

## Poverty and safeguarding of the environment

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### Abstract

In most poor countries, poverty affects more the rural populations but with various degrees. The bordering populations of the forests because they earn a part of their income from forest products seem to be privileged compared with the other rural populations. This situation highlights the dilemma between poverty alleviation and environment safeguarding especially for the most vulnerable populations. Indeed, because they don't have enough resources and sometimes no access of the arable land, they earn a large part of their incomes from forests. This paper analyzes the link between poverty and environment through the importance of the forest resources in household incomes of nine (9) villages surrounding forests in the area of cascades in Burkina Faso. To illustrate this link, an ordered polynomial probit will be used to analyze the marginal effects of forest income and socioeconomic characteristics on households' poverty status.

**Key Words:** Ordered polynomial logit, marginal effect.

### 1. Introduction

The analysis of household surveys conducted in recent years show that the incidence of poverty in Burkina Faso has increased in recent years from 43.4% in 2003 to 46.3% In 2009. Like most poor countries, poverty in Burkina Faso remains a rural phenomenon. Nevertheless, many differences exist between different areas. These disparities are particularly due to the availability of arable land and good rainfall essential to agriculture.

Some studies show that the rural populations surrounding forests earn a part of their income from the forest. This is important especially for the poorest households. Thus, exploitation of the forest would be a strategy for these households to cope with poverty. This could affect the conservation of exploited resources.

In this paper we show that the exploitation of forest resources by the poorest households is a fact. However, this practice depends on the socio-demographic characteristics of these households. The exploitation of the forest is the use of poor households when they have no other potential sources of income including income from agriculture. This analysis is based on a sample of 281 households from nine (9) villages, bordering four (4) forests of the Cascades region in Burkina Faso.

First, we present the characteristics of households in the sample before presenting the model specification and the analysis of the results from estimating this model. Finally, we discuss the findings and recommendations in terms of economic policies.

## 2. Data source and sample characteristics

The data used in this study come from the database of Poverty and Environment Initiative Network (PEN) surveys performed in Cascades region in Burkina Faso. PEN is a research project on the link between poverty and environment. This project has achieved in 2007 from a series of surveys in the region of Cascades from households bordering four forests distributed among four (4) villages. In addition, these forests are divided between two areas: one benefiting from the contribution of the Association of Forest Resource Management (AGEREF) and the three others do not benefit from the contribution of this association. The AGEREF was set up by the authorities to involve local populations in the management of forest resources. This involvement aims to improve the management and the sustainability of forest resources in order to benefit to communities.

These surveys have estimated annual income of sampled households in 2007. The following tables present the profile of the sample of households by key variables of the study.

**Table 1: Characteristics of the sample**

	Area A		Area B		Total	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
<i>Share of forest income</i>	10.9%	0.13	7.2%	0.07	9.1%	0.11
<i>Share of agricultural income</i>	38.4%	0.29	52.9%	0.25	45.4%	0.28
<i>Share of wage income</i>	8.2%	0.18	1.0%	0.04	4.7%	0.14
<i>Household Size</i>	9	5	11	6	10	5
<i>Per capita income</i>	182 425	205 864	146 877	138 843	165 220	177 219

**Source:** Author's calculations according to PEN data

The analysis of the main variables of the analysis mainly shows that the sampled households are households with a dominance of farm income in total income (45.4%). Analysis by area reveals that farm income represents more than half of total income (52.9%) of households in Area B against 38.4% in Area A. Moreover, wage income remains the lowest income of the sampled households (4.7%). However, this share is larger in area A (8.2%) than area B (1.0%).

Forest income represents on average 9.1% of the total of households income. This share remains relatively higher in area A (10.9%) compared to the area B (7.2%). Moreover, the surveyed households are on average larger sizes (10 members), households in Area A are on average 11 members against 9 members for those who belong to area B. This is of course characteristic of rural households; the average sizes exceed the national average of 5.6 members.

**Table 2: Distribution of the sample between the practice of salary activity and possession of arable land**

	Number of Observations	Salary activity		Possession of arable land	
		Yes	No	Yes	No
<i>Area A</i>	145	57(39.3%)	88	46(31.7%)	99
<i>Area B</i>	136	32(31.6%)	104	43(23.5%)	93
<i>Total</i>	281	89	192	89	192

**Source:** Author's calculations according to PEN data

Among the 145 households in area A, 57 households have at least one member who participates in salary (or 39.3%), 46 area households have cultivable land (31.7%). The proportion of households owning farm land in Area B (31.6%) is relatively close to that of Area B. Contrary to area A under a quarter of households in area B (23.5%) have a member who participates in salary.

The indicator of well being retained as part of this study is per capita income. Table 3 shows the evolution of the share of forest income in total income of the five quintiles. The first quintile is the quintile of poorest households while the fifth quintile is one of the richest households. The distribution analysis of the evolution from the forest income in total income shows that it is the middle class households (third quintile) who have the highest average share. With the notable exception of this, the share of forest income in the aggregate income appears to decrease with the standard of living of households. This could confirm the hypothesis that the poorest households are more dependent on forest income that households less poor.

**Table 3: Evolution of the share of forest income according to quintiles income**

	Number of Observations	Area A		Area B		Ensemble	
		Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
<b>1st Quintile</b>	56	13,6%	0,13	8,9%	0,08	11,5%	0,11
<b>2nd Quintile</b>	56	10,5%	0,09	7,0%	0,07	8,5%	0,08
<b>3rd Quintile</b>	56	16,4%	0,20	7,2%	0,07	12,1%	0,16
<b>4th Quintile</b>	56	8,0%	0,08	6,7%	0,05	7,2%	0,06
<b>5th Quintile</b>	57	6,0%	0,07	6,4%	0,06	6,1%	0,07

*Source: Author's calculations according to PEN data*

To test the validity of the strong dependence of the poorest households' forest income, Section two analyzes the determinants of households belonging to different quintiles.

### 3. Specification and model estimation

We use an ordered multinomial logit model to estimate the determinants of membership in quintiles of households. The choice of this model is explained by the fact that the quintiles are based on the importance of per capita income of households. To estimate the model, we make three assumptions with the expected signs of explanatory variables.

*Hypothesis I: The share of forest income remains higher in the total income of the poorest households;*

*Hypothesis II: The household access to arable land decreases its probability of being poor (its dependence on forest resources).*

*Hypothesis III: The poverty level of a household depends on its demographics. Specifically, we analyze the impact of gender of household head, household size and the presence of an employee in*

the household on its poverty status. Because it reduces the dependence of the household of forest resources, the presence of an employee in a household decreases the probability of being poor. Moreover, gender remains an important factor in the poverty status of households. Because they are excluded from the spheres of decisions and not having access to factors of production (especially land), women are a vulnerable population in rural areas. As a result, households headed by women are more likely to be poor than those headed by men.

At last, we consider that the probability to belong to one of the five quintiles depend on the area. We expect to analyze through this assumption the impact of the forest management on the households' poverty status.

The dependant variable is defined as follow:

$$Y_i = \begin{cases} 1 & \text{if household is member of quintile 1;} \\ 2 & \text{if household is member of quintile 2;} \\ 3 & \text{if household is member of quintile 3;} \\ 4 & \text{if household is member of quintile 4;} \\ 5 & \text{if household is member of quintile 5.} \end{cases}$$

According to the definition of the dependant variable, the reference quintile is the fifth quintile.

**Tableau 4: Model estimation results**

	Coefficients	Marginal effects				
		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
<i>Share of forest income</i>	-3.461129 (0.003)	-.5404188 ( 0.003)	-.2922319 (0.008)	.0113533 (0.774)	.2965072 (0.007)	.5247902 (0.004)
<i>Household Size</i>	--.0665931 (0.001)	-.0103978 ( 0.002)	-.0056226 (0.005)	.0002184 ( 0.774)	.0057049 (0.005)	.0100971 (0.002)
<i>Sex of household head</i>	-.9591059 (0.155)	-.1112577 ( 0.045)	-.0880145 (0.141)	-.036012 ( 0.447)	.0495459 (0.000)	.1857382 (0.232)
<i>Possession of arable land</i>	.0180501 (0.936)	.0028227 (0.936)	.0015217 ( 0.936)	-.0000638 (0.942)	-.0015482 (0.936)	-.0027325 (0.936)
<i>Presence of salary income</i>	-.3980699 (0.088)	. -.059429 (0.076)	-.0346065 ( 0.106)	-.0015867 (0.755)	.032471 (0.083)	.0631512 (0.102)
<i>Area</i>	-.2706165 (0.226)	-.0422539 (0.228)	-.0228488 (0.235)	.0008877 (0.781)	.0231831 (0.234)	.0410319 (0.226)
<i>Log likelihood</i>	-440.90012					
<i>Number of observations</i>	281					
<i>LR chi2(5)</i>	22.69					
<i>Prob &gt; chi2</i>	0.0009					

() Significance of the coefficients at 5%

The estimation results of the model show that the model is globally significant ( $\text{Prob} > \chi^2 = 0.0009 < 0.05$ ) at 5%. Because their P-values is higher than 5% , the sex of household head, the possession of arable land and the presence of salary income and the area are not significant at 5%. Thus, with the giving data we have, the determinants of membership in quintiles of households are summarized in the share of forest income and the household size. It should be noted that these two variables contribute negatively to the fact of belonging to the highest quintiles (positive coefficients' sign). It's means that these variables have the positive impact on the probability for a household to belong on the poorer quintiles.

These results confirm the hypothesis include the fact that the share of forest income is higher among poorer households. Moreover, the poorest households are still those who have the most members. When we consider the marginal effects of share of forest income and the size of households, we notice that theses marginal effects decrease from the fifth quintile to the first quintile. But, the marginal effect of the share of forest income is more important than the marginal effect of the size of households. An increase of one unit of share of forest income decreases the probability for a household to belong respectively to the fifth and the fourth quintiles by 0.54 and 0.29. However, the probability to belong to the second and the first quintiles increase respectively by 0.29 and 0.52,

An increase by one unit of a household' size decreases by 0.01 its probability to belong to the fifth quintile; but it increases its probability by 0.01 to belong to the first quintile. For the fourth and second quintiles, the impact of an increase of household' size is not significative.

#### **4. Conclusion and Recommendations**

This study highlights the importance of forest income in the income of local forests residents. This is especially important for the poorest households who derive much of their resources from these forests. Authorities aware of this reality have set up groups of forest users (FUG) and associations of forest resource management for more efficient management of forest resources. The study showed that the share of forest income of households in the area of activity of these associations (Area B) is relatively small compared to Area A. These structures through participatory management could help to preserve forest resources.

Households in the sampled villages bordering forests are essentially farm households seen the importance of agricultural income in their total income. Policies promoting agriculture could be initiated to ensure that these households could obtain their livelihoods from farm income. Therefore, they will have less recourse to other sources of income especially forest income.

#### **References**

Augus, D( 2000)" The Analysis of Household Survey: A microeconomic Approach to development Policy," Third edition, Johns Hopkins University Press.

Colin , A. and Pravin , K. (2010) "Micro econometrics Using Stata," Revised Edition, Stata Press Publication.

Dr Will, C." How do forests support, insure and improve the livelihoods of the rural poor?," Center for International Forestry Research(CIFOR), A research note

Arild, A. and Sven, W.( 2003)” Exploring the Forest—Poverty Link: Key Concepts, Issues and Research Implications,” CIFOR Occasional Paper No. 40.