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Socio-economic Benefits of Non-timber Forest Products to the AFCOE2M Communities of Southern Cameroon

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Abstract

A study was carried out in the community forest of Ebo, Medjounou and Mbamesoban communities (AFCOE2M) in the South Region of Cameroon to evaluate the contribution of non-timber forest products (NTFPs) to the people's livelihood.

The study identifies the various NTFPs used and further evaluates their socio-economic and cultural contributions in sustaining the livelihood of the AFCOE2M community. Essentially, the study assesses the exploitation and utilization of NTFPs. One Hundred and twenty five (125) individuals were randomly selected in the three villages that make up the AFCOE2M community forest. Fifty two (52) species of NTFPs of plant origin were identified, from which seven (7) were frequently used in all the three villages namely; *Irvingia gabonensis, Trichoscypha acuminata, Alstonia boonei, Garcinia kola, Piper guineense, Picralima nitida, and Ricinodendron heudelotii.* Results reveal that NTFPs plant parts used for consumption consist of 68% fruits, 20% seeds, 5% barks, 4% roots and 3% leaves. NTFPs used for medicinal purposes comprised of 70% barks, 16% seeds, 7% leaves, 5% fruits and 2% roots. There was a significant difference (P = 0.049) in the number of NTFP types consumed as food while that was not the case for medicinal NTFPs (P = 0.86). There was a significant difference in the number of NTFP species used for food originating from different land use types (P-value = 0.048) as well as between those used for medicinal purposes (P-value = 0.012).

Keywords: non-timber forest products, livelihood, local communities, Congo basin forest

1. Introduction

Forests provide many useful goods and services of subsistence and commercial values called non-timber forest products (NTFPs). From time immemorial, forest goods other than timber have supplied the basic needs of humankind. These include fruits, roots, seeds, nuts, barks, fungi, resins, feathers, bush meat, fibres and leaves (Nkwatoh *et al.,* 2010; Shanley *et al.,* 2015). NTFPs play a crucial role in the daily lives and welfare of people. They act as sources of food, income, medicine, construction material and fuelwood, as well as resources of spiritual and cultural significance (Aiyeloja and Ajewole, 2006; Hoare, 2007). NTFPs provide nutrients which are usually absent in daily diets such as proteins, vitamins, starch, minerals and other compounds, thus preventing malnutrition (Johns and Sthapit, 2014; Shanley *et al.,* 2015). NTFPs are also important for food security, making a major contribution to food intake of most rural dwellers (Termote *et al.,* 2010; Olaniyi *et al.,* 2013). However, the sustainable management of community forests is crucial to sustain a stable livelihood for the community dwellers.

Sustainable management ensures that forest goods and services meet present needs while ensuring their continued availability to meet long-term needs (Bikoue and Essomba, 2008). According to Caspa *et al.* (2014; 2015), there has been an increased awareness of NTFPs contribution to household and national economies. The latter authors equally point out the contribution of NTFPs to some environmental objectives such as biodiversity conservation.

African forests are reservoirs of biodiversity and the ecological functions that are essential for humanity. The forest formations play an important role in meeting many basic needs of local people. According to Eyog Matig *et al.* (2006), they provide wood and energy and contribute to the nutritional needs, especially of the most vulnerable social groups. Similarly, they represent the main source of medicines in rural areas. Given their

importance to rural communities, local NTFP species in Cameroon deserve more attention in order to optimize the potential they represent. NTFPs are exposed to pressure from logging, slash and burn agriculture, population growth and mining. The consequences include deforestation and degradation of forest ecosystems, significant land use change and poor standards of living for rural populations (Ernest *et al*. 2010).

Community forests were created to facilitate the participation of local communities in the sustainable and equitable management of natural resources and access to social and economic benefits from these resources. The forest areas of Cameroon have a significant potential for NTFPs worth valuing. Participatory management and development of the NTFPs sector will reduce extreme poverty and hunger while promoting environmental protection (Tchoundjeu *et al.,* 2010). Also, it could improve living conditions of rural communities. So it is important to understand the evolution of a range of issues relating to NTFPs such as their modes of management and the contribution they make to the development of local communities.

NTFPs are harvested from the wild in natural forests (SCBD, 2001; van Andel, 2006) or from wild stock preserved by local farmers on farms in various traditional agroforestry systems (Tabuna, 2000). They are used and managed in complex socio-economic and ecological environments. In traditional forest communities, many NTFPs may be used for subsistence while others are the main or only source of income (Nivedita and Pramod, 2016). Many NTFPs, especially those that are traded in international markets are sometimes cultivated as farm crops, whereas those for local and regional trade are managed in home gardens, fallows and forests (Shackleton, 2004). These complex forest management systems generate dietary variety and reduce environmental risks, thus represent a key adaptation strategy in the face of climate change (Gomez-Baggethun *et al.,* 2013).

The objective of this study is to determine the contribution of NTFPs to the livelihood of AFCOE2M communities.

2. Materials and Methods

2.1 Study Area

The AFCOE2M community forest is located in the Ambam Sub-Division, Ntem Valley Division in the South Region of Cameroon. It covers 3,155 hectares of land and extends over three villages namely, Mbam-Essaobam, Ebozi II and Medjounou. The area is specifically located between latitude 20^{o} 40’ East and longitude 11^{o} 58’ West (Amang *et al.,* 2015)

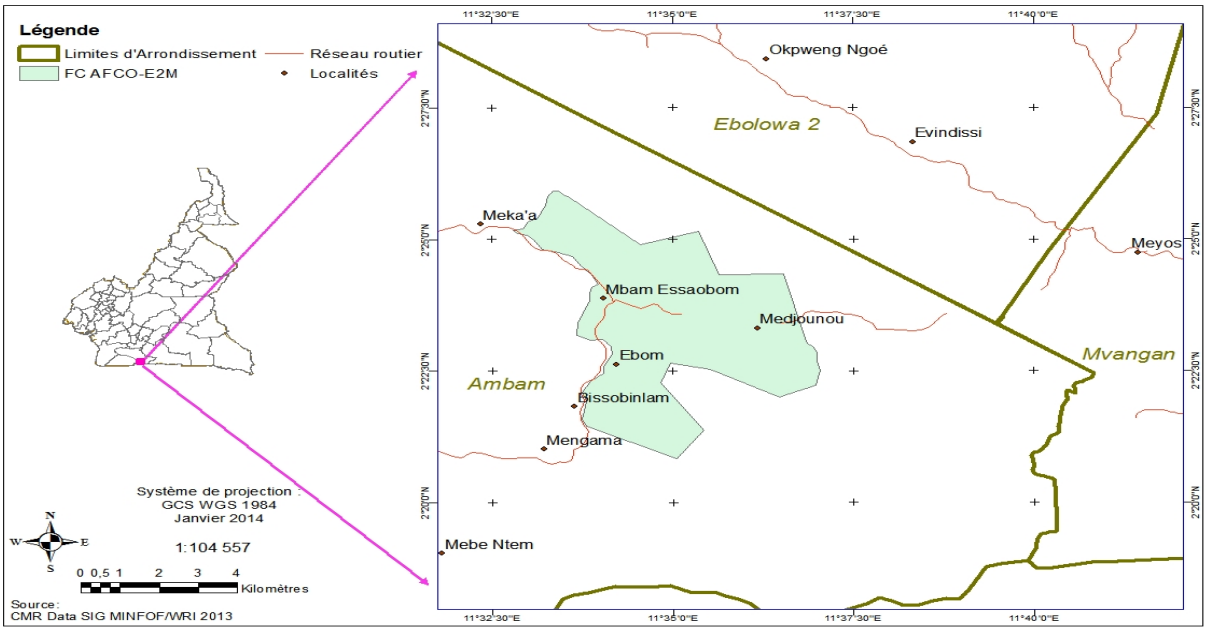

Figure 1. Location map of the AFCOE2M Community forest (Mabe, 2013).

The climate is of the Guinean equatorial type (bimodal rainfall) with four seasons: a long rainy season (mid-August to mid-November), a long dry season (mid-November to mid-March), a short rainy season (mid-March to mid-June), and a short dry season (mid-June to mid-August). The average annual rainfall varies

from 1600 mm to 1700 mm, meanwhile average temperature ranges between 23.8 ℃ and 25.3 ℃, with an average of 24.5 ℃. AFCOE2M community forest is part of the tropical rain forest area and most particularly the rainforest zone of evergreen forest at low and medium altitudes (Gartlan, 1989). They contain many species of high economic value (Table 1).

Table 1. Some NTFPs of the AFCOE2M and their uses

Species	Part used	Use
Afromomum melegueta	Seed	Ingredient for several traditional medicines
Afzelia bipindensis	Bark	Treatment of waist pain
Alchornea cordifolia	Bark	Treatment of diarrhea
Allanblackia floribunda	Seed	Aphrodisiac and treatment of stomach ache
Alstonia boonei.	Bark	Malaria treatment
Anonidium mannii	Fruit	Production of beverage
Baillonella toxisperma	Fruit and seed	Production of oil (seed) and treatment of infertility in women (bark).
Cola acuminata	Seed	Direct consumption
Coula edulis	Seed	Direct consumption
Dacryodes edulis	Fruit	Direct consumption
Dacryodes macrophylla	Fruit	Juice fabrication.
Drypetes grossweileri	Bark	Aphrodisiac
Annikia chlorantha	Bark	Filaria and malaria treatment
Entandrophragma cylindricum	Bark	Treatment of anaemia
Entandrophragma utile	Bark	Facilitates expansion of the cervix during childbirth
Fagara hertzii	Seed	Spice
Garcinia kola	Bark and seed	Additive in palm wine (bark) and direct consumption (seed)
Guarrea cedrata	Seed	Cure for back ache
Guibourtia tessmannii	Seed	Cleaning of genital tract and protection against witches
Harungana madagascariensis	Bark	Cleaning genital tract
Hylodendron gabunense	Fruit	Consumption
Irvingia gabonensis	Fruit	Spices for sauce.
Mammea africana	Bark	Cures sexual weakness
Myrianthus arboreus	Fruit	Production of beverage
Nauclea diderrichii	Seed	Treatment of sexual weakness
Pachypodanthium staudtii	Seed	Eliminates head lice
Picralima nitida	Bark	Malaria treatment
Piptadeniastrum africanum	Bark	Treatment of sexual weakness
Pterocarpus soyauii	Bark	Treatment of anaemia
Raphia	Stem	Construction of thatch houses and furniture production
Trichoscypha acuminata	Fruit	Production of beverage
Trichoscypha arborea	Fruit	Production of beverage

2.2 Data Collection

Data were collected through literature reviews, interviews with different actors including the local population, administrative officials and some local Non-Governmental Organizations (NGOs) present in the locality, as well as direct observation. Each respondent had to cite the plants used for pre-defined usage categories including food and medicinal purposes. Plants considered as food were those collected from the wild and eaten directly as fruits, used for seasoning as spices or leafy plants used as vegetables or for packaging. Those considered as medicine were plants frequently used within communities to treat common ailments like malaria, cough, diarrhea, headache, intestinal worms, etc. Note was taken of different land use types (crop field, cocoa agroforest, fallow and virgin forest) within the community forest from which NTFPs were collected and used by the local communities. The goal was to evaluate the contribution of NTFPs to the socioeconomic well-being of the population.

Data were analyzed using SPSS for means and percentages and the SAS software for the generalized linear model and Duncan test for the separation of means at the level of $\alpha = 5\%$.

3. Results

3.1 Identification of NTFPs used by the Communities

One hundred and twenty five (125) people were interviewed and represented as follows: 53% of women and 47% men. Forty seven (47) percent of respondents were in the 20 to 30 years age range, 40% in the 31 to 50 years age range and 13% of respondents were over 50 years old (men and women). Respondents varied with respect to occupation and consisted of farmers (66 %), farmers/traders (13%), farmers/hair dressers (7%), seamstress (7%) and students (7%). Fifty two (52) plant species were recorded for the two usage categories.

Table 2. List of plants identified in the villages according to the usage categories

Scientific names	**Family**	**Local names**	**Usage**	
			Nutritional plants	Medicinal Plants
Aframomum melegueta	Zingiberaceae	ndong		+
Allanblackia floribunda	Clusiaceae	nsangom		+
Alstonia boonei	Apocynaceae	ekouk		+
Aningeria robusta	Sapotaceae	Abam	+	+
Annikia chlorantha	Annonaceae	Nfo'o		+
Anonidium mannii	Annonaceae	ebom	+	
Antrocaryon klaineanum	Anarcadiaceae	ozakon	+	+
Baillonella toxisperma	Sapotaceae	adjap	+	+
Ceiba pentandra	Bombacaceae	edoum		+
Cola nitida	Sterculiaceae	kola	+	+
Cola pachycarpa	Sterculiaceae	evoy	+	
Coula edulis	Olacaceae	ewome	+	+
Dacryodes edulis	Burseraceae	Sa'a	+	+
Dacryodes macrophylla	Burseraceae	atom	+	+
Elaeis guineensis	Palmaceae	Ikan	+	
Erythropleum ivorensis	Caesalpiniaceae	Elone		+
Garcinia kola	Clusiaceae	Onien	+	+
Garcinia lucida	Clusiaceae	essok	+	+
Gnetum africanum	Gnetaceae	okok	+	
Guibourtia tessmannii	Caesalpiniaceae	essinga		+
Irvingia gabonensis	Irvingiaceae	Ndo'o	+	+
Maranthaceae	Maranthaceae	Akuen	+	
Myrianthus arboreus	Cercopiaceae	Egokon	+	+
Pachypodanthium staudtii	Annonaceae	ntome		+
Pentaclethra macrophylla	Mimosaceae	Ebaye	+	+
Petersianthus macrocarpus	Lecythidaceae	Abwuing		+
Picralima nitida	Apocynaceae	ebam		+
Pipper guineense	Piperaceae	poivre noir	+	
Pycnanthus angolensis	Myristicaceae	eten		+
Ricinodendron heudelotii	Euphorbiaceae	njansang	+	
Scorodopheulus zenkeri	Caesalpiniaceae	Olong	+	
Tetrapleura tetraptera	Mimosaceae	Saka	+	
Trichoscypha acuminata	Anarcadiaceae	mvout	+	
Trichoscypha arborea	Anarcadiaceae	ngong	+	
Voancaga africana	Apocynaceae	obatom	+	+
Terminalia superba	Combretaceae	Akom		+
Xylopia aethiopica	Annonaceae	Oyang	+	
Piptadeniastrum africanum	Caesalpiniaceae	Edza	+	

N.B: + = presence

3.2 Usage of NTFPs

Out of the 52 species recorded, 14 were strictly medicinal, among which are *Alstonia boonei, Picralima nitida, Annikia chlorantha* and *Ceiba pentandra* while 12 were strictly used for nutrition such as *Irvingia gabonensis, Ricinodendron heudelotii, Gnetum africanum* and *Annonidium mannii*. The results revealed that plant parts used

for consumption consisted of 68% fruits, 20% seeds, 5% bark, 4% roots, and 3% leaves while NTFPs used for medicinal purposes were mostly made of bark (70%), seed (16 %), leaf (7%), fruit (5 %) and roots (2%).

A statistical analysis comparing NTFPs plant parts for both usage categories showed a significant difference (P-value = 0.049) between those consumed as food, with seeds being most highly consumed unlike those used for medicinal purposes which showed no significant difference. (P-value = 0, 86).

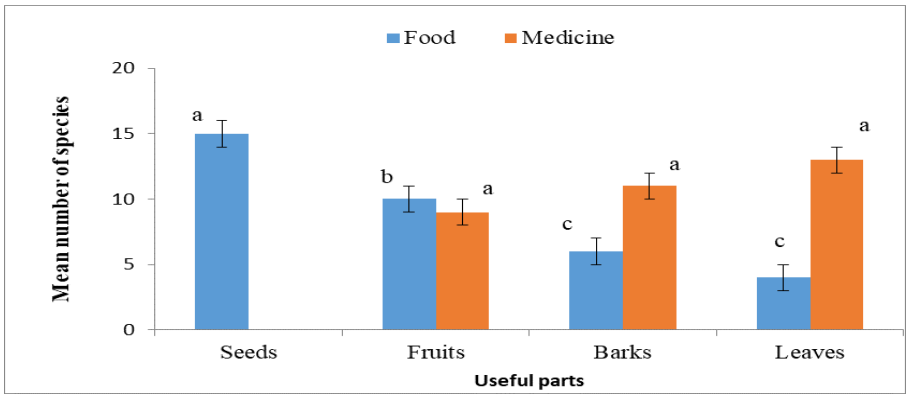

Figure 2. Parts of NTFP species used in each category

Means followed by the same letter are not significantly different at 5%

With respect to land use types, it was observed that 38%, 29% 28% and 18% of collected NTFPs originated respectively from the virgin forest, fallows, cocoa agroforest and food crop fields. Thus, NTFPs used by the communities are predominantly collected from the virgin forest. The two usage categories varied according to their sources, with medicinal NTFPs mostly collected from the virgin forest and cocoa agroforest, while nutritional NTFPs were more frequently harvested from the cocoa agroforest and virgin forest in descending order, followed by fallow and cultivated field (Figure 3). There was a significant difference in the number of NTFP species used for food originating from different land use types (P-value = 0.048) as well as between those used for medicinal purposes (P-value = 0.012).

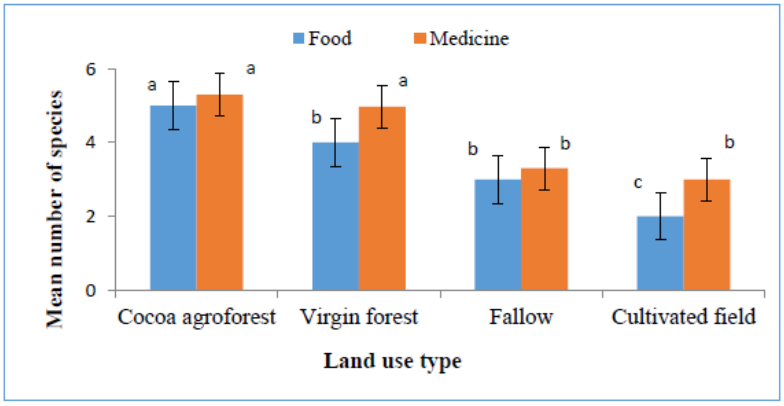

Figure 3. NTFP usage categories in each Land Use Type

Means followed by the same letters are not significantly different at 5%

Figure 4 shows percent citation of common diseases in the study community.

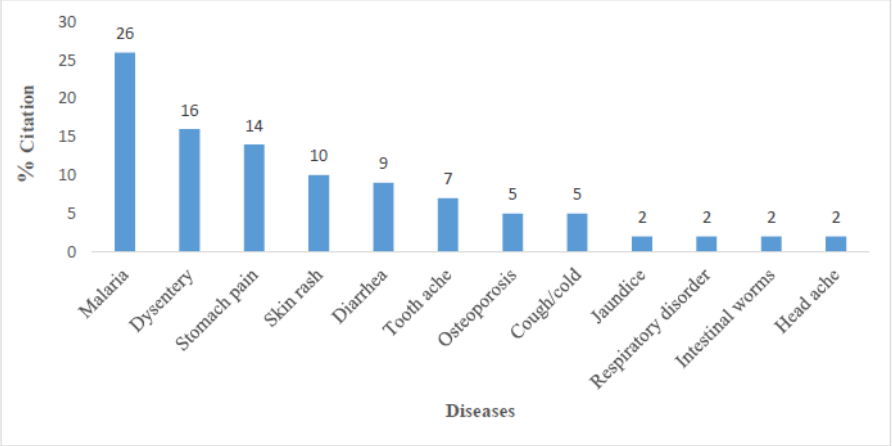

Figure 4. Recurrent diseases in the study community

The result revealed that malaria, dysentery and stomach pain are the most common ailments in the study community.

4. Discussions

The findings of this research showed that every sector of the community (women, men, youths and the elderly) participates in NTFPs collection. This is probably because NTFPs are freely collected, and as a matter of habit as people in most forest communities have been used to gathering these products from the forest over the years. This is in agreement with Ngansop *et al.* (2017) and Hirai (2014) who observed that indigenous people in forest communities in South East Cameroon gather NTFPs for their daily food supply as well as for medicinal purposes. More women (53 %) were involved in NTFPs collection than men (47 %) probably because they play the traditional role in daily food preparation in households and directly involved in taking care of the sick. Apart from agricultural products, NTFPs usually constitute a major source of income. However, with increasing monetary value of most NTFPs, men now participate in their collection and sometimes protect wildlings or plant them in cash crop (mostly cocoa) farms. A higher proportion of respondents (47 % for the 20 to 30 years age group and 40 % for the 31 to 50 years range) belonged to the youthful and middle age groups probably because they still have physical strength to walk long distances to the forest and farms where NTFPs are collected. These age groups also have the responsibility to take care of the very young and very old, thus they make use of the benefits offered by NTFPs to meet their needs.

The outcome of this investigation revealed that NTFPs are mostly collected from the virgin forest and cocoa agroforest. This could be because NTFPs are likely to be more abundant in the forest which has undergone very little or no human intervention. When land is being cleared for cocoa cultivation, useful plants such as NTFP species are preserved, not only for the economic benefits they provide, but also for shade provision for the cocoa plant. A majority of people in most rural communities do not have stable sources of income such as formal jobs through which they can earn regular monthly salaries. Consequently, they collect, consume and sell NTFPs which are available at different periods of the year. This is in line with the findings of Nguetnamoum (2012) and Caspa *et al.* (2015; 2018) who reported that NTFP harvesting is the most important source of livelihood in most forest communities.

The fact that up to 52 plant species were cited for medicinal uses can be explained by the near absence of modern medical facilities in most rural communities due to their inaccessibility to urban centers. Medicinal plants are often obtained at no financial cost, unlike conventional medicines which are sometimes not affordable to local communities due to extreme poverty. Malaria was the most frequently cited disease, attesting to the fact that it is rampant in the area, as in other parts of Cameroon and the tropics. This is possibly due to the warm and moist conditions of the area that provide a favourable environment for the proliferation of mosquitoes which are vectors of the malaria parasite. Dysentery and stomach pain were the next important ailments cited. This is probably because of poor hygienic and sanitation conditions in such communities. Locals drink water from streams which are equally used for other activities, meaning one could be drinking downstream without knowing what activity took place upstream that might have contaminated the water. Consequently, there is a high

prevalence of stomach disorder. As observed in this study, Betti *et al*. (2013) identified *Alstonia boonei, Picralima nitida* and *Annikia chlorantha* amongst many other plants used in Andom village in the East Region of Cameroon for the treatment of malaria. These plants are also well recognized in the literature for their activity against the malaria parasite (Betti, 2003; Idowu *et al.*, 2010) and thus, gives credibility to the pharmacopoeia of the study community. The role of NTFPs (plants and animals) in the pharmacopoeia cannot be disputed. It is estimated that 80% of the world population primarily uses traditional medicines for their primary health care (FAO, 1997). This situation is very common in Africa and particularly in Central Africa where, humans have for centuries used plant or animal organs to heal themselves of some diseases. Plants for medicinal use in the Congo Basin are extremely numerous, hence, it is difficult to give an exact number of forest species used for medicinal purposes for each country. The general impression that emerges from people encountered during field visits is that almost all plants of the Congo Basin forests have therapeutic properties.

A significantly higher number of plant species had seeds and fruits as food source whereas those used for medicinal purposes mainly consisted of bark, leaves and roots. This could be due to the fact that naturally, the edible parts of most plants, and forest tree species in particular are fruits and seeds. The active ingredients for the different ailments concerned are certainly concentrated in plant parts extracted for medicinal purposes (leaves and bark) as shown in the results.

Tree bark is also used for other purposes such as additive in palm wine, the case of *Garcinia kola* bark. The latter resource is overexploited, therefore posing the problem of sustainability (Nguenang, 2010). Peters (1996) reported that commercial harvesting of NTFPs has a number of negative impacts, including a gradual reduction in the vigor of harvested plants, decreasing rates of seedling establishment of harvested species, potential disruption of local animal populations and nutrient loss from harvested material. For example, Guedje (2002) observed that stripping of the bark of *Garcinia lucida*, which is used as palm wine additive, resulted in a 74 % mortality rate. The use of *Scorodophloeus zenkeri* bark as condiment is prevalent in the study community. However, according to community members, one must go far into the forest to obtain *Scorodophloeus zenkeri* bark of good quality. In our study site, the exploitation modes used were gathering and direct harvest. Similar to this research finding were the results of Loubelo (2012).

Indigenous food plants of the forests of the Congo Basin consumed regularly or occasionally are numerous. A survey conducted in Cameroon by Vivien and Faure (1996) revealed that there are more than 215 species of edible perennial fruit plants in the dense humid forest of Cameroon. The diversity of these species involves a variation in the phenology of production. Leafy vegetables are available all year while fruit production, taken in its diversity is spread over time. So at every time of the year, there is food in the forest to gather or harvest for food.

5. Conclusion

NTFPs play an important role in the medicinal and food habits of populations of the Medjounou, Mbam and Essaobam Ebozi II villages. However, from the results of the analysis it can be concluded that communities have enormous NTFPs potentials that are underexploited. Only a few NTFPs are sold regularly. Virgin forests and cocoa farms remain the most important places for the collection of NTFPs.

Recommendations

Collective action through the creation of common initiative groups in study villages can enhance NTFPs collection and valorization, hence livelihoods. Sustainable NTFPs harvesting practices should be adopted for a positive impact on resource conservation and management. This will enhance NTFPs quality and quantity as well as economic returns. NTFPs could also be planted on-farm in different agroforestry systems to ensure continuous availability of products and reduced pressure on the wild stock.

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