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# Socio-Economic Factors Influencing Household on Non-Timber Forest Product Dependency from Chilimo Forest, Ethiopia

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ABSTRACT

Non-timber forest products are very important in providing basic needs, cash deposits, and home consumption to forest-adjacent communities. Several socio-economic factors influence household dependence on non-timber forest products. This study focused on analyzing the socio-economic factors determining a household's dependency on non-timber forest products from the Chilimo forest in Dandi, Ethiopia. Descriptive statistics and logistic regression were applied to analyze the data. The main NTFPs extracted by local communities in the study area included honey, fodder, wild vegetables, medicinal plants, firewood, and charcoal. Thus products are used for home both consumption and commercial purposes. Availability of the non-timber forest product also influenced its extraction from the forest ($\chi^2$ (2,432) = 4.973, p<0.084). A majority of households (87%) who got NTFPs explained that this resource availability had decreased when compared to ten years ago, thus diminishing their chances of getting NTFPs possibly due to the degradation of the forest. Based on the results from logistic regression factors like age, the career of a household head, and distance to the market had a significant positive correlation on household NTFPs exploitation dependency. Household that lives near the forest has more advantages to extracting NTFPs from the forest than those who live further away. Also, land size, formal education, and household need for fuel wood were positively correlated with the local household, dependency on NTFPs from the Chilimo forest.

## INTRODUCTION

Non-timber forest products are very important in providing basic needs, cash deposits, and home consumption to forest-adjacent communities (Newton, Watkinson, & Peres, 2012), (Kimaro, 2013). Non-timbers are very important for local household energy sources, employment, medicine, and subsistence needs of the majority of local communities, especially in developing countries (Sinha, Nanda, Kumar, & Gaudo, 2013). Non-timber forest products, broadly as any forest-derived tradable products that do not include commercial timber, are known for having a significant contribution to the economies of the local communities (Debela, 2019; Shackleton & Shackleton, 2004). Various socioeconomic factors influence household dependence on non-timber forest products. Among these factors, are age (Newton et al., 2012); sex of the household head; land tenure, and income (Dewees, 2013; Rahman, 2021). The other factors that also influence household dependence include labor availability, distance to the forest, involvement in non-agricultural activities, and incorporation into the market (Mcelwee, 2008), (Gatiso, 2019; Maua, et al, 2018).

An understanding of the frequency of utilization and pattern of households' non-timber forest product dependency will help researchers and policymakers to design empirically informed interventions in diversified households' livelihood and encourage sustainable resource utilization to foster a balance between non-timber forest product dependency and nature conservation (Dida, 2010; H. Garekae, 2017; Mulenga, 2011; Shemnga, 2015). This study introduced for determining and analyzing the socio-economic factors that influence local household adjacent to Chilimo Forest, on the

dependency of non-timber forest products. The findings of this study will be important in designing specific interventions that can minimize the dependency of local communities on non-timber forest products, planning, and policy development for sustainable management strategies.

## MATERIALS AND METHODS

### Study Area

The study area Chilimo forest is located in West Shewa Zone, Oromiya Regional State, and located seventy-five kilometers west of Addis Ababa on the Addis Ababa to Naqamte road. The total population of the district is about 209,554. Chilimo Forest is the first forest priority area in Ethiopia. It is found 78 Km Southwest from the capital city of Ethiopia, Addis Ababa, between 38005'E to 38015'E and 9000'N – 10008'N, with elevations, ranging between 2000 - 3200 m a.s.l. (Abate, Shiferaw, & Tesfaye, 2015). The forest represents the dry Afro montane forests in the central plateau of Ethiopia. The economic activities of most of the local households of the district are based on mixed farming and NTFP collection. Agriculture mostly depends on seasonal rainfall and uses an ancient traditional form of farming.

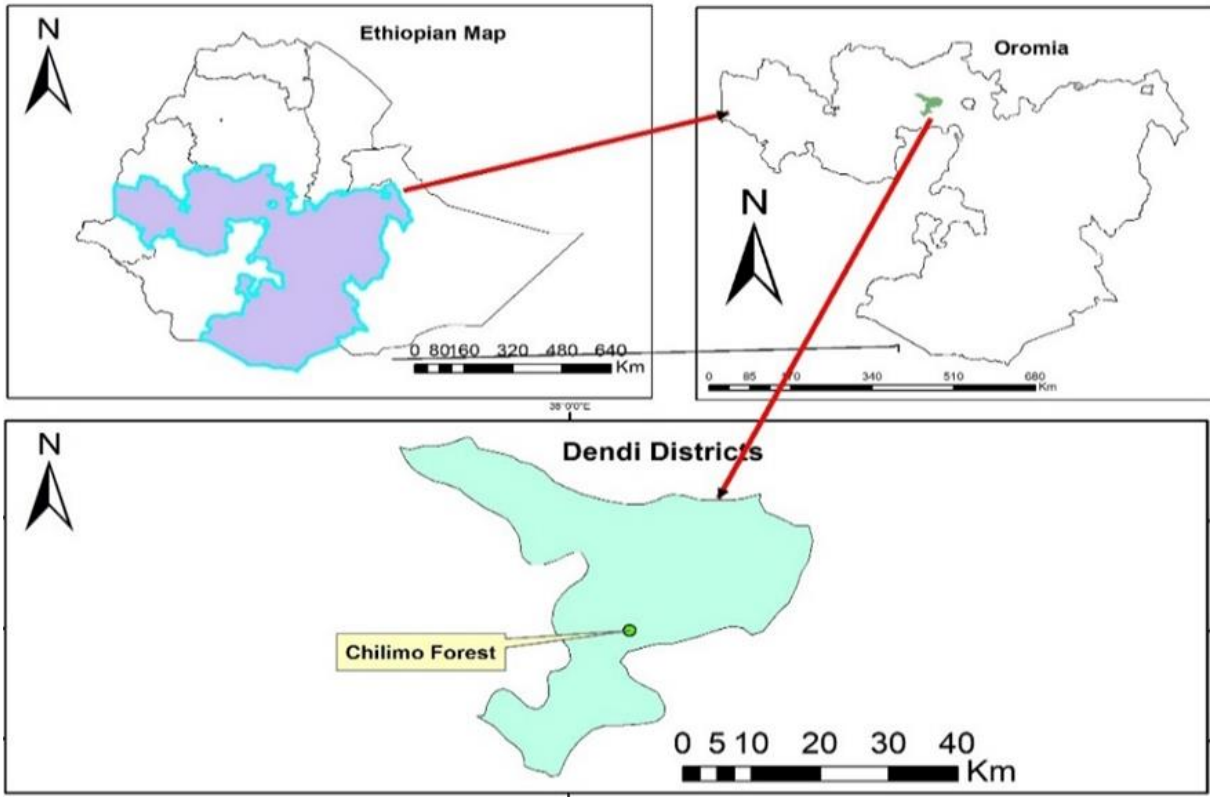


Figure 1. Map of the study area

Forest resource management was faced with heavy challenges by the local people who use the forest resource without any protection (Tadesse et al., 2014). If the local community does not have the right to use forest resources and does not have the security of access in the future, they will progress to use forest resources, in an unmanageable way. Access rights to forest resources and ownership are essential factors in encouraging sustainable forestry (Belete & Molla, 2019). PFM depends on the idea to allow greater autonomy and management for the local community participating in forest resource protection.

### Sampling Techniques

The study area was selected purposively based on household dependency on non-timber forest products and the availability of NTFPs in the study area. A simple random sampling technique was used to select respondent households from the total households that cooperated to protect the forest in the study area. Finally, based on the (Yemane, 1967) formula with a 93% confidence interval and 7% precision level.

$$n = \frac{N}{1+N(e)^2}$$

Where:

n = Total Sample Size

N = Total Population

e = Level of Precision/Significance

The key respondent during the household survey was the head of household for they are presumed to be the decision-makers for the households in access to NTFPs (Kajembe, 1994; Walle & Nayak, 2022). Primary data were collected from the field through semi-structured questionnaires and market surveys. Checklists for key informant interviews, focus group discussions, and direct observation were used to allow cross-checking of the collected information. Face-to-face interviews were performed using semi-structured questionnaires. Ultimately, 431 sampled households with valid answers were used for analysis.

**Data Analysis**

Both quantitative data and qualitative data were used to analyze the collected data, using descriptive statistics and with the help of SPSS software version 13. All data that were collected from the household interviews were coded and entered in the SPSS data sheet and Excel. The results were presented in the table, chart, and figure. The different variables entered were analyzed to obtain descriptive statistics. A binary regression analysis was used to analyze qualitative data generated from the questionnaires. A Binary logistic regression model was used to determine the socioeconomic factors influencing households' NTFP dependency (Hosmer Jr, Lemeshow, & Sturdivant, 2013; Garekae, 2017). Below is the description of the model used to determine the socioeconomic factors influencing NTFP dependency.

$$\text{Logit (y)} = \ln\left(\frac{\pi}{1-\pi}\right) = \alpha + \beta_1 X_1 + \beta_2 X_2$$

Where $\pi$ is the probability of an outcome, $\alpha$ is the Y-intercept, $\beta$'s represent the regression coefficients, X's represent the set of independent variables, and $e$ = 2.71828. For this study, independent variables age, distance of household residency, distance from market, education, land size, and occupation were used to describe households' NTFP dependency.

## RESULTS AND DISCUSSION

**Household profiles**

In the study, area female dominates the distribution of NTFPs collectors and sellers. Based on the respondent's responses 56.86% of NTFPS collectors were female while 43.14% were male in the study area. In this study, about 46.1% of NTFPs collectors and traders in the study area were aged between 18-35 years, followed by 33.3% who were between 36-45 years and 20.6% who were above 45 years. The majority (81.4%) of NTFP collectors and traders were married, followed by 18.4% who were single study area. The results showed that 44.1% of respondents have attained primary levels of education, 21.6% attained secondary school education, 3% attained college and 31.3% have not attended even formal education. About 54% of the local households said that they were unemployed while only 12.60% of households were employed on a full-time basis. It was described that agriculture was the main important economic sector and provided livelihoods to a high proportion of the communities and provides livelihoods to a high proportion of the population.

**NTFPs available from Chilimo Forest**

This study found that the major NTFPs consumed and marketed by households in the study area include honey, fodder, wild vegetables, medicinal plants, firewood, and charcoal. Among major NTFPs available from Chilimo Forest, firewood was the most collected NTFP, which account for greater than 80.15% followed by honey (63.24%), fodder (54.41%), wild edible plant (38.24), charcoal (36.03%), and medicinal plant (34.56%) in the study area, Chilimo Forest in Dandi. Firewood is the main source of energy for most rural areas in sub-Saharan Africa for cooking and heating. This finding indicates that firewood is used by most rural households and plays an important role in rural life. It is used both for self-consumption and to a certain extent as a source of income.

Table 1. Medicinal plant, parts used and disease traditional cured

| Scientific names | Vernacular name | Part used | Disease cured |
|---|---|---|---|
| *Echinops kebericho* | Kebericho | Roots | For treating toothache, vomiting, and headache |
| *Hagenia abyssinica (Bruccie) T.F.Gmel* | Kosso | Fruits | Tapeworm |
| *Opuntia ficus-indica (L.) Miller* | Ejersa | Leaves | For killing malaria |
| *Acacia nilotica (L.) Willd ex.De* | Qordimo | Shrubs | Mich |
| *Croton macrostachyus Del* | Bakanissaa | Leaves, roots | Gonorrhea, Stomach ache |
| *Oncocalyxschimperi (A.Rich.) M.Gillbert* | Haarmo-goraa | Leaves | Wound |
| *Euphorbia tirucalli L.* | Qinchib | Roots, Latexs | Used as treatment of tumor/cancer |
| *Euclea racemosa L.* | Qorica budaa | Roots | treating evil spirit, evil eye |

Source: Survey data

Availability of the NTFP also influenced the extraction of NTFPs from the Chilimo forest ($\chi^2$ (2,432) = 4.973, p<0.084). The majority of households (87%) who got NTFPs explained that this resource availability had decreased when compared to ten years ago, thus diminishing their chances of getting NTFPs possibly due to the degradation of the forest. The result of this study demonstrates that the distance of local household residency to the border of the Chilimo forest was significantly correlated with the harvesting of NTFPs. The utilization of NTFPs as a source of primary income also significantly influenced their collection from the forest. The households rely on their adjacent forest for products such as firewood which is used by almost 95% of the households as well as fodder 61% of the local households have livestock and therefore rely on the NFPs like fodder from their adjacent forest (Franzel, Carsan, Lukuyu, Sinja, & Wambugu, 2014; Odiakha, 2015). About 75% of the respondent local households have participated in farming which has also been recognized as the main occupation for NTFP collectors in most developing countries like southeastern Nigeria (Suleiman et al., 2017; Bisong & Ajake, 2001; Malleson et al., 2014), livelihood dependency on non-timber forest products (Soe & Yeo-Chang, 2019). So, it might be that those households engaged in NTFP collecting mainly when their workload is low. In Ethiopia, the small-scale farms indicate that the smaller land sizes make households depend on the forests to enlarge their income levels by selling and use of NTFPs.

**Household dependence on forests for NTFPs**

About 90% of households in the villages got NTFPs from the Chilimo forest. The distance of local households' residency from the Chilimo forest was significantly related to the harvesting of NTFPs ($\chi^2$ (16,431) = 51.24, p<0.001). Household heads that live near the Chilimo forest were more benefited from the forest more than other households living far away from the Chilimo forest. The hours spent by households to obtain NTFPs from the Chilimo forest influenced the chance of local households going to the forest for NTFP ($\chi^2$ (10,431) = 37.07, p<0.001.

Table 2. The trend in the number of households getting NTFPs with an increase in distance from forest to house

| Household getting NTFPs from Chilimo forest | Distance (km) |
|---|---|
| 40 | >3.5km to 4km |
| 80 | >3km to 3.5km |
| 120 | >2.5km to 3km |
| 160 | >2km to 2.5km |
| 200 | >1.5km to 2km |
| 240 | >1km to 1.5km |
| 280 | <1km |

Source: Survey data

Reliance on NTFPs was negatively correlated with the level of education; land size; and distance to the forest of the household head. But, there was a positive association between reliance on NTFPs with household age, occupation, and the distance between the markets from the residency of the local household head. The outcome of the logistic regression indicated that age, a career in a local household, and distance from the market were positively correlated with NTFPs collection from the Chilimo forest. The age of the respondent household had a positive association with the extraction of NTFPs. This expressed that the older household is more probably went to the adjacent forest than the youth from the Chilimo forest. It is surprising since the old age people own children who are more probably collect the NTFPs from the Chilimo forest adjacent to them on their behalf. However, some of the NTFPs like medicinal plants are more known by older people for their sources in the forest, and old age peoples are more possibly extract them from the Chilimo forest. The Same observation has been explained in Kenya, and it was revealed that the elderly people were more probably to extract the NTFPs because of their compressive knowledge of medicinal plants in the forest (Cameron, 1996), (Langat & Maranga, 2016). Table 3 shows the result of logistic regression on factors that influence local households to depend on NTFPs.

Table 3. Results of the logistic regression of factors influencing dependence on NTFPs

| Variables | B | S.E. | df | Sig. | Exp(B) |
|---|---|---|---|---|---|
| Age | 0.18 | 0.09 | 1 | 0.04 | 1.2 |
| Distance to market in Km | 1.86 | 0.61 | 1 | 0 | 6.41 |
| Formal education in year | -0.76 | 0.28 | 1 | 0.01 | 0.47 |
| Distance from forest | -341 | 1.62 | 1 | 0.04 | 0.03 |
| Land-size | 1.17 | 0.43 | 1 | 0.01 | 0.31 |
| Occupation (1 Farmer) | 2.79 | 1.52 | 1 | 0.07 | 16.24 |

Model $X^2$ =230.37, df=67, p=0.00;

Hosmer & Lemeshow: $X^2$ = 3.18, df =8, p=0.92

$R^2$ = 0.42

The overall accuracy of classification (%) = 97.7

Source: Survey data

The result revealed that an additional unit increase in education results in a decrease in the possibility of household dependence on the Chilimo forest with a factor of 0.467, which imply that household with more education, is less probably to rely on the Chilimo forest for NTFPs. Most of the studies have shown that NTFP extractors in many developing countries are inclined to have comparatively less educational levels (Gharai & Chakrabarti, 2009; Sherstobitoff, 2009), for example, in Bolivia, Mexico, and Northeastern Honduras, less educational levels were explained by both commercial and non-commercial NTFP extraction by households with median education of 3.6 years (Maua, 2018). A unit increase in land size results in a decrease by a factor of 0.311 in the likelihood that a household will depend on the forest. Similar findings have been reported in Sundarbans that the local household reliance on the forest was highly associated with the size of land, and the landless household was the most dependent on the forest (Abdullah, Stacey, Garnett, & Myers, 2016; Dafar, 2018). There was a negative association between distance from their adjacent forest border and reliance on NTFPs. An additional unit increase in distance results in decreases in the odds by a factor of 0.033 in the probability that a local household will rely on the forest. This association is anticipated because the far distances from their adjacent forest add to the expense of extracting NTFPs in terms of time expended.

## CONCLUSION

The result of this study showed that the local households who are living near to Chilimo forest were significantly reliant on the Chilimo forest adjacent to them for NTFPs. About 90% of local households derive benefits from the Chilimo forest.

Based on logistic regression model results three variables influenced dependence on NTFPs from the forest in a negative manner, namely number of levels of education, size of land they owned, and distance from the forest to homestead. The study also showed that three variables positively associated with reliance on NTFPs namely household head age; the occupation of the local household and also a distance from the market to the household's homestead.

It is important to understand the above specific socio-economic conditions of forests adjacent to households before or when implementing forest policy on sustainable participatory forest management at the local level. A high level of dependence on NTFPs and time spent by households to collect NTFPs among others cannot be ignored when preparing forest management plans. This shows that the forests are a critical resource base for the local community hence the potential motivation to participate in forest management that enhances the flow of the NTFPs for it will be in their best interest to do so, at the same time motivating them to conserve the forest. Therefore, the forest policymaker should take into consideration these aspects when preparing or revising the participatory management plans. The forest resource users may come up with local initiatives which may be more effective than the forest policy on sustainable forest management.

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