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Dry forest based livelihoods in resettlement areas of Northwestern Ethiopia

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ABSTRACT

While the importance of forests for livelihoods has long been well-recognized, empirical knowledge of the factors influencing the extent and diversity of household engagement in the extraction of forest products across different socio-economic groups remains limited. In this paper, we use primary data collected through a household survey of 180 households in a resettled dry forest areas of Northwestern Ethiopia. The paper mainly aims at identifying the main drivers of household behavior regarding collection of main forest products in the context of dry forest environment. A multivariate probit analysis was used to explain variation in household participation in collection of different forest products. The results show that households' participation in collection of different forest products is significantly determined by a combination of household demographic characteristics, ownership of oxen and of cows, proximity to forest, access to health and school infrastructure, resettlement history and self-reported change in standard of living. The estimation results also suggest households most likely to engage in collection of forest honey, gum, and wood for fuel and other purposes are those located farther from the forest. Policy implications and outlook for further study are discussed in the paper.

1. Introduction

Forests provide a wide range of goods and services to people living in both developed and low-income countries. However, in the context of low-income countries the literature on the socioeconomic importance of the forest presents a broader debate on poverty–environment relationship and underscores the dual goals of their sustainable use and protection. In this respect, it has been stressed by various researchers and international institutions (e.g. World Bank, 1992; Cavendish, 2000; Swinton and Quiroz, 2003) that the continued and heavy dependence of the poor on forests is the result of poverty and that in the end the poor are the victims of their own actions if the resource disappears or deteriorates in quality. Using survey of the literature on poverty–environment relationship, Durrapiah (1998) concluded that poverty is the main responsible factor for natural resource degradation in Sub-Saharan Africa.

Given this state of affairs, policy makers in the developing countries are often confronted with achieving the dual goals of reducing poverty and protecting the forest resource (Wunder, 2001; Coomes et al., 2005). As pointed out by Heady (2000), however, achieving the two goals simultaneously is difficult because reducing forest degradation requires limiting forest extraction activities of the poor who may not have other livelihood alternatives. One means of addressing this conflict is to look at how and to what extent the poor rely on forests and address the basic causes of dependence through, for instance, designing need based sustainable community based management of the forest resources. In line with this, previous studies in Latin America (e.g., Takasaki et al., 2004; Coomes et al., 2004), Sub-Saharan Africa (e.g., Fisher and Shively, 2005; Fisher, 2004; Cavendish, 2000) and Southeast Asia (e.g., Adhikari et al., 2004) have reported that the local population residing in the periphery of tropical forests are heterogeneous and that their forest extraction behavior is conditioned by a host of factors including access to infrastructure and local institutions. This obviously implies that one-size-fits-all kind of policy prescription cannot create the required changes for poverty reduction, forest protection or both.

As pointed out by Reardon and Vosti (1995), the relationship between poverty and environment depends, among other things, upon level and types of poverty being considered. Building on this notion of poverty environment link, various researchers such as Heady (2000), Adhikari et al. (2004), McSweeney (2005), Coomes et al. (2004) and Takasaki et al. (2004) indicated that a better diagnosis of the unique characteristics of the local population and of their heterogeneity in natural resource use behavior is essential for an appropriate understanding of the poverty–environment link in a given

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location. Moreover, most of the existing forest microeconomic studies come from a limited number of countries and are also based on mainly montane rain forests.

Ethiopia's dry forests host valuable flora and fauna species. Situated between highland montane forests and the lowland wetlands dry forests also provide an important protection for wetlands both inland and in the neighboring countries of Sudan, Somalia and Egypt (Lemenih, 2005). The dry forests of Ethiopia are known for their rich composition of different species of Acacia, Boswellia and Commiphora. The trees are important sources of commercially important gums and resins such as gum arabic, frankincense and myrrh. Ethiopia has enormous potential, and currently is one of the largest global suppliers of these products (Lemenih, 2005). The commercial gums and other valuable products from Ethiopia's dry forests are important sources of rural livelihood for many people (e.g. Lemenih et al., 2003; Lemenih, 2005).

Despite their continued beneficial contributions to society the dry forests are currently under severe threat of degradation. For example, in Metema district, where this study was conducted, the dry forests have been sharply dwindling over the past few years as a result of rapid human settlement and the resulting excessive use of the forest resources for different purposes. The dry forests in Metema district belong to the State *de jure* but it is *de facto* open access as a result of weak forest management and of poor enforcement of existing forest management rules and regulations. Unfortunately, our knowledge regarding why and to what extent the local people use different dry forest resources is limited.

This study has two interrelated objectives. First, it aims at identifying the key factors influencing perceived changes in living standards of the local population, and second, it explores the impact of household perception of change in living standard on the use of and dependence on dry forest resources in Metema district, where remnants of the dry land forests of the country are found.

The paper is structured as follows. In Section 2, the methods used for analyzing the empirical data are described. This is followed by description of the study area and the data used in the paper in Section 3. In Section 4, the results of the study are presented and discussed. Finally, the paper concludes with some policy implications and outlook for further research.

2. Data analysis

The choice of a relevant method of data analysis depends on the kind and measurement of the dependent variable. We have two dependent variables of main interest for this study: (1) perceived change in the standard of living of a household and (2) diversity of forest product types extracted by the household. Similar factors may influence both these outcomes. Hence, the strategy we chose was to first estimate determinants of self-reported change in standard of living and use the predicted values of the perceived change in living standard to explain participation in the extraction of the dry forest resources in the study area.

In particular, the first dependent variable was measured by directly asking the sampled households to respond to the question "how has your standard of living changed over the recent past?" Three response levels representing how the household's standard of living has changed were elicited. The three responses were improved, worsened, and unchanged standard of living. The perceived change in general standard of living is used as a proxy for change in poverty among the local population. Following McKelvey and Zavoina (1975), modeling these response options demands an application of a variant of an ordered probit model. The ordered probit model is built around a latent variable, which is related to observed variables as follows:

$$S_i^* = \beta' x_i + \in_i \tag{1}$$

where S_i^* is unobserved index of the ith household standard of living, β is a vector of parameters of the latent regression model, x a vector of factors influencing the households perceived change in standard of living and $\in$ a random disturbance term with zero mean and constant variance. The latent variable (S_i^*) exhibits itself in an observed ordinal categories (S_i), which could be coded 0, 1 and 2, respectively for an increased, unchanged and a decreased standard of living of the ith household. More specifically, $S_i^*$is related to S_i as follows:

$$\begin{aligned} S_i &= 0 \quad \text{if} \quad S_i^* \le \mu_0 \\ S_i &= 1 \quad \text{if} \quad \mu_0 \le S_i^* \le \mu_1 \\ S_i &= 2 \quad \text{if} \quad \mu_1 \le S_i^* \le \mu_2 \end{aligned} \tag{2}$$

where μ's are the unobservable threshold parameters to be estimated along with the regression coefficients (β). When an intercept term is added to the regression, μ_0 is normalized to a zero value (Greene, 2000) such that only $J-1$ additional parameters are estimated together with the regression coefficients.

Given this classification, the probability that the ith household finds himself in one of the standard of living levels is determined as follows:

$$\begin{aligned} P[S_i = 0] &= \Phi(-\beta' x_i) \\ P[S_i = 1] &= \Phi(\mu_1 - \beta' x_i) - \Phi(-\beta' x_i) \\ P[S_i = 2] &= 1 - \Phi(\mu_1 - \beta' x_i) \end{aligned} \tag{3}$$

where Φ is the cumulative normal distribution such that the sum of all probabilities is equal to 1. Since the dependent variable is an ordered variable, an ordered logit/probit model can be used. In this paper we used an ordered probit model to analyze the empirical data.

The second dependent variable was measured by asking the respondent the major types of forest based activities in which he/she has been engaged in the year preceding the survey. The list of main dry forest products collected by the sample households included fuel wood, timber, wood for making farm implements and household furniture, grass, honey and gum. The probability that a household participates in the collection of these products can be represented by a multivariate probit model. As in the ordered probit case, the observed response variable is related to utility generated by collecting a product or products from the dry forest. This utility is, however, latent (unobservable) and, thus, the model is formulated as follows:

$$F_{ij}^* = \alpha_j' x_i + \in_{ij} \tag{4}$$

where $F_{ij}^*$is an index which governs whether or not the ith household collects the jth forest product. A discrete response variable then can be built around the index variable. In other words, a household collects a given forest product if $F_{ij}^* > 0$, and does not collect otherwise. As such, the probability that the ith household collects the jth forest product ($F_{ij} = 1$)can be specified as follows:

$$\Pr ob\left[F_{ij} = 1\right] = \Phi\left(\alpha_j' x_i\right) \tag{5}$$

where X denotes a vector of the determinants of participation in gathering different forest products and $\in_{ji}$ denotes error terms with zero mean and constant variance. The correlation coefficient between two error terms indicates that unobservable factors like skills and knowledge are related between two forest-based activities and that if it is statistically significant, there are gains in estimating the two decisions together.