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CONTRIBUTION OF NON-TIMBER FOREST PRODUCTS TO RURAL HOUSEHOLD INCOME IN ZAMBIA

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KEY POLICY POINTS

- Non-timber forest products (NTFPs) play an important role in supporting rural livelihoods and food security in Zambia. NTFP-dependent households are poorer, have younger household heads with lower levels of education, and are located closer to district towns than other rural households are. NTFPs are a particularly important source of income in Luapula, Northwestern and Western provinces.
- Income from woodfuel represented the greatest share of income for households that participated in NTFPs, and it was the most commonly reported business activity, with 68% of NTFP households reporting income from charcoal and firewood. NTFPs contribute an average of 32% to total household income among participants, with the poorest being more dependent on these sources.
- Given the widespread demand for woodfuel and other forest products, it is likely that rural households will continue to engage in the extraction and trade of NTFPs as a business activity. However, charcoal production, if left unchecked, could compromise the integrity of forests and adversely affect the availability of other NTFPs. In order to reduce households' reliance on charcoal/firewood as an income source, outreach efforts could promote other NTFPs such as wild honey, ants, and mushrooms as business activities. Mushrooms, ants, and caterpillars may particularly be important activities for female-headed households, as more female-headed households derived income from these sources.

INTRODUCTION: Forest products play an important role in supporting rural livelihoods and food security in many developing countries (Adhikari, DiFalco, and Lovett 2004). Pimentel et al. (1997) found that the integrity of forests is vital to world food security, mostly because of the dependence of the poor on forest resources. In Zambia many people living in and around forests harvest a range of products from forests for trade or consumption, with most households earning income from NTFPs as compared to timber, due in large measure to less expensive extraction technology and greater ease of access. The most commonly extracted and traded NTFPs include roof-thatching materials, wild honey, mushrooms, ants, caterpillars and medicinal plants. By contrast, timber is mainly exploited by commercial enterprises and urban elites who have sufficient capital and are well connected to the market (Mutamba 2008). Thus, participation in business activities related to NTFPs is more common among rural households.

There have been few studies on the role of forest products in rural livelihood in Zambia. Jumbe, Bwalya, and Husselman (2007) and Bwalya (2004) estimate the joint contribution of forest products (both timber and NTFPs) to total household income at 20.6% and 29.6%, respectively. This study focuses on the role of non-timber forest resources to rural livelihoods, because of their widespread use across Zambia to supplement farm income. The results have implications for both rural development strategies and forest management policies.

There were two objectives of this study. First, household survey data were used to estimate the share of NTFP income to total household income in rural Zambia. Second, statistical models were used to estimate the determinants of rural household

dependence on NTFPs for income. The implications are important for development interventions aimed at increasing rural household income and for sustainable forest management.

DATA AND METHODS: This study is based on data from the supplemental survey to the 1999/00 Post-Harvest Survey (PHS) of rural households conducted by the Central Statistical Office (CSO) and Food Security Research Project (FSRP) in 2008. The sampling frame of Standard Enumeration Areas (SEAs) was constructed using the results from the 2000 Census of Population and Housing. The sampling frame included all rural SEAs. A two-stage-sampling scheme was adopted. First, SEAs were selected from each district through a Probability Proportional to Size (PPS) selection procedure. A sample of 410 SEAs was drawn from a total of 12,789 SEAs nationwide. Second, systematic sampling was used to select households in each sample SEA. Data were collected from 8,094 households.

Households were asked to report income from a range of business activities, including the extraction and sale of charcoal/firewood, wild honey, mushrooms, and ants/caterpillars. Income from these NTFP activities was used to estimate their contribution to rural household welfare. Descriptive and econometric methods were used in the analysis.

RESULTS: About 6% (or 464) of the national sample of households reported income from NTFP activities. Participation was greatest in Luapula, Northwestern and Western Provinces, where between 16% and 20% of households reported income from NTFPs. Table 1 presents the average contribution of several forest products to household income for households that reported income from NTFP business activities. Charcoal/firewood was the greatest source of income (49%), followed by caterpillars (29%), honey (26%) and mushrooms (21%). A greater proportion of female-headed households participated in the collection and sale of mushrooms and ants/caterpillars (22% and 33% respectively), as compared to male-headed households (12% and 21% respectively). Male-headed households were more likely to participate in activities related to the collection and sale of charcoal/firewood and wild honey (71% and 75%, respectively), as compared to female-headed households (56% and 4%). Widespread participation in the extraction of woodfuel raises concerns about the integrity of forests and the long-term sustainability of charcoal production as a business activity. Appropriate outreach efforts and broader market development in other NTFPs could reduce reliance on charcoal as an income source and consequently ease environmental pressures from deforestation.

Table 1. Contribution of NTFPs to Household Income for Participating Households

NTFPs	Average share of total household income
Charcoal/firewood	49%
Ants/Caterpillars	29%
Wild honey	26%
Mushroom	21%

Source: Calculated from Supplemental PHS data (2008).

The primary sources of income were analyzed by dividing the sample of households that reported income from NTFPs into quartiles of total household income (see Table 2).

Table 2. Income Sources by Income Quartiles for NTFPs Households (000s of Kwacha)

Household income	Household income quartile			
	1st	2nd	3rd	4th
Total income	1110	2418	4337	12800
NTFP income	386 (37%)	776 (33%)	1466 (33%)	3226 (27%)
Agricultural income	462 (40%)	1030 (42%)	1582 (36%)	3744 (33%)
Employment income	23 (2%)	82 (4%)	94 (2%)	955 (6%)
Trading income	145 (13%)	396 (16%)	1010 (23%)	4576 (32%)
Remittance income	95 (9%)	133 (6%)	184 (4%)	331 (3%)

Source: Calculated from Supplemental PHS data (2008). n=464 (116 households in each quartile). Values in parentheses represent mean share of household income.

Overall, agriculture represents the greatest share of income across all income groups. Income from NTFPs was the second greatest source for all but the wealthiest households, and they represented an

average share of 34% of total household income among participants. The results reveal that households in the 4th (wealthiest) quartile earned more income from NTFPs than the 1st (poorest) quartile in absolute terms; however, the share of income from NTFPs was greater for poor households, indicating that the poor rely more on NTFPs to supplement farm income. These findings are consistent with similar studies (e.g., Shackleton 2006; Fisher 2004).

Determinants of household participation in NTFPs were estimated using a two-stage econometric model originally proposed by Cragg (1971). The model allows for separate estimation of the determinants of (1) the probability of household participation in NTFPs and (2) the contribution of NTFP income[1]. The results are presented in Table 3. The first column (probit) represents estimates of the determinants of participation in NTFP activities; the second column represents the unconditional average partial effect (UAPE) on the contribution of NTFP income.

Table 3. Determinants of Household Probability of NTFP Participation and Share of NTFP Income[2]

	Marginal Effects			
Variable	**Probit**		**UAPE**	
Intercept	n/a		n/a	
Age of household head	-0.001	***	-0.0003	***
Sex of household head	0.0142	**	0.008	***
Education level of household head	-0.0025	***	-0.0013	***
Household size	-0.0016		-0.0001	
Landholding size (ha)	1.0E-05		-4.0E-05	
Square of landholding size	-0.0035	***	-0.0001	
Log of value of assets (ZMK)	-0.0014	**	-0.001	***
Population density (persons/sq. km)	0.0002	***	3.0E-05	**
Distance to district town (km)	-0.0004	***	-0.0002	***

** and *** refer to statistical significance at 5% and 1%, respectively.

[1] We define household participation in NTFPs if any member(s) earned income from extraction and sale of any of the four NTFPs in the last 12 months prior to the survey. Contribution of NTFP income is calculated as the ratio of NTFP income to total household income.

[2] Eight province dummy variables were included in the model, although they are not included in the table above.

From a policy perspective, the UAPEs represent the overall expected impact of NTFP income on the variable of interest, and are therefore useful as a summary indicator. The probability of a household participating in NTFPs is significantly and negatively correlated with several human capital factors, specifically the age and educational level of the head of household. Thus, households participating in NTFP activities are more likely to have a male head who is relatively younger and with less education. Overall, the value of assets is negatively associated with participation in NTFPs and NTFPs income, reinforcing previous assertions that the poor are relatively more dependent on NTFPs for livelihoods.

The negative sign of square of landholding size (second column) suggest that initially, an increase in landholding size leads to increased probability of participation in NTFPs; however, the rate at which participation increases with landholding size diminishes with greater landholdings. Thus, measures that would increase access to land for rural households would have mixed effects at the household level. Overall, population density is positively associated with both participation in NTFPs and the contribution of NTFP income to household income. This is possibly because population centers provide greater market opportunities for trade in NTFPs. Distance from the homestead to the district town (proxy for market access) is negatively and significantly related with likelihood of participation in NTFPs and NTFP contribution to household income.

This underscores the relevance of market access for rural smallholder household participation in off-farm income earning activities.

CONCLUSIONS: The results indicate that NTFPs are a common and important source of income in Zambia, particularly for households in Luapula, Northwestern and Western provinces. NTFPs account for 34% of total household income for households that reported income from these sources, with the wealthy earning more income from the resource than the poor. However, NTFPs represent a greater share of total incomes of the poor than the wealthy. It is, therefore, important that

poverty alleviation strategies and forest conservation policies take into account the central role NTFPs play in the livelihoods of the rural poor. Non-wood products such as mushrooms, ants, and caterpillars are particularly important for female-headed households, which underscores the need for outreach activities and market interventions to recognize the gender implications of household participation in NTFPs. The significance of market access in this study demonstrates that rural infrastructure development such as road development could increase the contribution of NTFPs to incomes of the rural poor. However, the prominent role of charcoal and firewood in rural business activities raises concerns about the long-term sustainability of woodfuel production and use, as widespread deforestation would compromise both ecological integrity and off-farm income opportunities. Thus, there is a need for careful policy considerations to strike a balance between rural welfare improvement and natural resource sustainability. Promotion of non-wood NTFPs has the potential to reduce households' reliance on charcoal/firewood for income, as evidenced by their substantial contributions to income. In addition, improving rural households' access to adequate land could ease environmental pressure from NTFP extraction.

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