The socio-economic importance and sustainability of the major Non-Timber Forest Products collected in the South West and Littoral Regions of Cameroon

Abstract

Interest in non-timber forest products (NTFPs) has increased due to their role in poverty reduction, conservation, and food security. However, data on the current environmental and socio-economic aspects of NTFPs harvests are sparse. Using secondary data from literature review as well as participatory rural appraisal tools, information was gathered on NTFPs collectors, and on the relative socio-economic importance of the main NTFPs collected, collectors' access to NTFPs and sustainability of collection in major collection sites in the South West and Littoral Regions of Cameroon. An estimated 5500 collectors of NTFPs operate in the South West and Littoral Regions of Cameroon. The study revealed that NTFPs are important in the livelihoods of the village communities in the study area constituting 33% to their household income after agriculture (50.6%). The most important NTFPs collected in the study area were *Gnetum spp*., *Irvingia sp*., and *Ricinodendron heudelotii*. In important harvest divisions like the Manyu and Mungo divisions, the contribution of *Gnetum spp*. and *Irvingia spp*. to collectors NTFP related income is statistically significant (χ^2-test; $p<0.05$). Increasing harvests, combined with insufficient regulatory and customary control have led to a situation of long-term unsustainable collection. While NTFP collection is essential in providing income to collectors, their exploitation is failing to contribute in meeting environmental sustainability goals. This study concludes that domestication and awareness raising programs could lessen the pressure on the forest resource base and effective regulatory and customary control measures, if implemented and enforced, could limit over-exploitation and enhance sustainable collection and trade in NTFPs.

Key words: *Non-timber forest products, collectors, socio-economic importance, access, sustainability*.

1. Introduction

According to the World Bank (2006), "around 60 million indigenous people are almost entirely dependent on forests, whilst over 350 million people living in or near the world's tropical forests depend largely on this ecosystem. Forest resources are complementary to food production households; provide essential nutritional food and products for medicinal purposes." "The forests of Central Africa and Cameroon are rich in non-timber forest products (NTFPs), which have long been an important component in the livelihood strategies of forest-dwelling people, providing subsistence needs, employment and cash income" (Arnold and Ruiz-Pérez 2001). "Most Cameroonians, particularly the rural inhabitants, depend on NTFPs for subsistence and cash income" (Ingram, 2014). "As a result, there has been increased interest in the collection and trade of NTFPs as an instrument for sustainable rural development" (Tieguhong and Ndoye, 2006). "The importance of NTFPs from outside forests is attracting increasing attention, to help meet growing demands and reduce pressure

on natural forests and plantations" (Holding *et al.,* 2001). "Indigenous people have developed their locality specific knowledge on NTFPs use, management, and conservation for the past centuries" (Duguma & Mesele, 2019; Teklehaymanot, 2009; Yigezu *et al.,* 2014). The subsistence production of the rural population comprises fishery, agriculture, livestock husbandry, and the collection of forest resources.

"Farmers' livelihoods and economic development is hampered by a low level of education, limited income alternatives and poor infrastructure, and the productivity of the cropland is limited by highly unpredictable rainfall and soil fertility constraints very similar to those encountered in the West African Sahel" (Batiolo *et al.,* 1998, Buerkert *et al.,* 1998). "Therefore, collection of NTFPs provides an important supplementary source of income (Sula, 2011) and an overuse of such resources threatens people's livelihood." "In the last 15 years, a large number of studies have sought to understand how social, economic, cultural, environmental, and geographical factors influence the traditional knowledge about plants at small scales. Factors such as gender, age, ethnicity, birthplace, and level of education have been identified as important on an individual level" (Luoga *et al.,* 2000, Byg, 2004, Byg and Balslev 2006, Paniagua Zambrana *et al.,* 2007). "Family size, integration into the market economy (e.g., sale of animals and agricultural products), or amount of material goods at the family level (e.g., possessions of farm animals, tools, and transport) have been linked to the household level" (Byg and Balslev 2001, 2004, Reyes-García *et al.,* 2007). "Access to commercial centers and to health, education, electricity, or water, as well as land tenure systems and settlement history, have shown a greater relevance at the community level" (Takasaki *et al.,* 2001 and Vandebroek, 2010).

"A few studies on the socio-economic characteristics of NTFPs collectors and their access to forest resources have been carried out in Cameroon covering some parts of the country but left out certain regions despite their richness in plant diversity" (Adjanohoum *et al.,* 1996; Mbolo *et al.,* 2002). "An example of such a region are the forested areas of Manyu, Ndian and Kupe-Muanneguba divisions of the South West region and the Mungo division in the Littoral region containing the most important protected areas and technical operation units in the area which are rich in plants and animal species. The consumption and sale of NTFPs can be important particularly for women, whose limited access to land, credit and other assets hinder their ability to pursue alternate livelihood opportunities" (Hasalkar and Jadhav, 2004). "Research has highlighted the role of gender in shaping access, management and use of forest resources and their associated benefits" (Mai *et al.,* 2011, Ndumbe, 2013). Due to the high use of forest resources by the locals as food and income generation, the increasing anthropogenic activities which destroys the natural habitat of these plants calls for the urgent need to document the different NTFP species collected for food and income generation, determine their relative socio-economic importance to collectors, and to determine access to and sustainability of harvests of the major NTFPs identified in the South West and Littoral Regions of Cameroon.

2. Materials and Methods

The study area as shown in Figure 1 covered four divisions in Cameroon: Manyu, Kupe-Muanenguba, Meme and Ndian, which were purposively sampled as important NTFP collection zones in the South West region and one division, Mungo, in Littoral region was purposively sampled. These were selected based on a situational analysis and rapid assessment that was carried in these regions prior to field work. In Manyu division all four sub-divisions were judged to be important in terms of NTFP collection. In Kupe Muanenguba, Nguti sub-division and in Ndian, the Bamusso sub-division were selected. Two villages were then selected in each sub-division based on their access to markets (easy and difficult).

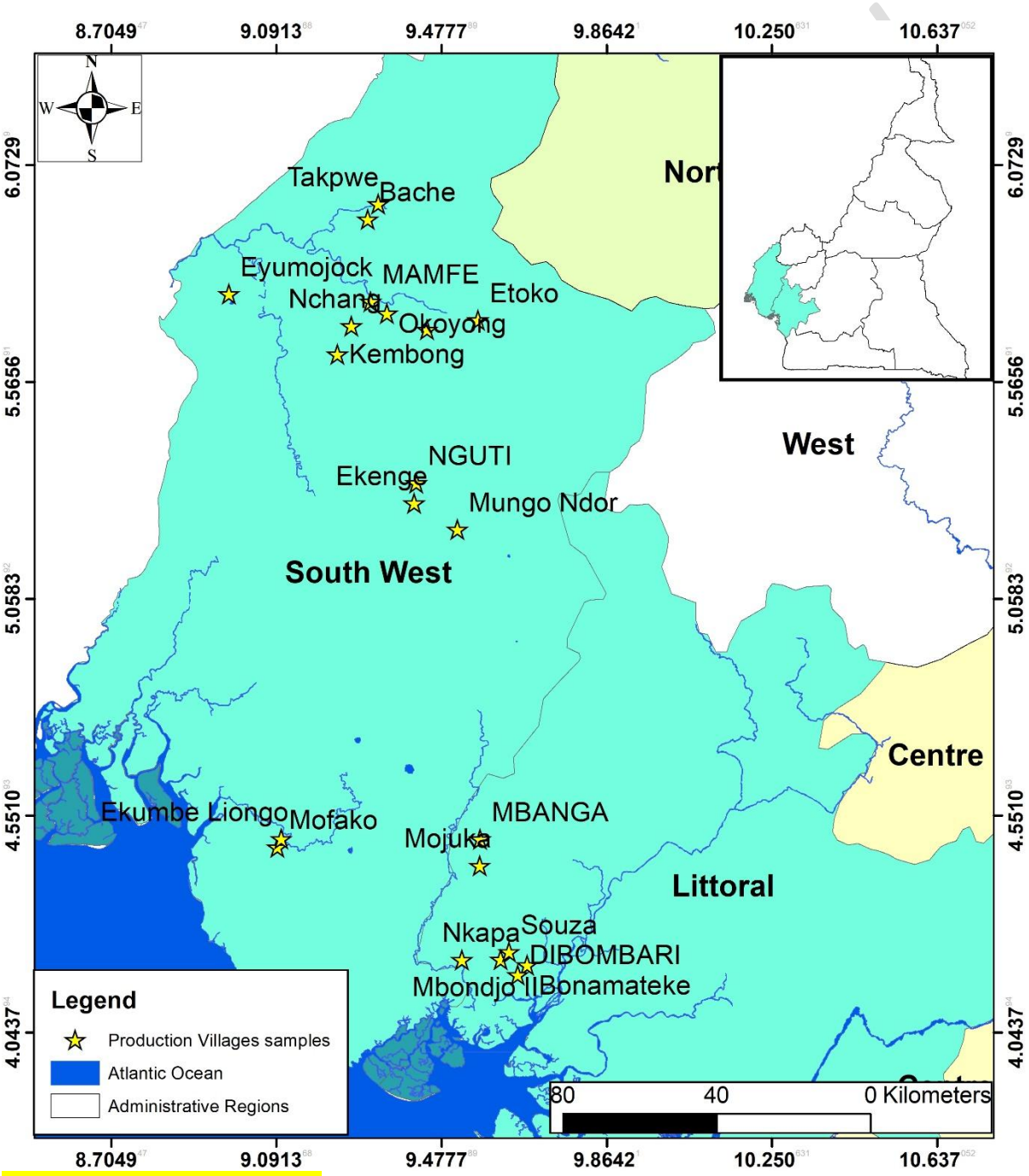

Figure1: Map of study area

In the Mungo division, Bonalea, Dibombari and Mbanga sub-divisions were selected as productively important. As shown in Table 1, two villages were selected in each sub-division according to their accessibility to markets (ease of access - determined by distance, state of the roads and availability of transportation) with 50% sampled with 'easy' and 50% 'difficult' access. In each village, 25% of estimated NTFP collector population present (after a rapid survey of those present) was interviewed using a questionnaire.

Data was obtained on the socio-economic characteristics, NTFPs relative contribution to collector's household income, tenure, access and sustainability of harvest through a review of literature and by using open-ended conversations and semi-structured questionnaires from January to April 2017. Respondents were selected randomly in the villages following age groups. The collected quantitative data was analyzed using Statistical Package for Social Sciences software version 20 (SPSS software V.20) using descriptive and inferential statistics.

Table 1: Sampled villages in Study Area

Region	Division	Sub-division	Village	Access D- Difficult E= easy	Estimated collectors population	Estimated number present	Percentage interviewed of those present	Proportion population Interviewed
South West	Manyu	Akwaya	Bache	E	30	16	25	13
			Tapkwe	D	20	20	25	25
		Mamfe Central	Nchang	D	42	24	25	14
			Okoyong Native	E	25	12	25	12
		Eyumojock	Kembong	E	70	32	25	11
			Eyumojock	D	40	20	25	12
		Upper Bayang	Bachuo-akagbe	E	45	16	25	9
			Etoko	D	40	16	25	10
	Kupe-Muanenguba	Nguti	Ekenge	E	25	12	25	12
			Moungo-Ndor	D	14	8	25	14
	Ndian	Bamusso	Ekombe Liongo	E	20	12	25	15
			Mofako	D	15	8	25	13
	3	***6***	***12***	***D=50% E=50%***	***386***	***196***	***25***	***13***
Littoral	Mungo	Dibombari	Nkapa camp	E	30	16	25	13
			Bonamateke	D	18	16	25	22
		Bonalea	Souza	E	200	28	25	4
			Mbonjo II	D	30	20	25	17
		Mbanga	Mbanga	E	50	20	25	10
			Mojuka	D	45	16	25	9
	1	***3***	***6***	***D=50% E=50%***	***373***	***116***	***25***	***8***
Total	**2**	**9**	**18**	**D=50% E=50%**	**759**	**312**	**25**	**10**

Table 2: Population statistics of study area

Country	*Region*/*State* Division	Surface Area km^2	Population	Density per km^2	Capital	Ethnic groups
Cameroon	*Southwest*	24,571	838,042[1]	34	Buea	Bakweri, Anyang,
	Ndian	6,626	129,659[2]	20	Mundemba	Ejaham, Balong, Bassossi, Upper Banyang, MboKorup, Isangele, Oroko
	Kupe Manengouba	3,404	123,011	36	Bangem	
	Manyu	9,565	177,389	19	Mamfe	
	Littoral	20,239	2,202,340	109	Douala	Bassa, Duala (Douala)
	Mungo	3,723	452,722 [2]	122	Nkongsamba	Abo, Bankon

[1] 1987 Census, [2] 2001 estimate: n "Departments of Cameroon". Statistics from Institut national de la statistique (Cameroun) - Annuaire statistique du Cameroun 2004. http://www.statoids.com/ycm.html. Retrieved April 6, 2009., [3] 2005 estimate from 1991 census

3. Results and Discussion

3.1. Socio-economic Characteristics of Collectors in the South West and Littoral Regions of Cameroon

An estimated 5500 collectors of NTFPs operate in the South West and Littoral Regions of Cameroon. The ages of 94.5% collectors were recorded with more than half of them aged above 41.5years. However, the youngest NTFP collector sampled was 22 years old while the eldest was 70 years old. The average age for NTFP collectors was 43.66 year. Weighing by age group, collectors aged between 31 and 40 had the highest weight 30.8%, followed by collectors between the ages of 41 and 50 years with 25.0%. The age group with the least number of collectors was “61 years and above” making 9.6% of the sample. The majority of collectors in the South West are married. Women constitute the majority

of NTFP collectors in the study area (79%) and the majority of them are married (65%). Manyu division had the highest average number of persons 6.47±0.3 living in a NTFP collector's household. The majority of collectors 53.6% had attained just primary education, while just 2.7% had attained tertiary education.

3.2. Collectors sources of household Income in the South West and Littoral Regions of Cameroon

The various sources of collectors' household income are indicated on figure 2. The majority of collectors (50.6%) main source of household income is Agriculture (including market gardening) followed by the harvesting and sale of NTFPs (33%).

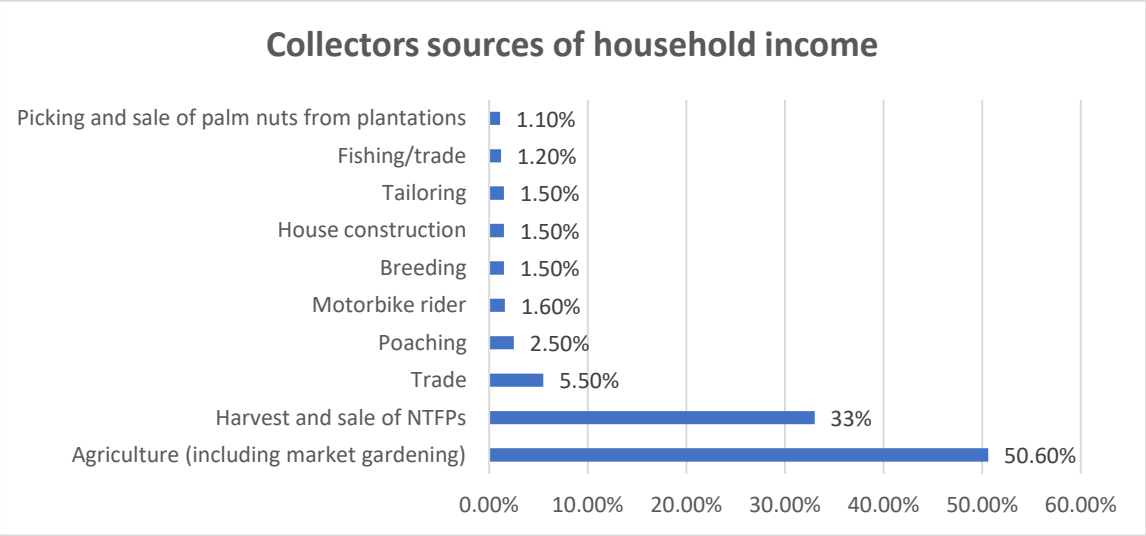

Figure 2: Collectors sources of household income in the South West and Littoral Regions of Cameroon

The crops grown around Fako and Mungo Divisions include cassava, cocoyam, plantains, banana, yams, and fruits such as avocado, orange and mango. Cash crops include cocoa, coffee and banana, around Ekona, Bafia and Munyenge and Malende. From Tiko to Limbe and Debundscha maize can be cultivated continuously throughout the year, due to the year-round rainfall in this area. There is small to large scale poultry farming and piggery. Plantation agriculture for banana and pineapples is carried out by the Cameroon Development Corporation (CDC). In Meme, agriculture is also the most dominant economic activity, with both indigenous and settlers involved in subsistence food crop farming of

cocoyam, plantains, cassava, yams, maize, tropical fruits and vegetables. Cash crop farming includes cocoa, coffee, palm nuts and rubber. Plantain agriculture is also carried out in Malende, Mokonje, Laduma, Kompenda, Bakossi and Bai-Mbonge, mainly by Cameroon Development Cooperation.

3.3. Non-timber forest products collected and their relative contribution to collectors' NTFP related income

In the South West region thirteen NTFPs were named by collectors as being important in providing income and/or food in addition to other forest products. In Littoral, nine products were named. The most important NTFPs collected are *Gnetum spp*. (Eru), *Irvingia sp*. (bush mango) and *Ricinodendron heudelotii* (njansang) as indicated on Table 3. In important harvest divisions like the Manyu in the South West region region and Mungo in the Littoral region for example, the contribution of Eru and Bush mango to collectors NTFP related income is statistically significant (χ^2-test; $p<0.05$). The contributions of the other NTFPs collected to household NTFP related income is not statistically significant. However, njansang was found to contribute to 16% of NTFP related household income in Manyu and 14% in Mungo. Njansang's contribution may not be statistically significant but it is a very important NTFP for some households that have access to collect njansang from the forest. "The leaves of the dioecious forest liana known as afang and okazi in Nigeria, eru and okok in Cameroon, plucked from *Gnetum africanum* Welw and *Gnetum buchholzianum* Engl are ranked amongst the 10 most important NTFPs in Congo Basin countries, and in the 19 most used and valued NTFPs in Cameroon" (Ingram *et al*., 2012). "Both species are morphologically highly similar, growing to about 10m. They co-exit in the same ecological niche, of densely shaded under-story of wet, primary lowland tropical and swamp gallery forests across Central Africa, often near slow-moving rivers" (Clark and Sunderland, 2004).

"Irvingia spp. on the other hand are collectively known as bush mango in the South West region, mangue sauvage, ndo'o, and andok in Centre, South and Littoral regions, and peké in the East Region of Cameroon" (Ingram *et al*., 2016). "These products originate from two species: *Irvingia gabonensis*, a tree bearing fruits with fragrant, juicy flesh and sweet juice, and *Irvingia wombolu* (also known as dry season manago), a similar tree with smaller, bitter fruit" (Tchoundjeu and Atangana, 2007; Oyen, 2007). "Both species grow to between 25m to 40m tall and co-exist in the lowland tropical humid forests across Central Africa, with the range of *Irvingia wombolu* extending further east and west (Clark and Sunderland, 2004).

"Njansang – *Ricinodendron heudelotii* (Baill.) Pierre ex Pax. – trees are common across the lesser humid forest zone, particularly in secondary forest, fallow, cocoa and farms" (Ndumbe *et al*., 2018). "It is often preserved as a multipurpose tree in the neighborhood of villages in the secondary forests, requiring little management" (Plenderleith, 2004).

Table 3: The types of forest products collected and their contribution to collectors' NTFP related income

NTFPs* %		Divisions and Sub-divisions	Total	

contribution to household income	Manyu				Total Manyu		Kupe M.	Ndian	Mungo			Total Mungo	Average	
	Eyumojock	Akwaya	Upper Bayang	Mamfe Central		Chi-squared statistic	Nguti	Bamusso	Bonalea	Dibombari	Mbanga			Chi-squared statistic
Gnetum (Eru)	33%	26%	19%	24%	**26%**	χ^2=8.05 P=0.0045	20%	22%	92%	57%	47%	**63%**	**33%**	**χ^2=17.58 P<0.001**
Bush Mango	28%	27%	19%	21%	**24%**	χ^2=6.80 P=0.009	20%	13%	8%	21%	18%	**16%**	**18%**	**χ^2=5.37 P=0.02**
Njangsang	18%	6%	16%	24%	**16%**	χ^2=1.68 P=0.19	12%	22%	0%	7%	12%	**7%**	**14%**	**χ^2=2.91 P=0.88**
Bush Pepper	3%	12%	11%	8%	**8%**	χ^2=0.22 P=0.64	20%	22%	0%	0%	6%	**2%**	**13%**	**χ^2=2.36 P=0.12**
Bush Onion	-	9%	11%	8%	**7%**	χ^2=0.52 P=0.47	12%					-	**5%**	**χ^2=0.31 P=0.57**
Native Cola	3%	3%	0%	0%	**3%**	χ^2=3.62 P=0.89	8%				6%	**2%**	**3%**	**χ^2=1.52 P=0.22**
Hot leaf	8%	12%	19%	16%	**14%**	χ^2=0.93 P=0.33					-	-	**3%**	**χ^2=1.52 P=0.22**
Snails								13%			-	-	**3%**	**χ^2=1.52 P=0.22**
Bitter Cola	3%	3%			**3%**	χ^2=3.62 P=0.89		4%			6%	**2%**	**2%**	**χ^2=2.66 P=0.10**
Monkey Cola			5%		**5%**	χ^2=1.60 P=0.21	8%	-			-	-	**2%**	**χ^2=2.66 P=0.10**
Mushrooms								4%			-	-	**1%**	**χ^2=4.33 P=0.83**
Bush meat	3%				**3%**	χ^2=3.62 P=0.89					6%	**2%**	**1%**	**χ^2=4.33 P=0.83**
Kasa mango										7%	0%	**2%**	**1%**	**χ^2=4.33 P=0.83**

Pepper										7%	0%	**2%**	**1%**	**χ^2=4.33 P=0.83**
Eboya	3%	3%			**3%**	χ^2=3.62 P=0.89			-	-	-	-		
TOTAL	**33%**	**26%**	**19%**	**24%**	**26%**		**20%**	**22%**	**92%**	**57%**	**47%**	**63%**	**33%**	

Table 4: Local and Scientific names of some identified NTFPs

English name	Local name	Scientific name
Mushroom	Essok	Several species
Bitter Cola	*Bassa* : wè ; *Boulou* : onié ; *Douala* : ebongagnagne ; *Ejagham* : ejare, nya ; *Ewondo* : onié ; *Ibo* : adi ; *Pygmée Baka* : ngbwel.	*Garcinia kola* Heckel
Cola	Cola, Cola nut	*Cola nitida*
Eru	Eru (Efik); eru (Ibibio); ukasi (Igbo); ikokoh, (Ovande); gelu (Anyang); ecole (Boki)	*Gnetum africanum* and *Gnetum buchholzianum*
Bush mango	Bush mango (vern.); ogbono (Igbo); bojep (Boki); eloweh (Ovande); kelua (Basho); gluea (Anyang)	*Irvingia gabonensis* and *I. wombolu*
Njangsang	Njansang (vern.); ngoku (Basho); itche (Becheve); ngoge (Boki); ngongeh (Anyang)	*Ricinodendron heudelottii*
Bush Onion	Felou (Basho); elonge (Becheve); eloweh (Ovande); elu (Anyang)	*Afrostyrax kamerunensis*
Bush Pepper	Kakwale (Ovande); iyeyeh (Becheve); ashoesie (Boki); taquale (Basho); acachat (Anyang)	*Piper guineensis*
Bush meat		Many species of duikers, antelopes, monkeys, wild pigs, rats, snakes, porcupines, cane rats etc.
Faux muscadier	*Douala* : pebé ; *Ewondo* : ding ; *Pygmée Baka* : dengo. *Bakoko* : gangat ; *Bassa* : ikoma; *Baya* : biko ; *Boulou* : ozek	*Monodora myristica* (Graertm.) Dunal
Monkey Cola	Monkey Cola	*Cola pachycarpa* K. Schum.
Snails		Several species

Sources : (Sunderland *et al*., 1999 ; Sunderland *et al*., 2003 and Eyog Matig *et al*., 2006;)

3.4. Socio-economic importance of major NTFPs collected

"In cameroon and Nigeria, *Gnetum* leaves are used mainly for food, being highly nutritional" (Mialoundama 1993; Abia *et al*., 2007; Mensah *et al*., 2008). "They are eaten cooked and fresh by almost all societal strata, occasionally distilled into alcohol" (Nkefor *et al*., 2000), and "often served at culturally important ceremonies" (mialoundama, 1993). "The leaves are traditionally used to treat enlarged spleen, herpes, to ease childbirth, sore throats, hangovers and as a cathartic" (Fondoun and Tiki-Manga, 2000; Clark *et al*., 2004; Jiofack *et al*., 2008; Mensah et al., 2008).

"Bush mango has ranked among the 10 most economically important NTFPs in Congo Basin countries, and has long been one of the most used and valued NTFPs in Cameroon" (Clark and Sunderland, 2004; Ingram *et al*., 2010). "Across Central Africa, products from *Irvingia* spp. have multiple uses. The oil-rich nuts are used as a popular condiment and sauce thickener. Cooking oil is also extracted from the nut, the juice is used in cooking and wine, the pulp as a dye, the bark and kernels have multiple medicinal uses, and the timber is used for construction" (Ingram *et al*., 2016).

"The boiled and dried kernels of njansang is a commonly traded non-timber forest product from Central African humid forests, used as a spice" (Ndumbe *et al*., 2018). "There are reports of farmers's crude processing of njansang by pressing to produce edible oil, used for cooking and also for the manufacture of soap and varnish" (Ekam, 2003). "The kernels are also processed into edible oil in laboratories on a small-scale" (Tchiengang *et al*., 2005).

3.5. Tenure and access

The situation of access in different forest categories in the South West and Littoral regions is indicated on table 5. The majority of collectors (75%) have free access to collection sites while 25% indicated that they do not have free access to community forests, private forests, national parks and private plantations for different reasons as indicated on Table 5. Under the 1994 Forestry Law (94/01), all forested resources in Cameroon belongs to the state, with adjacent communities granted forest user rights for normal (not commercial) use of forest resources.

Table 5: Tenure and access situation per region

Tenure & Access	Response	South-West %	Littoral %	Total %
Are there areas where you are not allowed to collect eru?	No	75	100	88
	Yes	25		13
If yes, what type of areas?	Community forests	46	50	48
	Private forests	20		10
	National park	33		17
	Private plantations		50	25
Why are you not allowed to collect from these areas?	It is a protected area.			0
	Forests belonging to other village communities who do not allow non-indigenes to exploit.	56	30	43
	Forests/Plantations belonging to private individuals/companies who prohibit harvesters as some also steal crops.	44	69	57

3.6. Environmental sustainability

The various sites where collectors harvest NTFPs are indicated on Table 6. The majority of harvest is from non-protected areas while 2.9% of respondents collect from national park (protected area). The vast majority, 97% of the total collector's population sampled, responded that the distance travelled to collect NTFPs have increased in the past decade and that distances currently travelled are further than in the past. A large majority (97%) of respondents observed that the forest area around their village area has diminished, and only 2.7% had not yet observed any changes. 68% of respondents attributed this reduction to forest clearance for farmlands and 25% attributed it to the creation of palm plantations. In the Mungo division 7.4% attributed it to logging.

T**able 6: Collection sites**

Area of harvest		Percent
Protected Area	National Park	2.9
	Sub-Total	*2.9*
Non-protected Area	Open access forest (Primary and Secondary)	41.9
	Village forest (Primary and Secondary)	20.9
	Farmlands(Group and family)	5.7
	Private forest	17.3
	Palm plantations	11.3
	Sub-Total	*97.1*

TOTAL		*100*

The results suggest that the majority of NTFP collectors are youths being in their economically active stage that could drive productivity if supported within an enabling environment. Given that majority of collectors are married, these communities therefore can be more stable and suitable for a consolidated family unit. This offers an opportunity for stakeholders to easily integrate them into management programs. The collection of NTFPs in the South West and Littoral Regions is an activity that involves adult individuals of which many have not received formal education. This may have a strong impact on introduction of innovations in sustainable harvesting techniques. Lack of education also suggest lack of ability to organize themselves into groups, cooperatives or organizations. Emphasis in this direction will improve the ability of the inhabitants to organize the marketing process of NTFPs to their advantage. The level of education sheds light on the ability to read and write, and how formalised trading is, whether written contracts are required or used for transactions between harvesters and traders (Ndoye, 1995).

Collectors in the study area have varying strategies in generating income. Respondents indicated that agriculture is their main livelihood activity contributing to 50.6% of household income followed very closely by NTFPs collection which contributes up to 33% of a collector's household income. This finding matches studies of NTFPs incomes in Takamanda National Park (Sunderland *et al.* 2003; Tajoacha, 2008), Mone Forest Reserve (Mdaihli *et al*., 2002; Tajoacha, 2008), Korup national park (Fuashi, 1997; Malleson, 2001 and Lingondo *et al*., 2006), Banyang Mbo Forest Reserves (Nkembi *et al*., 2001 and Nkembi, 2003) and Ejaham (Nkwatoh, 2000), and reinforces the importance of NTFPs in the livelihoods of the village communities in the study area.

In the South West region thirteen NTFPs were named by collectors as being important in providing income and/or food in addition to other forest products. In Littoral, nine products were named. The most important NTFPs collected are *Gnetum spp*. (Eru), *Irvingia sp*. (bush mango) and *Ricinodendron heudelotii* (njansang) of which both Eru and bush mango were shown to be statistically significant. This corroborates with the findings of Ingram *et al*., 2012; Ingram *et. al*, 2016, and Ndumbe *et. al*, 2018. For example, Ingram *et al*., (2012) found that *Gnetum* contributes on average to 62% of a harvester's annual income (562, 500 FCFA) in the South West and Littoral regions and that 2,324 tons of *Gnetum* was harvested in 18 villages in the South West Region from 2007-2009. The results also corroborate the findings of Ingram *et. al* 2016 in which bush mango incomes contribute on average to 31% of harvester's annual income. The Ingram *et al*., 2016 study revealed that an average annual quantity of bush mango harvested in the South West region was 113 tons while an estimated 4109 tons of bush mango was harvested annually in the period 2007 to 2010 in Southern Cameroon with an estimated value of 1,175,121,208 FCFA, and a market value of 4,801,062,134 FCFA based on average market prices. Similarly, Ndumbe *et al*., 2018 found out that income from the sale of NTFPs contributes on average 19.8% for those collectors whose main activity is njansang collection, of which the average contribution of njansang was 10%. The quantity of njansang collected by collectors in the South West from 2013 to 2015 was 65.8 tons.

"The governance context of NTFPs in Cameroon is characterized by a shift from largely separate customary and formal systems since colonial times, governing respectively access to resources and access to markets, to an increasing comprehensive – but not always well integrated – regulatory framework" (Ingram, 2014). "On paper regulations set out rights to access NTFPs species and regulate their trade. However, in practice regulations have been largely ineffective, with enforcement highly sporadic and geographically specific, and non-adherence due to ignorance and/or a perceived lack of legitimacy, especially regarding tenure" (Ingram, 2014). "As a result, many high value NTFPs such as *Gnetum spp*. are subject to considerable parallel 'governance' by corruption. In contrast, customary regulations have generally weakened in application and enforcement, threatened by formal regulations and non-adherence, related to factors such as increasingly heterogenous communities. Customary regulations are still clung onto products such as *Cola* spp. as long as their values do not change" (Ingram, 2014).

Under the 1994 Forestry Law (94/01), all forested resources in Cameroon belongs to the state, with adjacent communities granted forest user rights for normal (not commercial) use of forest resources. Many respondents in the study area however believe that the forests belong to them by right of inheritance. This is a common misconception in Cameroon (Oyono *et al*., 2009). Customary rules of land tenure in forested village communities in Cameroon vary from one community to another according to the customs of the people regarding inheritance and who own land. Traditional authorities (village chiefs and councils) in many areas, such as Takamanda, are generally the custodians of forests (i.e lands that are forested and neither family forest or farms) and responsible for forest management in villages. In the communities in the study area, only men have the right to inherit land property as it is held that women are given land when they marry. Women however in most communities interviewed have free access to village and family forest and family farmlands. Women constitute the majority of NTFP collectors in the study area (79%) and the majority of them are married (65%). They are also free to harvest from and cultivate NTFPs on their husband's lands. But if the men (husbands of those married and in-laws of those who are widows) want to create cocoa farms and plantations on the land, women do not have any say. The majority of respondents (89% in the Southwest and 96% in Littoral) indicated that they do not have to pay for entering the forest or harvest. If payment was required, this was to either the village traditional council in the southwest), or the forest owner (in Littoral). All respondents in Littoral indicated that there had been changes in forest access. One third indicated that local communities had not previously been aware of the economic importance of some NTFPs and their forests, but now that they aware, those who are not part of the community no longer have free access and payments were therefore demanded from the 'Forest owner'. The majority (70%) indicated however that forested land that is now being bought and owned by individuals, who prohibit harvester's free access. In the South West, 18% of all respondents indicated that there had been access changes. One third of these changes related to the establishment of protected areas and the restriction of rights in not being able to harvest freely from the national parks. Two thirds of respondents who noted access changes indicated that with the increase in the knowledge of the value of some NTFPs, communities now restricted harvest from their own forests. This shows that if land tenure is defined and collectors 'own' or manage land, collection will be controlled.

NTFPs are collected most often from primary or secondary forest or in forest seen as belonging to village (although the majority of this is not legally classed as community forests) where access is free for everyone in the community. The second major source of NTFPs is from private forests and plantations. A small proportion is reported to be collected in protected areas and from farmlands. One third of the therefore harvest originates from privately held lands (farm, private forest or plantations). This differs slightly from Oyono *et al.* (2009) surveys when in the production zones of Lékié and zone Bassa, Mbanga (Centre), Souza (Littoral), Kumba and Mamfe (Southwest) respondents indicated the majority of NTFPs were harvested from long fallow areas, secondary forest, short fallows and primary forest (in that order). However, the focus of this survey was particularly the main collection areas in the Centre province. There are no tenure arrangements specific to NTFPs. Communities legal user rights to use NTFPs in their area for own consumption are however misappropriated with many individuals harvesting for commercial reasons. Collectors tend to act individually and independently, and rationally consulting their own self-interests. An indicator of unsustainable harvest of NTFPs is indicated increased distance to harvest. The vast majority, 97% of the total collector's population sampled, responded that the distance travelled to collect NTFPs have increased in the past decade and that distances currently travelled are further than in the past. This indicates that NTFPs are becoming scarcer and that the rates of harvesting are above the natural regeneration rates for many NTFPs. This matches the experiences in the Centre, East and Littoral regions (Blackmore and Nkefor, 1998; Fondoun and Tiki-Manga, 2000; Awono *et al*., 2002), where increased NTFPs like *Gnetum spp*. has been found in secondary forest where it thrives after primary forest is disturbed, but is also highly prone to over harvesting with most of the methods used in collecting NTFPs observed to be unsustainable. "Furthermore, both species of *Gnetum* are IUCN Red List classified as near threatened (Lakeman Fraser and Bachman, 2008; Baloch, 2009) whilst *Irvingia gabonensis* is classified as lower risk/near threatened (needing updating) and *Irvingia wombolu* is not listed. Although no range-wide inventories have been carried out, the 1998 IUCN Red List risk assessment is based on a perception of declining populations due to logging operations, the expansion of human settlements and poor natural regeneration." "Worthy of note is the fact that the exploitation of bush mango is generally regarded by harvesters in the study area as sustainable, as only fallen fruits are harvested and bush mango is usually left or actively managed in fallows" (Ingram, 2014). "However, increasing forest clearance may pose a risk to ecoregion level populations. Fruiting is highly variable from year to year and demand is generally higher than supply. Customary tenure and ownership rules dominate governance arrangements" (Ingram, 2014). "*Irvingia* trees within forests are not owned by individuals or families and access is generally on a first-come, first-served basis. The majority of harvesters indicated that they did not require prior authorization from any authority before harvesting bush mango. However, families tend to harvest in the same area each year, constructing 'bush houses' for the harvest season, indicating tacit acknowledgments of 'ownership' within most communities" (Ingram, 2014). "Trees planted or maintained on farmland are owned by the landowner, with access restricted without permission. As *Irvingia* spp. has increased in value, some people have begun to clear land around these trees in the forest. This extension of tenure through clearance usually relates to

farmland, but resources from retained trees are also considered to be owned by the family that cleared the land" (Ingram, 2014).
Similarly, Tchoundjeu and Atangana (2006) reported that "the number of njansang trees in the humid forest zone of Cameroon is decreasing due to deforestation and over exploitation" whilst Sunderland and Tchouto (1999) found evidence that "over-harvesting of fruits, given the length of time needed for the seed to reach germination point, was impacting natural regeneration rates and sustainability." Anjah and Oyun (2009) suggested that "appropriate silvicultural systems be implemented for propagation and alternative methods to natural regeneration sought to ensure its survival."

4. Conclusion

An estimated 5500 collectors of NTFPs operate in the South West and Littoral Regions of Cameroon. NTFPs are important in the livelihood's strategies of the rural communities in the South West and Littoral regions of Cameroon constituting 33% to their household income after agriculture (50.6%). The most important NTFPs collected in the study area were *Gnetum spp*., *Irvingia sp*., and *Ricinodendron heudelotii*. Increasing harvest, combined with insufficient regulatory and customary control have led to a situation of long-term unsustainable collection. While NTFP collection is essential in providing income to collectors, their exploitation is failing to contribute in meeting environmental sustainability goals. Findings suggests that distances travelled to collect NTFPs in the forest have increased. Domestication of commercially important NTFPs on farms is a solution to not only boost output but also lessen the burden on the forest resource base, recognising the socio-economic relevance of NTFPs and insufficient controls to manage forest resources. The management and sustainability of NTFPs could be improved by clarifying land tenure arrangements and the overlaps between unenforced and mostly unknown formal land tenure rules and customary rules.

Consent

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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