Original Article

# Economic and Medicinal Importance of Nontimber Forest Products at Yoni Chiefdom, Sierra Leone

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## Abstract

**Objectives:** Nontimber forest products (NTFPs) have been used for a wide range of things, even as they are linkable to numerous conventional ideologies and cultures. Information on the diversity and value of NTFPs in an environment is beneficial to the community, scientists, and decision-makers. Unfortunately, such vital information about the study area is unavailable in literature. **Methods:** This study identified the various types of NTFPs, determined the economic significance of NTFPs, and evaluated the role of NTFPs in the study area. Based on their origins, 24 NTFPs in the study area were divided into different categories. The amount of money which households made through the marketing of NTFPs was minuscule, and a large portion of it was being utilized in paying children's school fees, supplies, clothing, food, and medicine. The study demonstrated that residents of the study area often used NTFPs as key alternatives to pharmaceutical, contemporary medicines in the treatment of ailments, while a smaller percentage of residents of the chiefdom utilized the stems, seeds, and flowers and other parts acquired from NTFPs in the treatment of diseases, leaves, and roots were the most commonly utilized parts. **Results:** As a result of the findings, it is advised that NTFPs be developed into value-added products that are capable of attracting high market values and serving as alternative livelihood options. **Conclusions:** Community stakeholders involved in NTFP-related activities should be trained in the use of NTFP extraction, processing, storage, and conservation facilities, so as to maximize profit and ultimately ensure the sustainability of such products.

**Keywords:** Forest, medicine, nontimber, rural, Sierra Leone

## Introduction

Forest-based nontimber product NTFPs are a broad category of economic or subsistence items derived from forests but not including timber. They could also be thought of as broadly speaking biological resource-derived products. Forest products other than wood NTFPs include a variety of plant and animal items that are gathered from forests, savannahs, and other types of natural vegetation. Canoes, wood carving, local house construction, fencing supplies, and firewood are all mentioned in this description, but industrial lumber is not included.

Humans have used NTFPs for a variety of uses since the dawn of time including food, fodder, fiber, traditional medicine, agricultural amenities, domestic materials, and construction materials. Many of these uses are connected to particular cultures.[1-3] Plants or plant parts that have a perceived economic or consumption value high enough to induce their removal from the forest are considered NTFPs. To put it another way, they are objects that have been taken from forest areas for personal use or to be sold (excluding, saw timber, pole timber, natural gas, oil, sand, gravel, shale, and building stone all of which are covered under other sections). It can also be referred to as all the materials and goods that are taken out of the forest environment and used in domestic settings, sold, or that have social, cultural, or religious importance.[4]

Due to a lack of knowledge regarding the distribution methods utilized to get the products to final consumers, describing these products may be problematic. Unlike timber-based products, NTFPs are available in a wide range of places, such as health food stores and pharmacies. For many generations, the plants

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have helped people. According to Peerzada *et al*., NTFPs can sometimes have a large economic impact on local and regional economies. Given the current trajectory of NTFP commerce and use, this impact will undoubtedly increase greatly over the coming decades.[5]

According to Ogunkunle *et al*. of the vast plant and animal resources, only very few (<10%) have been domesticated, the majority being in the wild.[6] Recently, efforts have been made to develop more thorough comparative assessments and analyses that link the use of NTFP to livelihood systems and other facets of the sociocultural and economic frameworks in which their production and use take place. These efforts drew on data from numerous local studies. Some of these start with hypotheses drawn from pertinent theoretical bodies and aim to test them. Others, have been more exploratory and intended to develop theories.[7-9] The usage of NTFP has been connected to theories of household livelihood strategies in other works.[10-15] The elements hypothesized to account for variations in NTFP use include the availability of alternative income-earning possibilities, optimal use of labor and other resources, risk management, and the balance between subsistence and income aims.

Some studies from Africa revealed that NTFPs are a crucial source of revenue for the entire household economy. According to Kamanga *et al*., in Malawi, fruit trees grown naturally and artificially on public property contribute up to 15% of all income (cash and subsistence).[16] The provision of consumptive forest environmental products (such as fuel wood, farm equipment, construction materials, wild food items, herbs, and medicines) accounts for 27% of the income in northern Ethiopia, while wild plants contribute 10% to households' total food consumption in the Republic of Congo.[17]

In a very thorough analysis of forest environmental income in Zimbabwe, Cavendish discovered that forage plants, medicinal plants, diverse wood and grass uses, wild foods (plants and animals), and even termite and soil uses contributed to 35% of the typical rural income. Even though it is challenging to compare these studies because the majority of them only looked at a select group of forest products, they all support the economic significance of NTFPs. However, there are few pertinent studies of the semi-arid tropics in western Africa. Recent studies have only looked at the availability of NTFPs in Burkina Faso the local significance of NTFPs to rural residents and the location and acquisition of NTFPs in Benin. Others examined the trade in a specific species in Benin.[18]

The majority of rural Sierra Leoneans now spend a large portion of their time collecting and gathering NTFPs. NTFPs predominately encompassed the Yoni Chiefdom Tonkolili District Northern Provinces of Sierra Leone. The extent of the forest cover and its products has drastically decreased as a result of slash-and-burn agriculture, illegal logging, and rural growth, which puts the availability of NTFPs in chosen communities in Yoni Chiefdom at risk. There is also no documented research on the economic and medicinal importance of NTFPs in the five (Mathoir, Masanka, Matopie, Masethleh, and Makomba) communities of the Sierra Leonean Yoni Chiefdom which was selected for this study.

Because the economic significance of NTFPs in Sierra Leone has not been widely studied and documented, it is difficult to comprehend how they fit into rural communities' livelihood plans. Rural livelihoods are associated with socioeconomic features of households, such as household wealth, household composition (such as the proportion of women), and the percentage of adults with formal education, as well as with external factors such as access to infrastructure, markets, forests, and among others. The present study, therefore, focused on identifying the various types of NTFPs in the study area, determined their economic significance, and evaluated the role of NTFPs in traditional medicine in the area.

## Materials and Methods

### Description of the study area

Yoni Chiefdom is a "Class A" chiefdom located in Sierra Leone's Northern Tonkolili District [Figure 1]. It has roughly 360 villages and 12 sections, a population of 11,511 people (SSL, 2015), a gender distribution of 54,620 men and 57,891 women, and a density of 92.09 persons/km$^2$. There are two regions in the chiefdom, Yoni mamaylah and Yoni mabanta. Yoni mamaylah is divided into eight sections: Masengba, Foindu, Malumpor, Yoni, Kaindama, Mamaka, Mayira, and Makorgba. Yoni mabanta is divided into four sections: Ronietta, Makeni Yoni, Petitu, and Magbafth [Figure 1]. Majority of the lands are flat and undulating, covered in farm bushes and forest patches. In addition to human settlements, the predominant land use is the cultivation of upland rice, groundnuts, hunting, gardens, and vegetables. The locals also have a tradition of engaging in animal husbandry through the raring of sheep, goats, and chickens.

The primary occupations are petty trading, particularly in agricultural products, and a variety of government positions such as teaching, nursing, and administration. Even though

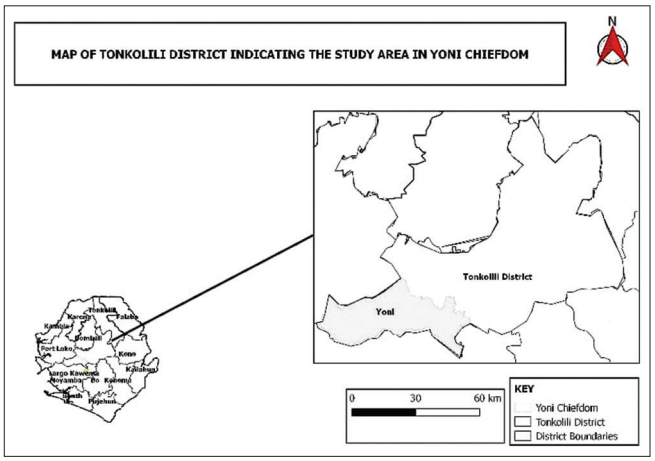


**Figure 1:** Map of Tonkolili District Showing the Location of Yoni Chiefdom. (Inset is the Map of Sierra Leone Showing the Location of Tonkolili District)

Islam and Christianity are the two main religions practiced by the citizens of Yoni Chiefdom, many of the indigenous male (young or old) population of Yoni belong to the PORO "secrete" society, while the females (young or old) are also members of the BONDO "secrete" society. Although the chiefdom is home to speakers of different tongues such as Krio, Mende, Fullah, Limba, Madingo, and others, Themne is the most common in the Yoni Chiefdom. Although the exploitation of NTFPs in the targeted villages began before the 19th century, it is generally believed that NTFP consumption is the primary source of livelihood support in the Yoni Chiefdom's targeted communities.

## *Mathoir community*

The Mathoir Community [Figure 2] is situated in Yoni Chiefdom of Tonkolili District, Northern Province of Sierra Leone. It is a sizable village with about 500 finished mud homes, the majority of which have zinc roofs. According to a quick count, Mathoir is home to roughly 1718 people, 761 of them are men and 957 of whom are women. The terrain of the Mathoir village is largely flat, with around 25% of the area being mountainous toward Rokimbie by the gravel quarry. The settlement's layout is distinctive; some of the homes are situated along both sides of Bo and Freetown Road, and there are numerous bushes throughout the community that are primarily farm related. The Mathoir community is divided into two sections: Mathoir Line and Old Town. Mathoir Line has one primary school, and Old Town has one. In the space between the two communities, two secondary schools – one a Catholic Mission and the other an Islamic Mission – are located. The Mathoir community has three mosques and one church. Muslims make up the majority of the population, which is primarily dependent on trade and agriculture. Mathoir hosts a "Luma" day, a general marketing day that starts on Friday, where locals from the group of villages that are far from major cities come to sell and buy goods for the week at a designated location adjoining villages concerned. There are two health centers in Mathoir, as well as community water faucets.

## *Masanka community*

Masanka community [Figure 2] is located in Mamaka section, Northern provinces, Tonkolili District, Yoni chiefdom. It is located along the Freetown-Masiaka highway. The community has a population of roughly 657 individuals, of whom 325 are men and 332 are women, and occupying 250 households. The community of Masanka has two junctions, one in the Old Town where the RC primary school is located and the other by the Junior Secondary School. The community also has two mosques, one of which is at the junction and the other at the Old Town. There is also a community center in the Old Town The community is surrounded by a secondary forest which is situated on a flat land and the inhabitants are primarily farmers, with a few involved in petty trading. About 100 hectares of their land is leased to the MIRO forestry company, which employs the majority of the youth.

## *Matopie community*

The Matopie community [Figure 2] is located in the Yoni chiefdom Patiyu part of Sierra Leone's Northern Province Tonkolili District. Approximately 250 houses make up the community of Matopie, which has a total population of 598 people – 290 men and 308 women. There is just one elementary school in the community, which is dominated by the Bamba and Fofonah families. Muslims make up the majority of the population and the only mosque in the community is

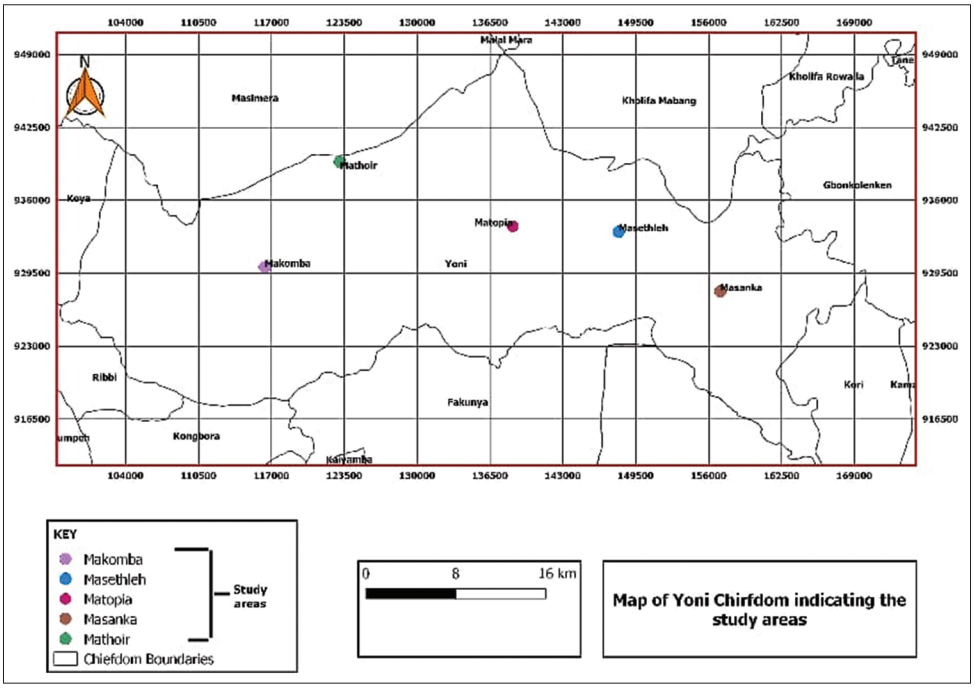


**Figure 2:** Map showing locations of the five selected communities in yoni chiefdom

constructed at the village's center. The entire community relies on a small stream near the village's entrance for their domestic use. The vegetation of the community is predominantly farm bush and majority of the human population are farmers and petty traders.

### *Masethleh community*

Masethleh community [Figure 2] is located between Royanka and Masanka, along the Freetown-Masiaka Highway. The community has 137 houses and a total population of 461 people, of whom 225 are men and 236 are women. The majority of Masethleh population are Muslims and the community has three mosques this community's land topography is flat, and it is surrounded by a secondary forest and an oil palm plantation. The community relies on natural sources of water, such as wells and streams which often dry up during the dry seasons.

### *Makomba community*

This community [Figure 2] is located halfway between the upper and lower Yoni. Farmlands are located on either side of the road going to this settlement. Makomba community has a small human population of roughly 131 people – 80 men and 51 women, with about 21 dwellings with thatched roofs. The topography is undulating and the village is surrounded by secondary forests. There is a single Islamic primary school, community center, water tap, mosque, and no health center at the entrance of the village while approaching Masanka. There are also some compartments of forest plantations belonging to MIRO Forestry Company around the community. The community is also bordered by secondary forests and banana plantations and patches of swamps.

This work focused on the following NTFPs because they are the most commonly and frequently exploited in the chosen communities:

i. Honey
ii. Rattan
iii. Mushrooms
iv. Fuelwood
v. Bush meat.

## Research design

The research design adopted for this study is deemed suitable due to the nature of the objectives and the data obtained (which was used to investigate the exploitation, trade, and medicinal uses of NTFPs within the five communities investigated).

### *Sampling procedure*

A purposive sampling method was used to select five 5 communities. These communities were chosen for sampling because NTFPs are reportedly more heavily exploited there than in some other regions of the district in focus, while key respondents were randomly sampled to elicit their views based on the objectives of the study.

### *Sample population*

To determine the precise number of responders, a preliminary visit was undertaken to each of the selected communities. Key respondent groups (collectors, users, and traders in NTFPs) were chosen using a purposive sampling technique, and respondents within those groups were randomly selected for data collection. In all of the communities investigated a total of 130 persons were sampled [Table 1]. Questionnaires were administered to respondents with varying levels of education, age, and sex. Ethnic background, marital status, and occupation are shown in Table 2.

## Data collection

To gather important information, both primary and secondary data were gathered. Direct interviews and semi-structured questionnaires were used to gather primary data. Desk research was used to acquire secondary data.

## Data analysis

Statistical Package for Social Sciences (SPSS) version 16 (IBM) and Excel Spreadsheet 2007 were used to analyze the collected data. Bar charts, pie charts, and tables were used to display the data after analysis. A descriptive analysis of the role played by NTFPs in traditional medicine and economy of the 5 communities was also carried out.

# Results and Discussion

## Nontimber forest products found in the selected communities

The five communities that were chosen for the study had 24 various NTFPs [Table 3]. These NTFPs were discovered in the field using their local names which were later translated to the corresponding scientific names for ease of use in the scientific community.[19]

They include *Elaeis guineensis, Dialium guinense, Salacia senegalensis, Cercopitheru stantalus, Discorea multiflora,*

**Table 1: Number of respondents from each community in the study area**

| Name of communities | Targeted number of respondents | Sample population | | | Actual number of respondents sampled | Percentage of sampled respondents |
|---|---|---|---|---|---|---|
| | | Exploiters | Traders | Medicinal | | |
| Mathoir | 40 | 18 | 12 | 6 | 36 | 90 |
| Masanka | 29 | 15 | 11 | 3 | 29 | 100 |
| Matopie | 25 | 14 | 9 | - | 23 | 92 |
| Masethleh | 20 | 9 | 7 | 4 | 20 | 100 |
| Makomba | 16 | 14 | - | 1 | 15 | 93.8 |
| Total | 130 | 70 | 39 | 14 | 123 | 94.6 |

**Table 2: Demographic characteristics of Respondents**

| Variables | Mathoir | Masanka | Masethleh | Matopie | Makomba |
|---|---|---|---|---|---|
| Sex, *n* (%) | | | | | |
| Male | 29 (80.6) | 22 (75.9) | 13 (65) | 20 (80) | 10 (66.7) |
| Female | 7 (19.4) | 7 (24.1) | 7 (35) | 5 (20) | 5 (33.3) |
| Total | 36 (100) | 29 (100) | 20 (100) | 25 (100) | 15 (100.00) |
| Age bracket, *n* (%) | | | | | |
| 15–19 years | 0 | 5 (17.2) | 0 | 0 | 0 |
| 20–29 years | 0 | 7 (24.1) | 9 (45) | 1 (4.3) | 6 (40.0) |
| 30–49 years | 7 (19.4) | 8 (27.6) | 0 | 0 | 2 (13.3) |
| 50 and above | 29 (80.6) | 9 (31.0) | 11 (55) | 22 (95.7) | 7 (46.7) |
| Total | 36 (100) | 29 (100) | 20 (100) | 23 (100) | 15 (100.0) |
| Education, *n* (%) | | | | | |
| Primary | 4 (11.1) | 3 (10.3) | 6 (30) | 2 (8.7) | 2 (13.3) |
| Secondary | 4 (11.1) | 4 (13.8) | 2 (10) | 2 (8.7) | 2 (13.3) |
| Tertiary | 0 | 4 (13.8) | 0 | 0 | 1 (6.7) |
| Tec.Voc | 2 (5.6) | 1 (3.4) | 0 | 0 | 0 |
| None | 26 (72.2) | 17 (58.6) | 12 (60) | 19 (82.6) | 10 (66.7) |
| Total | 36 (100.0) | 29 (100) | 20 (100) | 23 (100.0) | 15 (100.0) |
| Ethnicity, *n* (%) | | | | | |
| Temne | 25 (69.4) | 23 (79.3) | 14 (70) | 20 (87.0) | 8 (53.3) |
| Mende | 6 (16.7) | 4 (13.8) | 0 | 1 (4.3) | 2 (13.3) |
| Limba | 5 (13.9) | 2 (6.9) | 6 (30) | 2 (8.7) | 5 (33.3) |
| Total | 36 (100.0) | 29 (100.0) | 20 (100) | 23 (100.0) | 15 (100.0) |
| Marital status, *n* (%) | | | | | |
| Married | 29 (80.6) | 24 (82.8) | 10 (50) | 20 (87.0) | 6 (40) |
| Divorsed | 3 (8.3) | 2 (6.9) | 0 | 1 (4.3) | 4 (26.7) |
| Single | 1 (2.8) | 1 (3.4) | 6 (30) | 2 (8.7) | 2 (13.3) |
| Separated | 3 (8.3) | 2 (6.9) | 4 (20) | 0 | 3 (20) |
| Total | 36 (100.0) | 29 (100.0) | 20 (100) | 23 (100.0) | 15 (100) |
| Occupation, *n* (%) | | | | | |
| Farming | 24 (66.7) | 16 (55.2) | 11 (55) | 19 (82.6) | 5 (33.3) |
| Trading | 8 (22.2) | 12 (41.4) | 9 (45) | 4 (17.4) | 8 (53.3) |
| Others | 4 (11.1) | 1 (3.4) | 0 | 0 | 2 (13.3) |
| Total | 36 (100.0) | 29 (100.0) | 20 (100) | 23 (100.0) | 15 (100.0) |

*Agaricus bisporus, Discorea Sp, Eremospothia moacropa, Trema orientalis, Bambusa,* and *Ailonthus excelsa* [Table 3].

According to the community where they were discovered, the NTFPs were grouped by categories. Mathoir community had seven NTFPs, Masanka had eight, Masethleh had nine, Matopie had seven, and Makomba had eight NTFPs. The discovered NTFPs however frequently overlap among the five communities [Table 4].

Adepoju, *et al*. stated that the predominant plants utilized or their families tend to rely upon the species structure of the zone.[20] This research is related to the ones conducted by other researchers which reported a variety of NTFP resources that are used by rural communities, such as fuel wood, construction wood, edible fruits, edible herbs, edible insects, medicinal plants, bush meat, bee honey, reeds for weaving, and grass hand brushes.[21-27]

While a lesser number of respondents purchased the processed NTFPs from middlemen and then sold them to their end consumers, a bigger proportion of the targeted respondents in the five communities harvested and processed NTFPs before bringing them to market. This suggests that the majority of NTFPs were harvested, processed, and then sold to customers in the market [Table 5]. Harvested NTFPs were utilized to make food for everyday consumption or medicines to treat illnesses. Some are used as ruminant feed, while others, like rattans, are used to make domestic goods such as chairs and carpets that are marketed locally [Table 6].

The findings of this study are comparable to those of a study by Barfoot (2006), which found that many of the harvested items are forest botanicals that are consumed for personal consumption or traded for profit in the food products sector. Some of the most lucrative NTFPs being gathered and sold to established markets around the world are berries, herbs, and mushrooms. Essential oils, honey, nuts, seeds, spices, coffee, tea, and saps are some other dietary items.

## Economic benefits of nontimber forest products

According to an economic benefits analysis, the Mathoir community's targeted respondents profited from NTFPs in

**Table 3: Nontimber forest products identified in the selected communities**

| Local names | Scientific names | Living | Nonliving |
|---|---|---|---|
| Black tombla | *D. guinense* | √ | |
| Malombo | *S. senegalensis* | √ | |
| Monkey | *C. stantalus* | √ | |
| Bush yam | *D. multiflora* | √ | |
| Mushroom | *A. bisporus* | √ | |
| Wild cocoa | *Discorea* spp. | √ | |
| Wild palm fruit | *E. guineensis* | √ | |
| Honey | *Anthophila* spp. | | √ |
| Rattan | *E. moacropa* | √ | |
| Palm wine | *E. guineensis* | | √ |
| Charcoal | *T. orientalis* | | √ |
| Bamboo | *Bambusoideae* | √ | |
| Fuel wood | *A. excelsa* | | √ |
| Bush plum | *A. laurina* | √ | |
| Fish | *Siluriformes* | √ | |
| Termite | *Isoptera* | √ | |
| Bush potato | *I. batata* | √ | |
| Rubber | *H. brasilensis* | √ | |
| Gbangba | *C. siberiana* | √ | |
| Freetambo | *C. maxwelli* | √ | |
| Kofi | *S. juglanitolia* | √ | |
| Bush guava | *P. guajava* | √ | |
| Grass-cutter | *T. swinderianus* | √ | |
| Palm oil | *E. guineensis* | | √ |

√ = confirmed. *D. guinense*: *Dialium guinense*, *S. senegalensis*: *Salacia senegalensis*, *C. stantalus*: *Cercopitheru stantalus*, *D. multiflora*: *Discorea multiflora*, *A. bisporus*: *Agaricus bisporus*, *E. guineensis*: *Elaeis guineensis*, *E. moacropa*: *Eremospothia moacropa*, *E. guineensis*: *Elaeis guineensis*, *T. orientalis*: *Trema orientalis*, *A. excels*: *Ailanthus excels*, *A. laurina*: *Anisophyllea laurina*, *I. batata*: *Ipompa batata*, *H. brasilensis*: *Hevea brasilensis*, *C. siberiana*: *Cassia siberiana*, *C. maxwelli*: *Cephalophus maxwelli*, *S. juglanitolia*: *Sorindeia juglanitolia*, *P. guajava*: *Psidium guajava*, *T. swinderianus*: *Thryonomys swinderianus*, *E. guineensis*: *Elaeis guineensis*

**Table 4: Nontimber forest products identified per community**

| Communities | Local name | Botanical name |
|---|---|---|
| Mathoir | Black tumbla | *D. guinense* |
| | Malombo | *S. senegalensis* |
| | Monkey | *C. stantalus* |
| | Bush yam | *D. multiflora* |
| | Mushroom | *A. bisporus* |
| | Wild cocoa | *Discorea* spp. |
| | Wild palm fruit | *E. guineensis* |
| Masanka | Malombo | *S. senegalensis* |
| | Honey (bees) | *Anthophila* spp. |
| | Black tumbla | *D. guinense* |
| | Rattan | *E. moacropa* |
| | Palm wine | *E. guineensis* |
| | Charcoal | *T. orientalis* |
| | Bush yam | *D. multiflora* |
| | Bamboo | *Bambusoideae* |
| Masethleh | Palm wine | *E. guineensis* |
| | Fuel wood | *A. excels* |
| | Bush plum | *A. laurina* |
| | Fish | *Siluriformes* |
| | Termite | *Isoptera* |
| | Bush potato | *I. batata* |
| | Rubber | *H. brasilensis* |
| | Gbangba | *C. siebierina* |
| | Freetambo | *C. maxwelli* |
| Matopie | Wild palm fruit | *E. guineensis* |
| | Kafi | *S. juglanifolia* |
| | Wild cocoa | *Discorea* spp. |
| | Bush guava | *P. guajava* |
| | Malombo | *S. senegalensis* |
| | Fish | *Siluriformes* |
| | Mushroom | *A. bisporus* |
| Makomba | Honey | *Anthophila* spp. |
| | Malombo | *S. senegalensis* |
| | Black tumba | *D. guinense* |
| | Palm oil | *E. guineensis* |
| | Termite | *Isoptera* |
| | Grasscuter | *T. swinderianus* |
| | Bush plum | *A. laurina* |
| | Rattan | *E. moacropa* |

*D. guinense: Dialium guinense, S. senegalensis: Salacia senegalensis, C. stantalus: Cercopitheru stantalus, D. multiflora: Discorea multiflora, A. bisporus: Agaricus bisporus, E. guineensis: Elaeis guineensis, E. moacropa: Eremospothia moacropa, T. orientalis: Trema orientalis, A. excels: Ailanthus excels, A. laurina: Anisophyllea laurina, I. batata: Ipomea batata, H. brasilensis: Hevea brasilensis, C. siebierina: Cacia siebierina, C. maxwelli: Cephalophus maxwelli, S. juglanifolia: Sorindeia juglanifolia, P. guajava: Psidium guajava, T. swinderianus: Thryonomys swinderianus, I. batata: Ipompa batata*

terms of providing them with household goods, employment opportunities, food, and income. Given that Mathoir is a community along the Freetown highway, more of the respondents who were targeted received benefits from NTFPs as a result of the sale of the products. The majority of the targeted respondents indicated that NTFPs-related activities are their primary source of income and employment in Mathoir, while only a small percentage of the group received benefits from NTFPs in the form of food and household items such as chairs and local mats.

The bulk of the respondents from Mathoir community benefit economically from job opportunities and food distribution as against those of the Masanka and Masethleh villages. However, a larger percentage of the Matopie community's targeted respondents gained economic benefits through the provision of food and money creation, whereas a smaller percentage of the respondents did so through work and household goods. Similar to the Masanka community, the majority of the targeted respondents in the Makomba community benefited economically from the creation of jobs and the provision of food as an alternative to the staple food, with only a small number of respondents benefiting economically from income generation and household items such as cane mats and chairs. This clearly shows that the targeted respondents benefited financially from NTFPs in a variety of ways [Figure 3].

**Table 5: Nontimber forest products harvesting**

| Communities (variables) | Mathoir | Masanka | Masethleh | Matopie | Makomba |
|---|---|---|---|---|---|
| Yes, *n* (%) | 30 (83.3) | 25 (86.2) | 14 (70) | 20 (87.0) | 10 (66.7) |
| No, *n* (%) | 6 (16.7) | 4 (13.8) | 6 (30) | 3 (13.0) | 5 (33.3) |
| Total, *n* (%) | 36 (100.0) | 29 (100.0) | 20 (100) | 23 (100.0) | 15 (100.0) |

**Table 6: Nontimber forest products harvested and their uses**

| Local name | Botanical name | Their uses |
|---|---|---|
| Blacktombla | *D. guinense* | Food/plant |
| Malombo | *S. senegalensis* | Food/plant |
| Monkey | *C. stantalus* | Food/wild game |
| Bush yam | *D. multiflora* | Food/plant |
| Mushroom | *A. bisporus* | Food/plant |
| Wild cocoa | *Discorea* spp. | Food/plant |
| Wild palm fruit | *E. guineensis* | Food/plant |
| Honey (bees) | *Anthophila* spp. | Food/wild game |
| Rattan | *E. moacropa* | Local material |
| Palm wine | *E. guineensis* | Food/plant |
| Charcoal | *T. orientalis* | Cooking |
| Bamboo | *Bambusoideae* | Local material |
| Fuel wood | *A. excels* | Fire wood/ biomass |
| Bush plum | *A. lourina* | Food/plant |
| Fish | *Siluriformes* | Food/wild game |
| Termite | *Isoptera* | Food/wild game |
| Bush potato | *I. batata* | Food/plant |
| Rubber | *H. lrasilensis* | Plant material |
| Gbangba | *C. siberiana* | Medicinal plant |
| Freetambo | *C. maxwelli* | Food/wild game |
| Kofi | *S. juglanitolia* | Food/plant |
| Bush guava | *P. guajava* | Food/plant |
| Grass-cutter | *T. swinderianus* | Food/wild game |
| Palm oil | *E. guineensis* | Food/plant |

*D. guinense*: *Dialium guinense*, *S. senegalensis*: *Salacia senegalensis*, *C. stantalus*: *Cercopitheru stantalus*, *D. multiflora*: *Discorea multiflora*, *A. bisporus*: *Agaricus bisporus*, *E. guineensis*: *Elaeis guineensis*, *E. moacropa*: *Eremospothia moacropa*, *T. orientalis*: *Trema orientalis*, *A. excels*: *Ailanthus excels*, *A. lourina*: *Anisophyllea lourina*, *H. lrasilensis*: *Hevea lrasilensis*, *C. siberiana*: *Cassia siberiana*, *C. maxwelli*: *Cephalophus maxwelli*, *S. juglanitolia*: *Sorindeia juglanitolia*, *P. guajava*: *Pisdium guajava*, *T. swinderianus*: *Thryonomys swinderianus*

This study is a collaboration with FAO, (1990), which reported that many local people use varieties of NTFPs because they can meet important community needs for improved rural livelihood, help households achieve food security and nutrition, help generate additional employment and income, provide opportunities for NTFP-based enterprises, help to generate additional foreign exchange earnings, and support biodiversity and other conservation goals. For their daily needs as well as basic medical treatment, many locals still employ a variety of wild herbs in an old-fashioned manner.[28]

According to the data on income generation in the five chosen communities, the majority of respondents earn an annual income between SLL 100,000 and SLL 500,000 and SLL 600.000 and

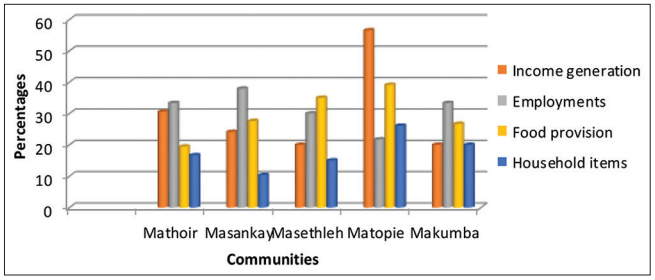


**Figure 3:** Economic benefits from nontimber forest products

SLL 1,000,000, respectively, with only a small minority earning an income above SLL 1,000,000 from the sale of NTFPs in all five chosen communities. This suggests that household revenue from NTFP marketing is hardly any, with a significant portion of that cash going toward paying for children's school supplies, clothing, food, and medical [Figure 4]. The findings of this study are in direct opposition to other research, which claimed that the invisible trade in wild resources generates $90 billion annually and that almost one billion people rely on wild-harvested goods for nourishment and money.

The study showed that other livelihood sources including farming, hunting, masonry, and carpentry in the Mathoir community, outnumber the sale of NTFPs as the only source of income for the targeted respondents. In fact, a larger percentage of the respondents did not identify the sale of NTFPs as a livelihood source. In the Masanka community, the majority of the targeted respondents do not believe that the selling of NTFPs is their sole source of subsistence, indicating that there are other viable alternatives. Other viable alternatives include fishing, farming, and hunting. The Masethleh, Matopie, and Makomba communities, respectively, exhibit a similar pattern [Table 7].

A study conducted in India, which discovered that harvest of forest products sustains the livelihoods of about 6 million people, is related to this research. Communities from the various study sites identified a number of favorite culinary and medicinal NTFP species, as well as the vulnerable species under each product category and the top priority for immediate domestication and commercialization.

## NTFPs used as traditional medicine

The NTFPs used by the respondents in the study areas include *Cassia siberiana, Anthophila Sp., Cercopitheru stantalus, Eremospothia moacropa, Siluriformes Discorea multiflora,* and *Ipomea batata*. These plants are used to treat illnesses such as high blood pressure, joint pain, malnutrition, worms, chest pain, fracture, malaria, dysentery, and fever [Table 8].

This research relates to the study conducted by the WHO (2000), that many locals use several wild herbs in traditional methods for both daily needs and basic medical care. NTFPs are used by 80% of people in poor countries to meet their nutritional and health needs. According to estimates from the World Health Organization, up to 80% of the population in many developing nations relies on biodiversity for primary healthcare, and the loss of biodiversity has been linked to an increase in the emergence and transmission of infectious diseases that have harmful effects on human health.

The findings from the field research demonstrated that residents of particular areas often employ NTFPs as traditional medicines as a key alternative to modern pharmaceutical drugs in the treatment of ailments. However, a substantial percentage of the targeted respondents in the Mathoir community utilized the bark, leaves, and roots, while a smaller percentage of the respondents used the stems, seed, and flower as pieces obtained from NTFPs in the treatment of diseases such as malaria, dysentery, boils, and ulcers. Similarly to this, the majority of the respondents employed the bark, roots, stems, leaves, seeds, and flowers to treat ailments. In the Masanka community, a significant fraction of the targeted respondents employed the bark, roots, stems, seeds, and flowers, while only a small percentage of respondents used leaves in the treatment of health issues in the absence of pharmaceutical medications. This suggests that the predominant NTFP components employed in the treatment of illnesses were the bark, roots, stems, etc. In addition, the majority of the respondents employed NTFPs' barks, roots, stems, leaves, seeds, and flowers as medicine to treat various health conditions. Contrary to this, the bulk of the Matopie people uses the roots and leaves as key medicinal components to treat health-related ailments. Few respondents utilized the stems, seeds, and flowers derived from NTFPs as parts obtained from NTFPs in the addressing of issues, while the majority of respondents used the bark, roots, and leaves as medicinal parts from NTFPs [Table 9].[29-31]

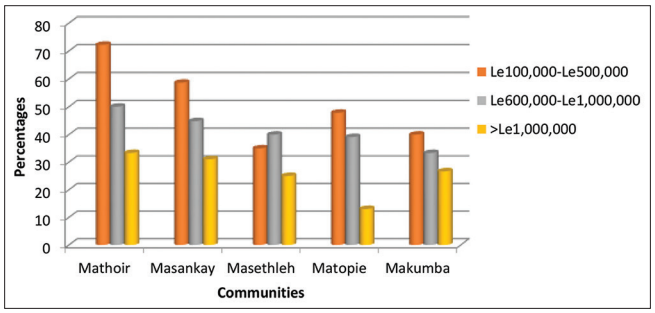


**Figure 4:** Range of income generation per annum

**Table 7: Nontimber forest products sale as livelihood sources**

| Responses | Count (%) | | | | |
|---|---|---|---|---|---|
| | Mathoir | Masanka | Masethleh | Matopie | Makomba |
| Yes | 6 (16.7) | 4 (13.8) | 2 (10) | 0 | 1 (6.7) |
| No | 24 (66.7) | 20 (69.0) | 14 (70) | 20 (87.0) | 9 (60.0) |
| Others | 6 (16.7) | 5 (17.2) | 4 (20) | 3 (13.0) | 5 (33.3) |
| Total | 36 (1000) | 29 (1000) | 20 (100) | 23 (100) | 15 (1000) |

Even in urban families, plant medicines are frequently utilized especially as first aid, according to Falconer who claimed that all people use them and that the majority of them (80%) rely on wild plants as their primary source of medicine. The usage of plants is a common theme among the majority of healing practices and beliefs, despite the wide variety of both. Common plant therapies are known and utilized by the majority of people; knowledge is not limited to specialized healers. As they are typically the ones who provide their children with first aid, women play a crucial role in this situation. Families transmit down their understanding of common medications, and this understanding is always changing as a result of environmental changes.

According to Table 10, majority of respondents (in three of the five selected communities) used sun-drying and perboiling as their primary methods of preserving NTFPs parts used as medicines, while only a small percentage of respondents used soaking in water as a secondary method of preservation. The two main methods used in the Matopie community to

**Table 8: Nontimber forest products used as medicine**

| Local name | Botanical name | Parts used | Ailments | Treatments |
|---|---|---|---|---|
| Honey | *Anthophila* spp. | Products (honey) | High blood pressure | Drink the product (honey) three times a day or continuously |
| Malombo | *S. senegalensis* | Roots and leaves | Boils | Grain the leaves or pealed roots and rub around the boil or the swelled part |
| Rattan | *E. macrocarpa* | Stem and roots | Joint pains | We used the stems and roots to cure joint pains in the human systems |
| Wild coco | *Dioscorea* spp. | Products (wild coco) | Ulcer | Grain the products (wild coco), dry it for some time, pound it and filtered the flower, mixed it with sugar or small salt, and eat |
| Bush yam | *D. multiflora* | Leaves | Wounds | Grain the fresh leaves and tied on a raw wound to reduce blood clotting and the tart onus |
| Blacktombla | *D. guineense* | Leaves and products | Chest pain | Pound the leaves with pepper and mix with small water then drink continuously for chest pain |
| Gbangba | *C. sibieriana* | Stem, leaves, and roots | Malaria, typhoid, and stomach ache | Soak either the stems, roots, and boil the leaves to cure malaria, typhoid and stomach ache, etc. |
| Bush potato | *I. costata* | Leaves and rope | Malaria | Boil it and mixed with lime for malaria treatments |

*S. senegalensis*: *Salacia senegalensis*, *E. macrocarpa*: *Eremospotha macrocarpa*, *D. multiflora*: *Dioscorea multiflora*, *D. guineense*: *Dialium guineense*, *C. sibieriana*: *Cassia sibieriana*, *I. costata*: *Ipomea costata*

**Table 9: Nontimber forest products parts used as medicines**

| Communities (variables) | Mathoir | Masanka | Masethleh | Matopie | Makomba |
|---|---|---|---|---|---|
| Barks, *n* (%) | 7 (19.4) | 6 (20.7) | 8 (40) | 3 (13.0) | 5 (33.3) |
| Root, *n* (%) | 9 (25.0) | 4 (13.8) | 2 (10) | 7 (30.4) | 4 (26.7) |
| Stem, *n* (%) | 6 (16.7) | 2 (6.9) | 0 | 3 (13.0) | 2 (13.3) |
| Leaves, *n* (%) | 8 (22.2) | 9 (31.0) | 4 (20) | 8 (34.8) | 3 (20.0) |
| Seed and flower, *n* (%) | 6 (16.7) | 8 (27.6) | 6 (30) | 2 (8.7) | 1 (6.7) |
| Total, *n* (%) | 36 (100.0) | 29 (100.0) | 20 (100) | 23 (100.0) | 15 (100.0) |

**Table 10: Preservation methods**

| Communities (methods) | Mathoir | Masanka | Masethleh | Matopie | Makomba |
|---|---|---|---|---|---|
| Sun-drying, *n* (%) | 15 (41.7) | 13 (44.8) | 10 (50) | 3 (13.0) | 6 (40) |
| Per boiling, *n* (%) | 12 (33.3) | 9 (31.0) | 5 (25) | 8 (34.8) | 3 (20) |
| Soaking in water, *n* (%) | 9 (25.0) | 7 (24.1) | 5 (25) | 12 (52.2) | 6 (40) |
| Total, *n* (%) | 36 (100.0) | 29 (100.0) | 20 (100) | 23 (100.0) | 15 (100) |

preserve NTFP pieces were perboiling and water-soaking, respectively. Contrary to the Makomba community, the majority of respondents utilized sun-drying and water-soaking as methods of preservation, while only a tiny percentage of respondents chose perboiling as a method of preservation to preserve components as medicines from NTFPs.

## Conclusion

It can be inferred from the research that the communities in the study areas are involved in activities linked to NTFPs. The five communities chosen for this study produced 24 different forms of NTFPs. Based on the communities where they were found throughout the research, these NTFPs were divided into different categories. The names of the NTFPs were gathered in their native tongues, and then those names were converted into their scientific nomenclature. The five selected communities all produced similar amounts of NTFPs, however, Masethleh community produced the most of them, followed by Masanka and Makomba, while Mathoir and Matopie communities which had equivalent numbers of NTFPs. The NTFPs created money, supplied jobs, provided food, and assisted homes with household items for the targeted respondents, according to an analysis of the research's economic benefits completed in each of the five villages that were selected. The meager profits that households made from the sale of NTFPs were largely used to pay for the clothing, food, medicine, and school supplies for their kids. The study showed that NTFPs were frequently used by locals as traditional remedies instead of expensive pharmaceuticals to cure illnesses. The barks, leaves, and roots were the parts most frequently used by the majority of the targeted respondents, while a smaller percentage of respondents used the stems, seeds, and flowers as components obtained from NTFPs in the treatment of ailments such malaria, dysentery, boils, and ulcers. The research also revealed that in all five of the communities that were chosen, Mathoir, Masanka, Masethleh, Matopie, and Makomba, sun-drying, perboiling, and soaking in water were the typical preservation techniques for preserving the parts obtained from NTFPs that were frequently used as traditional medicines. To better utilize NTFPs, government organizations must assist local businesses, forestry communities, and other organizations. The extraction, processing, and storage facilities of NTFPs should be taught to community stakeholders involved in NTFP-related activities to provide them additional value and reduce loss when transported to the market for sale; and to construct their plantation, MIRO Forestry Companies should offer incentives to the individuals who are primarily involved in the production and replacement of NTFPs that they harvested from the wild, such as harvesting supplies and storage facilities to prevent postharvest losses.

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### Conflicts of interest

There are no conflicts of interest.

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