

Research Application Summary

**Contribution of non-wood forest products in income and livelihood of rural communities in the dry lands of Central Darfur State, Sudan**

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**Abstract**

Non-wood forest products (NWFPs) have a considerable contribution to the livelihood systems and local economies of rural and urban societies. This study attempted to provide information on the contribution of NWFPs to the income of the rural livelihood and economic development in Central Darfur State, Sudan. A household survey was conducted using stratified sampling technique. The questionnaire covered different issues related to the household socio-economic characters and NWFPs types. Descriptive statistics and econometric model were used for data analysis. Multiple linear regressions were used to assess the impact of the socioeconomic factors on annual net return from NWFPs earned by collector. The study showed that NWFPs contribution to the total household's annual income was about (54%). The collection was dominated by female (63%). Security, level of education and family size showed positive and significant effect on annual net return from NWFPs in Central Darfur State.

Key words: Annual net return, collector, non-wood forest products, rural livelihood

**Résumé**

Les produits forestiers non ligneux (PFNL) contribuent considérablement aux moyens de subsistance et aux économies locales des sociétés rurales et urbaines. Cette étude a fourni des informations sur la contribution des PFNL au revenu et conditions de vie rurale, et au développement économique dans l'État du centre de Darfour, au Soudan. Une enquête a été menée auprès des ménages à l'aide d'une technique d'échantillonnage stratifié. Le questionnaire couvrait différentes questions liées aux caractères socio-économiques des ménages et aux types de PFNL. Des statistiques descriptives et un modèle économétrique ont été utilisés pour l'analyse des données. De multiples régressions linéaires ont été utilisées pour évaluer l'impact des facteurs socio-économiques sur le rendement annuel net des PFNL réalisé par le collecteur. L'étude a montré que la contribution des PFNL au revenu annuel total du ménage était d'environ (54%). La collecte était faite majoritairement par les femmes (63%). La sécurité, le niveau d'éducation et la taille du ménage ont eu un effet positif et significatif sur le rendement annuel net des PFNL dans l'État du Darfour central.

Mots clés: Rendement net annuel, collecteur, produits forestiers non ligneux, moyens de subsistance ruraux

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## Introduction

Rural households throughout the developing world use food, fuel, fodder, construction materials, medicine, and other products from forests and natural non-cultivated environments to meet subsistence needs and generate income (Kaimowitz, 2003; World Bank, 2004; Sunderlin *et al.*, 2005). Quantifying the contribution of non-wood forest products (NWFPs) income to total income is important for understanding the livelihood of rural people, the extent and determinants of poverty and inequality, the benefit implications of the degradation of natural resources and designing effective development and conservation strategies (Angelsen and Wunder, 2003; Jagger *et al.*, 2012). Overcoming the current gaps in knowledge in these areas requires moving beyond the current primarily case study-based state of knowledge on the importance of natural resources to overall livelihoods strategies.

Previous studies published over decades brought the researchers' attention to "the hidden harvest", the diversity of goods provided freely from the non-cultivated ecosystems such as natural forests, woodlands, wetlands, lakes, rivers, and grasslands (Cavendish, 2000; Campbell *et al.*, 2002). Literature identifies three primary roles for NWFPs in supporting rural livelihoods; supporting current consumption, providing safety-nets in response to shocks and gap-filling of seasonal shortfalls and providing means to accumulate assets and insure food security (Angelsen and Wunder, 2003). Despite the identification of the three primary roles for NWFPs, income by the growing literature, methodological heterogeneity and unfairness in study locations make it difficult to generalize the overall importance of NWFPs income to rural livelihoods and poverty alleviation in developing countries. There is also a growing concern among development organizations to exploit the economic potentials for rural economic development.

About 80% of the population of Central Darfur State live in the rural areas, they depend on rain-fed subsistence farming and grazing. For the people of this status, NWFPs have a considerable contribution to their income and livelihoods. Therefore, this study was motivated by the questions: (i) how much does the NWFPs income contribute to rural household's livelihood improvement and poverty alleviation?, (ii) what are the background variables which affect the magnitude and relative importance of NWFPs income?, and (iii) what are the lessons and recommendations that could be drawn to promote the rural household livelihood and income in Central Darfur State?. Hence, the overall purpose of this study was to provide a quantitative analysis of the contribution of NWFPs to rural livelihood and economic development in the dry lands of Central Darfur State, Sudan.

## Research methodology

Three localities in Central Darfur State were chosen, Zalingei, Garcilla and Bindisi. In each locality three locations were selected based on a set of criteria; abundant distribution of NWFPs income sources, widespread extraction of NWFPs, local community involvement in NWFPs collection and representative gradients of resources access. Primary data were collected through field survey conducted during December 2016. About 90 households, 30 from each locality, based on discussion of local leaders, were directly interviewed. The field survey was started with key informant interviews including experts and individuals who have firsthand information about the NWFPs income generation. The household survey was conducted using stratified sampling technique. The questionnaires covered different issues related to the household socioeconomic; type of NWFPs, quantities of resources extracted, prices of the NWFPs sold and consumed, NWFPs income and expenditure, access to market support services, policy and institution issues. Furthermore, group discussions were held in

the selected villages with the local leaders, association leaders and extractors to complement and verify the data collected through the household survey. Quantities of NWFPs collected were estimated in one season. The collector's gross and net cash income were determined for each product individually on annual basis. Gross annual cash income was calculated based on collector's recall of weekly sales of the products. Sack cost was subtracted from gross annual cash income to obtain net annual cash income per household. Computation was done case-by-case and then averaged, allowing for the measurement of variation around the mean. The data from questionnaires were transformed into codes. Statistical Package for Social Sciences (version 20) software was used in the analysis. Frequency distribution and percentage were calculated as a tool of analysis for interpreting the qualitative information collected from the respondents. Multiple linear regressions were used to assess the impact of the socioeconomic factors on annual net return from NWFPs. The multiple regressions were mathematically expressed according to the following equation:

$$R_i = \alpha_0 + \alpha_1 A_i + \alpha_2 C_i + \alpha_3 E_i + \alpha_4 F_i + \alpha_5 S_i + \alpha_6 N_i + \alpha_7 U_i + \alpha_8 D_i + \varepsilon_i$$

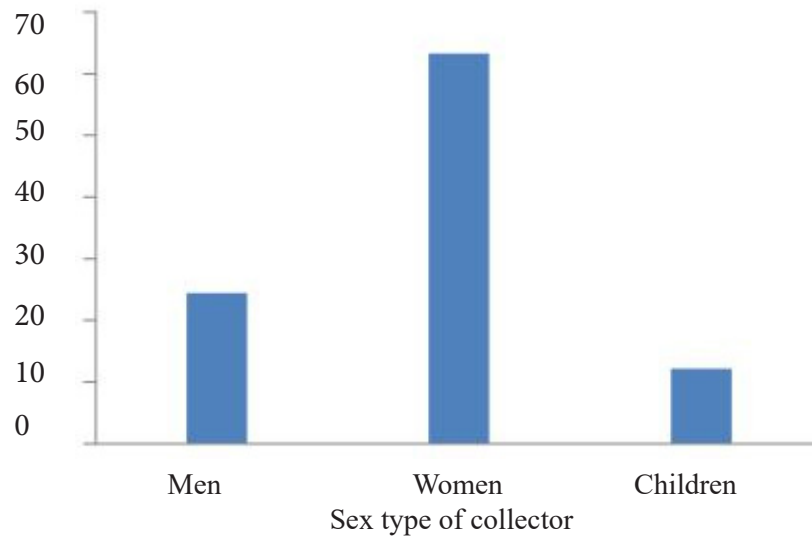
Where R was the annual net return from NWFPs during the survey period in 2016, (one period return),  $i$  represented the dependent and independent variables.  $\alpha_{1-8}$  represented the coefficient of the variables; represented the intercept term, and  $\varepsilon$  was an error term. A, C, E, F, S, N, U and D represented age of collector, collector sex, level of education of NWFPs producer, family size, seller sex, National Forest Corporation (NFC) qualifications, security in the three localities and distance from NWFPs producer's villages to nearest forests, respectively. Descriptions of the variables needed for collector of NWFPs are listed in Table 1.

## Results and discussion

The majority of the respondents said that women were more involved (63%) in NWFPs collection than men (Fig. 1). However, collection process of NWFPs in Africa is shaped by the economic, social, cultural and geographical contexts in which the population lives

**Table 1. Description of the variables used for non-wood forest products net return model (R<sub>i</sub>)**

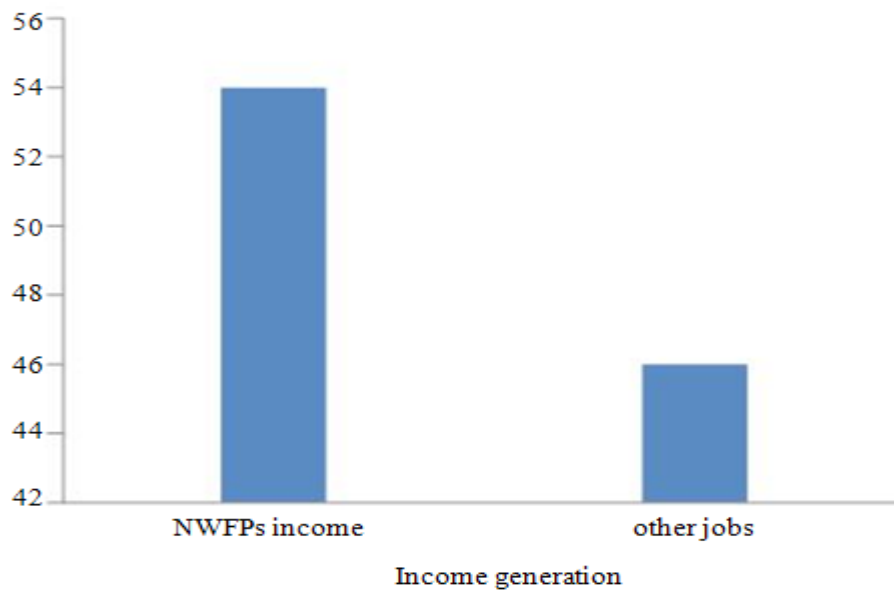
Variables	Description	Type	Expected sign
Age of collector	NWFPs collector age per years	Continuous	+
Collector sex	NWFPs collector sex (male = 1. Female 0)	Dummy	-
Level of education	NWFPs years of education per years	Continuous	+
Family size	NWFPs family size per persons	Continuous	+
Seller sex	NWFPs seller sex (male =1, female = 0)	Dummy	+
NFC qualifications	If NWFPs response to NFC qualifications (yes =1, No =0)	Dummy	+
Area security	If area around forest secure to NWFPs (secure = 1, Non-secure =0)	Dummy	+
Distance to forests	Distance from NWFPs villages to near forest per kilometers	Continuous	+



**Figure 1. Distribution of respondents involved in non-wood forest product (NWFPs) collection**

(Abdelrahim, 2015). Children contributes 12% of the collectors. In Ghana, Falconer (1994) mentioned that children too depend on forest products for food and income. They are widely involved in basket making and fruit collection in Sudan in order to make money needed to meet school fees and other expenses.

Figure 2 showed that the contribution of NWFPs sales to the total interviewed household's annual cash income was 54% while other jobs contributed only 46%. The easy access to the resource enables many households to generate income from non-wood forest products activities. In general, that was in agreement with FAO (1995) which reported that NWFPs contributed considerably to the livelihood systems and local economies of rural and urban



**Figure 2. Contribution of non-wood forest products (NWFPs) to household total income generation**

societies. Elsiddig (2007) also stated that non-wood forest products contributed significantly to the livelihood of the community as a source of income generation in Jebel Marra, in Sudan. But, in contradiction, Adam *et al.* (2013) mentioned that the potential of NWFPs contribution to the development still limited and open to doubt.

Tables 2, 3 and 4 show multi-regression results. All coefficients of socioeconomic variables had the expected signs. Out of eight coefficients of socioeconomic variables, three had positive and significant effects on net annual returns gain from NWFPs; security, level of education and family size. They were statistically different from zero. The coefficients of the age of collector, Forest National Corporation (FNC) qualifications and distance to forests were positive but statistically not-significant, implying no impact on annual returns gain from NWFPs. On the other hand, coefficient of collector sex has had negative but not-significant effect in return. This negative effect explained by the majority of women in the activities of NWFPs collection. Significance of the model indicated by F-value depicted that overall regression model was good for the present data. R2 values indicated that variables included in the model explained variation in annual return by 50%. In general, and according to the awareness of the prevailing conditions in the area of the study, the annual return in the three localities was seriously affected by insecurity in the Central Darfur state that resulted in considerable reduction of annual returns from NWFPs.

Figure 3 shows that the majority (81%) of respondents thought that security was the major problem hampering collection of NWFPs. The result was in partial agreement with Newton *et al.* (2006) who stated that various conditions affect access and marketing of NWFPs such as conflict with traditional rights, high pressure on resources, inadequate understanding by the people, state regulations, and a none transparent market accessed by many individual sellers with poor organization.

**Table 2. Descriptive statistics of the continuous variables used for non-wood forest products (NWFPs) net return model**

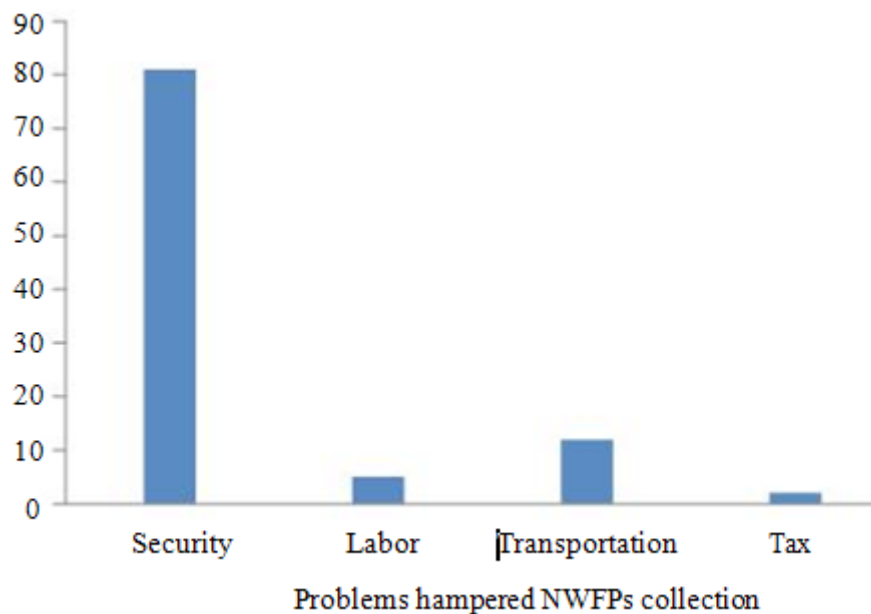
Variables	Minimum	Maximum	Mean	Std. deviation
NWFPs return	64.00	51600.00	3428.84	8060.31
Age of collector	18.00	80.00	43.60	15.30
Level of education	1.00	5.00	1.42	1.03
Family size	2.00	20.00	8.74	4.26
Distance to forests	1	27	7.25	6.02

**Table 3. Percentage of dummy variables used for non-wood forest products (NWFPs) net return model**

Variables	1 (%)	0 (%)
Collector sex	67.8	32.2
Seller sex	68.9	31.1
NFC qualifications	57.8	42.2
Area security	80.0	20.0

**Table 4. Estimated coefficients for non-wood forest products (NWFPs) return model**

Variables	Coefficient	t-statistics	Significance
Age of collector	40.6	0.820	0.415
Collector sex	-3606.3	-0.932	0.355
Level of education	2490.6	2.716	0.008**
Family size	425.4	2.050	0.044*
Seller sex	716.2	0.185	0.854
FNC qualifications	468.6	0.280	0.781
Area security	12744.3	4.978	0.000***
Distance to forests	107.3	0.903	0.370
Constant	-7999.5	-2.407	0.019*
N	90	R <sup>2</sup>	0.502
Durbin-Watson	1.636	F	8.817
P	0.000		

**Figure 3. Problems hinder non-wood forest products (NWFPs) collection**

### Conclusion and recommendations

Non-wood forest products (NWFPs) were the main source of income for most of the population of the area. They contributed 54% of the area's annual income. More women (63%) were involved in NWFPs collection compared to men. The major constraint to collection of NWFPs was insecurity in the area. To promote rural household livelihood improvement based on NWFPs income in Central Darfur State, the study recommended an increase in awareness by policy makers and planners of the

importance of NWFPs to development programmes in the region. It was also recommended that NWFPs that have potential to alleviate poverty be promoted and developed. Further, it was recommended that all factors that affect income generation from NWFPs be addressed and that more research on NWFPs development be conducted to identify and support groups likely to adapt research outcomes.

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