impossible without the support from the local community. Macura *et al*. (2011) reported that local people who had better access to forests, the forests were more aware of forest protection.

**Table 4**: Factors affecting people's dependency on forest resources.

| Variables | Estimate | Std. Error | Odds Ratio | z value |
|---|---|---|---|---|
| (Intercept) | -4.7197 | 4.9704 | 0.0089 | -0.95 |
| Age | -0.0495 | 0.1016 | 0.9517 | -0.487 |
| Occu2 | 0.9346 | 1.9945 | 2.5462 | 0.469 |
| Occu3 | 4.2438 | 2.0447 | 69.6721 | 2.076* |
| Education_level | -0.5523 | 0.2347 | 0.5756 | -2.355* |
| Forest_income | 1.2297 | 0.4378 | 3.4202 | 2.809** |
| Family_size | 0.7571 | 0.5004 | 2.1321 | 1.513 |

* Significant at 5% level and ** significant at 1% level ; Dependent Variable = Forest Dependence (1 if dependent, 0 otherwise); Age = Age of respondents (Years); Occu = Occupation (1 if Jhum or Agriculture; 2 if labour/ teacher/ business/ others (except forest related); 3 if Gardening/Horticulture/plantations in the Hills); Education_level = Education (No of schooling year); Forest_income = Forest income (in thousand BDT); Family_size = Family size ( Number of family members).

Respondent's education level was inversely related to their degree of dependency on the forest resources. The parameter estimate of Education level was 0.5523, which was significant at 5% level. An increased year of schooling of a respondent decreased his log (Odds) by -0.5523 (**Table 4**). The reasons might be two firstly, an educated respondent might have better understanding about the importance of nature conservation and secondly, he might have managed to have a better and alternative income source elsewhere. This is an important finding in the sense that forest resources could be better managed if the forest dependent people could be educated. Similar findings were reported by Jannat *et al.* (2018) and Rahman *et al.* (2017) and Adhikari (2004) who mentioned that educated people are less dependent on forest resources.

## CONCLUSION

People from developing countries like Bangladesh are directly or indirectly depend on forest resources for their daily needs. For this, it is important to evaluate identification of the driving factors that affect their livelihoods (Rabiul *et al*., 2020). We summarize that people's income, education and forest dependency are

the major factors which significantly affect their perceptions and attitudes towards forest conservation and sustainable management. People should be motivated, focusing on the socio-environmental benefits from forest, to divert their negative attitudes towards forest conservation. Conclusively, we recommend that consideration of socio-economic factors of the local communities who are living around the forests is important for future policy formulation and decision making process towards sustainable management and conservation of forests in developing countries like Bangladesh.

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## COFLICTS OF INTEREST

No potential conflict of interest was reported by the authors.

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