CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Tropical AgriSciences

Master's thesis

Collection and commercialization of non-timber forest products among households living close to Campo Ma'an National Park in southern Cameroon

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Prague 2019

Declaration

I hereby declare that this master's thesis titled "**Collection and commercialization of non-timber forest products among households living close to Campo Ma'an National Park in southern Cameroon**" is my own work and all the sources have been duly acknowledged by means of a complete reference.

In Prague 2019

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Tantoh Evate Ngwankfu

Acknowledgements

My first sincere appreciation goes to God Almighty for all his protection and unconditional love throughout my entire period of study here and very honest appreciation to my supervisor Ing. Vladimir Verner Ph.D. for all the feedbacks, corrections and above all, his time spent in supervising this work.

Secondly, I am very grateful to the Internal Grant Agency 20185014 and International Office of the Faculty of Tropical AgriSciences for the financial support during the data collection and not forgetting members of Tropical AgriSciences of the Czech University of Life Sciences Prague for their support.

I would further like to express my sincere gratitude to my lovely family members and friends who supported me financially and morally and a special thank you goes to mama Lilian GO-OH, Granny Ita Maya, kid brother Tata Kenedy Ndukong and wife Kelly, uncle George Kimbi who is always telling me that the sky is my starting point and Mrs Astrid for her prayers and words of encouragements.

Also, a very big thank you to Samuel Ahado for the time he invested in reviewing this work. May the Almighty continue to straighten, bless and guide you.

Finally, the tremendous role of tour guide Mr.Eric Adjomo during the data collection is much appreciated.

Abstract

Non-timber forest products (NTFPs) play an important role in the lives of more than 1.5 billion of people around the globe especially those living in forested areas. Despite many studies carried out so far, very little is known about household characteristics that are associated with the collection of NTFPs and their uses. In view of this, the research aimed to document NTFPs regularly collected, their purposes and the potential effect of household characteristics on it in Cameroon. Data were collected using structured questionnaires from 200 purposively and conveniently selected households in 4 villages of Ebolowa, southern Cameroon and 174 questionnaires were retrieved. Descriptive and multiple linear regressions were used for the data analyses. The result showed that majority (59%) were females with average age of 46years and standard deviation of 14.80. The average household size was 6 people with standard deviation of 3 and dependent members of 3 people averagely. The average farming experience is 12.56 with standard deviation of 10.07 and 56% of them have off-farm jobs. All the households collected bush mango, mushrooms and palms while 74% of them collected bitter kola, monkey kola (64%) and only 29% of collects cashew. Result revealed that main purposes of collection were medicinal (78%) followed by energy and fuel (53%) while only 22% for food. The result of regression showed that male household head were more likely to collect more NTFPs than their female counterparts, increasing age of the household head and level of education affected NTFPs collection negatively while increase in farming experience and having off-farm jobs were significant determinants of increase in NTFPs collection. The study concluded that households had high farming experience with off-farm jobs, bush mango, mushrooms and palms were main NTFPs collected and farming experience and off-farm jobs were the positive determinants of NTFPs collection.

Keywords: Bitter kola, bush mango, cashew, njansang and households.

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List of the abbreviations used in the thesis

FAO	Food and agricultural organisation
ICRAF	World Agroforestry Centre
NTFPs	Non-timber forest product
WHO	World Health Organisation
WWF	World Wildlife Fund

1. Introduction and Literature Review

1.1. Introduction

Forest refers to a vast area occupied by trees with a common pattern and implicit trust relationship among them. It provides ecosystem services to human and also serves as tourists' attraction. There are different types of forest such as tropical, temperate forest etc. According to Food and Agricultural Organisation of the United Nations, (FAO) 2018, an estimated 31% of world's land is covered by forest. In different part of West Africa, forests provide site for several cultural events because forests areas and particular trees are protected and valued for peculiar cultural shows and historic attributes. Different districts have specific traditions affiliated with sacred areas and the species that are found in them vary from district/village to village. Products from the forests are classified into timber and non-timber products and non-timber forest products (NTFPs) have been harvested over the years for both home consumption and commercial purposes.

Livelihood refers to a set of actions carried out to live a certain life span including securing a food, water, shelter and clothing etc that are necessary in an individual's life or lives of a group of people.

World Wide Life Fund (WWF) 2019 estimated three hundred million people throughout the world live in forests and 1.6 billion rely on them for their livelihoods. It provides oxygen that human need to breath, recreation, timber products that we use for our daily lives and also save as home to more than 80% of the world's terrestrial biodiversity. Forest is very important in the lives of rural households in developing countries (Babulo et al. 2008) because it contributes a lot to the livelihoods of local people (Rasmussen et al., 2017). It also serves as a source of employment to forest dwellers that collect products from the forests and sell to generate income as well as provides biodiversity

and ecosystem (Trædal and Vedeld 2018). Modern pharmacies around the globe rely also on the forest for their primary products. Aslam and Ahmad (2016) stated 30% of pharmaceutical products are manufactured from plants and have global market value of US $60.0 billion with an expected growth rate of about US $5.0 trillion (by the year 2050).

The importance of forest and livelihood has been researched in different areas but little has been done in Cameroon that has an estimated 20 million hectares of land covered by forest. The study of the importance of the forest in the livelihoods of local forest dwellers is important because of the abundance of forest in the study area.

1.2. Literature review

1.2.1. Basic information and definition of non-timber forest products

Forest products classified as timber and non-timber forest products (NTFPs) play a significant role in the lives of several people around globe especially those living near the forest (Quang and Anh 2006; Sudhakar et al. 2013; Ashok and Yogesh 2016). According to the works published by Sunderland et al. 2004, NTFPs have emerged since 1970s to be important to the several individuals and the present of NTFPs in the forest have helped to fight deforestation and the conversion of the forest to agricultural land. This is because NTFPs serve as a source of energy, medicine, shelter, food and fibre. In rural areas NTFPs are a primary source of cash generation and provide about 60% of income to household in poor regions (Areki and Cuuningham, 2010; Asfaw et al. 2013). In addition, NTFPs provide many essential products and services for the life of rural folks including provision of food, utensils, clothing, shelter, medicines and cultural significance (Wong 2000). Countless people across the globe in one way or the other depend on NTFPs for their livelihood. In India, about 275 million less privilege people rely on forest products for their local consumption and cash income (Tripathi and Pandey 2016).

In Africa, about two-thirds of households depend on forest products for their livelihood (Endamana et al. 2016). Anokye and Adu 2014, stated that NTFPs are a vital component in the socio-economic advancement of third world countries. Different people around Ghana are involved in the collection and selling of NTFPs and NTFPs are used by different people for different purposes that are: food, medicine, perfumes and cosmetics, dying and tanning, construction materials etc. According to Suleiman et al. (2017), households living in proximity to the forest rely on NTFPs because they serve as a source of food, medicines and income generation.

There has been extensive research and interventions in the non-timber forest products (NTFPs) sector. However, the category NTFPs is broad, encompassing different kinds

of products and production systems in a wide range of social, economic and ecological contexts (Belcher et al. 2003). Moreover, research on the issue is multi-faceted, addressing different questions, for different purposes. For these reasons it remains difficult to conceptualise and communicate the key lessons. As increasing emphasis on forestry-livelihood links is leading to a new wave of interests and investment in forest-product-based development; in addition to identifying and analysing general patterns and trends in forest product commercialization, there is real need for an in-depth study of the forestry-livelihood relations for particular species in order to improve the effectiveness of further interventions. Despite the enormous importance of the Garcinia spp. it remains one of the NTFPs species for which insufficient information has been noted and little has been done to disseminate the relevant information about the specie. Worst still, for the case of Cameroon, this information is still scanty. Therefore, there is the need to document the NTFPs in the area and to investigate the household characteristics that influence the collection of non-timber forest products in Cameroon.

1.2.2. Economic importance of NTFPs

WHO (2004) reveals that up to 80% of inhabitants of developing countries use wild plants for health and nutrition (Andel 2006). Thousands of plant and tree species are used for daily subsistence and only a small percentage is sold. However, activities centered on NTFPs remain the only source of employment to rural dwellers. NTFPs support the livelihoods of rural dwellers in the form of: food and food additives, animal food, construction, fuel, medicines, poisons, social and environmental uses.

Wild plants are sold in nearly every marketplace in Cameroon though little is known about their contribution to the national economy. Unlike timber and agricultural products, no regular monitoring or evaluation of the resources, market chains and socio-econom ic contribution of NTFPs at national level is done (Andel 2006). However, it is still contributing enormously to economic growth.

Several people across the globe especially from Asia, Latin America and Africa rely on traditional plant-based systems of medicine for their primary health care (Bodeker et al., 2005). At first only traditional healers used to gather medicinal plants but today it has been commercialized and there are fears of extinction of some species (Chen et al. 2016)

In traditional communities in Cameroon, many forest products play an important role in social and ritual activities. They are commonly used in traditional ceremonies like marriages, funerals, initiations, birth celebrations etc.

NTFPs exploitation can be used to ensure the sustainable management of forests and the conservation of biodiversity, depending on the species and the extent to which they are harvested. NTFPs are classified as 'special forest products' in Cameroon and generate tax revenues (Awono et al. 2013).

1.2.3. Factors that affect NTFPs collection

In Cameroon, it is unclear who owns the lands and the forests as legal and local traditions differ in this respect. This influences whether harvesting is sustainable, profitable or conflict free. The question of who benefits and controls NTFP harvest, and how the benefits are shared influences the collection of NTFPs (Awono et al. 2013). Women are the group of persons mostly involved in the collection but unfortunately, they are often disadvantaged in the sharing of the benefits. This discourages most women in the collection of NTFPs.

Most rural dwellers have insufficient knowledge about processing, storage and market opportunities for NTFPs. Thus, they collect only what they can use or sell immediately or in the short run and since NTFPs are mostly seasonal; these communities miss out on great quantities that could have been collected.

Most rural dwellers have no access to finance to enable processing or scaling up of operations. In some cases, the NTFPs collected will be transported to the market by head-loads. They are thus forced to collect just what they can handle.

1.2.4. Use of and current stage of knowledge on NTFPs in Cameroon

Ingram and Schure (2010) have compiled a list of over 487 forest plants and 82 animals, which provide non-timber forest products. From this, 45 NTFPs were identified as priority or key. Table 1 shows the NTFPs with high economic importance in Cameroon where they studied 20 households on market NTFPs, usage part of use, mode of collection and development stage of the plants and they came up with the ranking result as is seen in table 1 below.

Table 1: NTFPs with highest economic value collected in Cameroon

Species	Annual value USD	Forest type	Value score
Fish (Silures & other species	613,600,000	National	4
Fuel wood (wood, charcoal % sawdust	378,641,309	National	4
Gnetum africanum, Gnetum bulchozium	12,197,503	Humid lowlands	4
Irvingia gabonensis, Irvingia wombulu	8,089,580	Humid lowlands	4
Prunus africana	2,874,928	Montane	4
Dacryodes edules	989,504	Humid lowlands	4

Table 1 Continues

Pausinystalia johimbe	847,182	Humid lowlands	4
Risinodendron heudelotii	730,325	Humid lowlands	4
Voacanga Africana	585,586	Humid lowlands	4
Cola nitida	430,639	Humid lowlands	4
Rattans (Laccosperma, L)	284,013	Humid lowlands	4
Cola acuminate	269,083	Humid lowlands	4
Garcinia kola	249,938	Humid lowlands	4
Garcinia lucida	171,175	Humid lowlands	4
Bailonella toxisperma	11,868	Humid lowlands	4
Piper guineensis	79	Humid lowlands	4
Xylopia aethiopica	no data	Humid lowlands	4
Acacia senegal, Acacia polyacantha	4,040,000	Savannah	3
Bushmeat (small mammals, ungulates reptiles, rodents)	2,799,330	Humid, savannah & montane	3
Raphia spp.	1,574,661	Humid, montane and savannah	3
Tetrapleura tetraptera	124,489	Humid and lowlands	3
Rauvolfia vomitoria	94,803	Humid lowlands	3
Chinconia spp	31,500	Humid lowlands	3
Kigelia africana	18,000	Humid lowlands	3

Table 1 Continues

Carpolobia lutea, Carpolobia albea		5,911	Humid montane zone	3
Aframomum melegueta, Aframomum daniellii, Aframomum citratum		-	Humid lowlands	3
Alsonia booni		-	Humid lowlands	3
Coula edulis		-	Humid lowlands	3
Garcinia mannii		-	Humid lowlands	3
Guibourtia tessmannii		-	Humid lowlands	3
Harungana madagascariensis		-	Humid lowlands	3
Khaya ivorensis		-	Humid lowlands	3
Lophira alata		-	Humid lowlands	3
Lavoa trichilioides		-	Humid lowlands	3
Megaphrynium macrostachyum		-	Humid lowlands	3
Milicia excelsa		-	Humid lowlands	3
Monodora myristica		-	Humid lowlands	3
Morinda lucida		-	Humid lowlands	3
Nauclea diderrichii		-	Humid lowlands	3
Poga oleosa		-	Humid lowlands	3
Scorodophleus zenkeri		-	Humid lowlands	3
Terminalia superba		-	Humid lowlands	3
Trichoscypha arborea		-	Humid lowlands	3
Vitellaria paradoxa		-	Savannah	3
Apiculture	beeswax	244,420	Savannah, montane	3
	honey	61,105		3

Source: Ingram and Schure (2010)

Figure 1: Image of fresh eru

Figure 2: Image of cashew fruit

Figure3: Image of mushrooms

1.2.5. Promising and valued NTPFs

1.2.5.1. Garcinia kola

Based on the information from previous chapters, we can see that some species are still being neglected and not fully utilised. One example of that species is Garcinia kola. *Garcinia kola* (Heckel) of the Guttiferae family is a medium-sized tree growing up to 12 m high in 8 years. It is found in coastal areas and lowland plains up to 300 m above sea level with an average of 2000 - 2500 mm rainfall per annum and temperatures ranges from 21.4 to 32.2°C and a minimum relative humidity of 76.34%. The trees are abundant in densely populated areas of natural and secondary forests in Nigeria, Cameroon, Ghana and the Benin Republic (Andem et al. 2015). Yakubu et al. (2014) and Adebisi, (2004) put its fruiting age at between 20 and 30 years. When seen in oil palm, cocoa or yam plantations, it is planted or conserved.

It is an economically significant and a highly valued tree, used extensively in African traditional medicine (Kanmegne and Omokolo, 2008). The seed *Garcinia kola* has a bitter taste followed by slight sweetness and hence the species is locally known as "bitter kola". These fruits are smooth and elliptically shaped, with yellow pulp and brown seed coat (Agbelade and Onyekwelu, 2013), which is neither hard nor thick, but rather a thin, leathery and water-permeable testa surrounds the endosperm (Kanmegne and Omokolo, 2008).

Garcinia kola has economic value across West African countries where the seeds are commonly chewed and used for traditional ceremonies and medicines. It is highly valued for its perceived medicinal attributes, and the fact that consumption of large quantities does not cause indigestion (as cola nuts do) makes it a highly desired product (Agbelade and Onyekwelu, 2013, Andem et al. 2015). Extracts of various parts of G. kola are used for the treatment of laryngitis, mouth infections, cough, heart burn, liver disorder, chest colds, hoarseness and other inflammatory diseases. The seed itself is used in the treatment of bronchitis, throat troubles, postpartum haemorrhage, urinary tract infections and emesis. The antimicrobial activity of this plant is attributed to the benzophenones and flavanones (Kanmegne and Omokolo, 2008). The bark when soaked in water can be used as a treatment for intestinal worms and to cure stomach pain (Andem et al. 2015). The edible part of *Garcinia kola* fruit aids digestion when eaten raw. The potential utilization of *Garcinia kola* as hop substitutes in beer brewing has been reported (Eleyinmi, and Oloyo, 2001).

In fact, in the context of Africa and its culture, every part or aspect of *Garcinia kola* is valuable. It is therefore of enormous economic importance especially to the impoverished village dwellers.

Generally, *Garcinia kola* is one of the most useful indigenous trees prioritized by farmers in West and Central Africa (Anegbeh, Iruka and Nkirika, 2006) and the demand for the seed is great. Unfortunately, its cultivation is not popular owing to the difficulty in germination. Despite its socio-economic and cultural importance, very little has been

done either to improve the tree species or to reduce the very long time it takes to reach seed and fruit production.

Harvesting bitter kola fruits has very little negative impact on the tree. When ripe, the green pericarp becomes reddish yellow and the fruit drops from the tree. After fruit collection, they are kept in an open, cool place till the pericarp and the pulpy mesocarp become soft. Threshing releases the nuts which are now washed. Those nuts not sold fresh are sun-dried and preserved by wrapping them in leaves and keeping in baskets lined with jute bag material (Adebisi, 2004). There is no secondary or industrial transformation of bitter kola nuts, except when used in breweries. The activity is mostly carried out as household chore since almost all income generated will be spent on household commitments like school fees, feeding and other social obligations.

Bitter kola is an economic pillar to local communities especially in the domain of poverty alleviation. Adebisi (2004) surveyed people involved in the trade of this product and concluded that a substantial amount of revenue can be realized from farm gate to village and urban markets. The price increases as the commodity changes hands from first degree to third degree traders. Handling cost and other expenses involved in bringing the commodity to the market contribute immensely to this increase, but however, the base collectors still reap a great deal, their only expense being periodic transportation costs from their villages to the nearest suburban markets. Statistics on national, regional and global trade in bitter kola in Cameroon is rare to find.

Commercialisation of bitter kola has contributed to improving the living standards of poor resourced households. In a study carried out in south western Cameroon, 30% of gross farm income was derived from NTFPs and 70% from established tree crops, while in Fako division it was 15% and 85% respectively. Specifically, in these two study areas, in Manyu Division farmers can get up to about 12.47kg/annum of bitter kola compared to 36.28kg/annum in Fako Division. This gives them an income of USD 47.85 and USD 119.32 respectively (Egbe, Tabot and Fonge, 2012). Interestingly, G.

kola, like most other NTFPs was found to have negligible expenditure in their production and higher farm gate prices per kilogram than the established tree crops.

In most parts of the developing countries, employment opportunities from traditional industries are declining and people are seeking alternative sources of income. The increased awareness of the benefits of Non-timber forest products (NTFPs) due to the role it plays within the micro-level of the economy of these communities, and the high potential of the products to contribute to the livelihood of the people, has encouraged forest dwellers to turn to the collection of these products from nearby forests as a source of income. Agbelade and Onyekwelu (2013); Andem et al. (2015) have showed that *Irvingia gabonensis* generated the highest annual income in rainforest ecosystem while *Garcinia kola* generated the highest annual income in derived savanna ecosystem.

At least 25 major markets trade significant volumes of different NTFPs in Cameroon. These NTFPs can also be found in nearly every market in small quantities for everyday use. (Awono et al. 2013). The estimated market value of the 45 main NTFPs traded in Cameroon, is worth around US$1.028 billion annually. Pribyl et al. (2017) established that some of the *G. kola* sold in the city of Yaounde in Cameroon is imported from Nigeria. All other regions of the country (except the three northern regions), supply the city with the Littoral, West and Centre regions supplying the bulk. Meanwhile Egbe, Tabot and Fonge (2012) in their study on the ethnobotany and prioritisation of some selected tree species in south-western Cameroon established that, in the manyu division area, a farmer can get as much as 47.8 USD from the 12.5 kg of kola harvested annually as compared to 119.3 USD and 36.3 kg respectively Fako division by a farmer.

Various researchers (Adebesi, 2004; Akpan 2015 and Andem et al. 2015); have shown that bitter kola marketing to be a profitable business venture to the people of the rain forest and derived savanna ecological zones. The marketing efficiency of the commodity in Akwa Ibom state of Nigeria for example, has been established as 135.2% (Andem et al., 2015). However, the research as well reports that transportation cost, poor marketing channels, price fluctuation, perishability and seasonality of the product are the most severe constraints to bitter kola marketing in rural areas of Akwa Ibom State and by extension, in the entire sub region.

Figure 4: Bitter kola

1.2.5.2. Njansang

One of the main income generating NTFPs is njansang which has it origin to the humid tropical forests in Cameroon. It is used by most households in Africa and Cameroon in particular as spices. According to Cosyns et al. 2011, the commercialization of njansang is very important in alleviating poverty in the lives of poor households. They came to this conclusion based on a research that was carried out between 2005 and 2010 in

Cameroon. Households who participated in the project development World Agroforestry Centre (ICRAF) saw an increase in cash income generated from the sale of njansang due to the fact that group sales were organized for the households who participated in the project and they also had the opportunity to negotiate for higher prices as compared to the control group.

Figure 5: Image of njansang showing first stage of transformation.

1.2.6. Policy environment surrounding NTFPs

In addition to the permits for the exploitation of 'special forest products' in Cameroon, the law requires exporters to have an annual export permit, provided by the ministry in charge of forests in collaboration with the customs department. The formulation of environmental and conservation policies has been the specialized area of ecologists and conservationists. These policies fit the management of conservation areas into the general policy framework of the government. Thus, the environmental policy has a

single objective, conservation, which of course ultimately has influence over the attitude of the government with respect to forest-dependent communities.

In Cameroon, biodiversity protections laws exist. The 1994 Forestry Law grants free, customary-user rights to forest communities, allowing collection of 'all forest, wildlife, fisheries products freely for their personal use, except protected species' in all unprotected areas, and including subsistence fuel wood and wood for construction needs (Awono *et al.*, 2013). However, this law has seen numerous critics. One of them being that it limits farmers' rights to most NTFP to the rights to exploit for personal use only; because commercial exploitation is subjected to permits (Foundjem-Tita et al., 2014). If not for these laws, the entire forest would have been probably degraded. Even with these policies, through government permits, multi-national and foreign companies still get to exploit timber trees and cut down vast extends of virgin forests for the development of plantations. Today almost two-thirds of the forest has been degraded to secondary forest. In the process many of the NTFP resources have been destroyed or grossly decimated. This has affected the production of bitter kola, and the volume of its trade decreased when compared with that of the 1960s. However, the trade volumes may increase soon, as the forest and other inhabitants are now domesticating Garcinia kola trees.

Awono et al. (2013) observes that the legal framework in place with respect to non-timber forest products can hardly have a positive impact on the livelihoods of local people and may be because of these unfavourable laws, about 90% of farmers and traders in NFTPs in Cameroon are operating without permits and therefore are acting illegally (Awono et al. 2013). A serious issue that has had very little attention so far in Cameroon is the impact of forestry laws on the livelihoods of forest communities who depend on NTFPs to a large extent. Rist et al (2012) have highlighted both positive and negative impacts and equally attribute dwindling volumes of NTFPs collection to the logging of commercial timber species which possess NTFP value of enormous livelihood importance. This portrays a conflict of use and to address this, Laird (1999) proposed an integrated management policy for timber and NTFPs. Unfortunately, forest communities in Sub-Saharan Africa are still losing key tree species possessing NTFP

value to logging. This can be attributed to a number of factors (Rist et al., 2012) which include:

- The preference for timber over NTFPs in terms of economic value.
- A research bias toward internationally traded commodities.
- The invisibility of locally used and traded forest goods.
- The marginalization of forest-reliant communities.
- An underestimation of the socioeconomic and cultural importance of NTFPs to rural and urban households

In the past, villagers found it difficult to grow *Garcinia kola* because of the difficulties they had in raising seedlings in nurseries and the long gestation period before flowering and fruiting. Today in Cameroon, research (Kanmegne and Omokolo, 2008) has pointed out significant differences in seed germination rate among different collections of bitter kola seeds indicating that seed germination traits may be variable in the species.

This research finding is being valorised already by the agricultural and tree product program. The program has established more than 40 nurseries where *Garcinia kola* and other tree propagation techniques are studied and disseminated to farmers. With such efforts, NTFPs are increasingly evolving from mere livelihood safety nets with wild plants to necessary established plantations and medicinal species in rural communities in West and Central Africa (Egbe, Tabot and Fonge, 2012). Consequently, projections of plantation-scale cultivation have already been carried out and proposes a fruit production of 26 tons/ha/annum, with 278 trees/ha at 6m x 6m spacing (Adebisi 2004).

1.2.7. Preferences for NTFPs

Household use preferences of local communities for NTFPs have been found to be influenced by geographical location as well as ethnicity and to understand these preferences for a given community, economic studies on their NTFPs is recommended

(Leßmeister et al., 2016). For such communities, NTFPs play a considerable role in poverty alleviation and can reduce risks as well as serve as safety net in times of shocks and stresses (e.g., natural catastrophes, crop shortfall and illnesses) through diversifying local livelihood strategies such as unemployment, death, or disease. So, need and opportunity combined to give NTFPs an important role in the livelihoods of the rural poor (Belcher et al., 2003; Leßmeister et al., 2016). Classification of NTFPs into phylogenetic groupings or into functional categories has been recognized by Belcher et al. (2003) as being useful for organizing ecological understanding; but they find this classification inappropriate for understanding development implications of peoples' use and management. They rather recommend a classification that facilitates analysis and development interventions through a comparative analysis of issues like: how local conditions and opportunities affect NTFP use and management, relating kinds of cases to particular kinds of livelihood outcomes, and how NTFP production systems evolve under commercial conditions. The case grouping is found particularly useful because it brings out the importance of the case context in household use preferences of NTFPs and other forest resources. Here variables like property rights, size and accessibility of markets for NTFP, and the availability of alternatives, come to play.

1.2.8. NTFPs value chain development

Fondoun and Manga (2000) outlined three ways in which various products derived from indigenous tree species are used in Cameroon, they include (i) direct utilisation by household (e.g. fuel wood, food and medicine), (ii) indirect utilisation as inputs into the farming system (e.g. fodder and mulch) and (iii) as products for direct sales or for processing prior to sales.

Across the West African countries, *Garcinia kola* has socio-economic value across. The seeds are generally chewed and used for traditional ceremonies and medicines. *Garcinia kola* (Bitter kola) fruits are harvested annually between July and October, thus making it a very seasonal product (Agbelade and Onyekwelu, 2013). The fruit constitutes an

integral part of the rural livelihood of the people, and it boosts their economic status within the rural setting. It contributes substantially to the socio-economic uplift of the people.

In addition to its stimulant property, it is used as an aphrodisiac. The kola has very high position of cultural importance in Cameroon. Herbalists use it in their pharmacopoeia preparations for numerous ailments. Garcinia kola is highly valued for its perceived medicinal attributes, for example kolaviron, a natural antioxidant bioflavonoid isolated from G. kola has been found to demonstrate remarkable chemo preventive activities. Farombi, Adedara and Abarikwu (2017) thus noted that kolaviron could be useful as a novel bioflavonoid in the control of health threatening diseases such as cancer (Wallart *et al*, 2017) identifies Garcinia kola to possess useful anti-inflammatory effects and identifies garcinoic acid isolated from Garcinia kola as the phytochemical responsible for these effects.

Garcinia kola is being harnessed as a cure for ebola virus infection and flu (Andem *et al.*, 2015). It is among six indigenous tree species selected by ICRAF for domestication in Cameroon (Pribyl *et al*., 2017). It has equally identified collectors as major actors in the supply chain, accounting for up to 54.8% of the bitter kola supplied in the city of Yaounde. Majority of NTFPs sold by harvesters undergo only basic value-adding processes such as drying, chopping or cleaning (Awono *et al* 2013).

2. Problem statement and aims of the thesis

Commercialization of NTFPs has become an important livelihood strategy for households living in or near the forest and according to Egbe, Tabot and Fonge 2012 commercialisation of bitter kola and other NTFPs have contributed significantly to households living near the forest. However, little has been done in investigating which household characteristics contribute to the collection of these non-timber forest products in Cameroon.

Thus the aim of this study is to analyze effects of household resources on forest product collection and commercialization.

The specific objectives are to:

i. Document household characteristics
ii. Document non-timber forest products collected and their purpose of collection.
iii. Analyse the relation between household characteristics and non-timber forest product collection.

3. Methodology

3.1.1. Study site characteristics

The study was conducted in Ebolowa of the Mvila department, which is situated in the central part of the South Cameroon. Ebolowa is the administrative capital of the Mvila department. Mvila is bordered to Océan and Vallée-du-Ntem in the west and Dja-Et-Lobo in the east. It also shares border with Central Cameroon from the north and to the south with neighbouring country Gabon. The vegetation of the area is Guinea-type climate characterised by high humidity, two rainy seasons and one short and one longer dry season. Average temperature is between 24 and 26°C. The average annual rainfall rarely exceed 2,000 mm, most of them are distributed to those two rainy seasons that occurs in April-May and September-October, with 200-400 mm monthly precipitations (Valantine 2013).

Most of the rain comes in October, while two above-mentioned dry periods with monthly precipitation volume drops below 80 mm are in December-February and July-August, respectively. Such bimodal rainfall pattern determines two growing seasons with suitable weather conditions. The first starts in March and ends in July, while the second starts in August and ends in November. Between these two seasons, from December to March, arable swamps and valley bottoms are cultivated that allow to produce off-season food crops (Denis et al. 2007).

Mvila department covers an area of 8,697 km^2 and the last population census indicates the total population at 179,429. Average population density is thus around 21 people per square kilometre (Cameroon Data Portal 2017). Department is further administratively divided into eight communes. For the purpose of the survey, Ebolowa was selected as it covers both urban areas with markets where both agricultural and forest products are being sold as well as rural areas, with farming households and forested areas. The total population of Ebolowa commune reached 118,267, almost two thirds of the total population of the department (Cameroon Data Portal 2017). However, according to the

revised population census the region has a total population of 87,875 inhabitants (UN World's Population Prospect 2017).

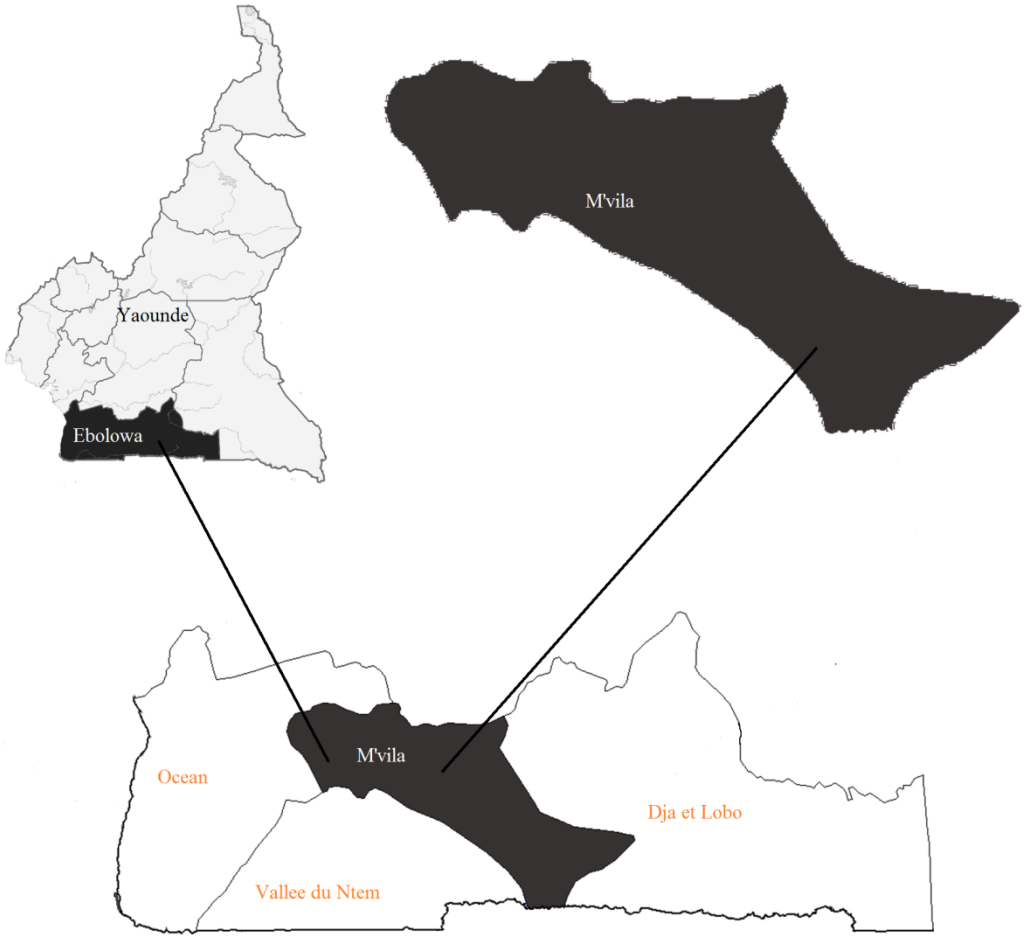

Figure 6: Map of Cameroon indicating study site

3.1.2. Research design and data collection

Main reason for choosing South Cameroon for this study is that the area is reported to be mostly covered by dense evergreen humid Congolese forest and the climax vegetation, particularly around Ebolowa town (Denis et al. 2007). Total forest cover of Cameroon is estimated around 186,000 square kilometres, and according to FAO, 2013 Most of the forested area is situated particularly in the southern regions (Denis et al. 2007; Robinson 2009; World Bank Data, 2017).

The city of Ebolowa covers an area of 560 ha. Although cosmopolitan, the city of Ebolowa is mainly populated by Boulou, a significant element of the forest peoples that are the Bantu and Pygmies bringing together, among other things, in the equatorial region, the Maka, the Pahouins, Fong, Eton, Ewondo, Yezum, Ntumu. It has 120,000 inhabitants distributed in the 24 neighborhoods that compose it and whose most densely populated are: New-bell, Nko'ovos, Angalé, Mekalat-Yevol, Ebolowa if I and II, Abang I and II.

Data were collected from August to September in 2018 in four villages of Ebolowa commune, and, in four stages. Firstly, local markets in Ebolowa town were visited in order to document which forest products are traded there and to gather the information from present vendors on collection places or villages (see Figure 1 showing the map of the study site and identified villages). Selection was limited to Ebolowa commune only. Secondly, identified villages, i.e. Bityli III (further in the study referred as Bityli), Nguet both villages are in the northern, Meyos in the southern, and Azem in the eastern part of Ebolowa, were approached and local village heads interviewed on the role of forests in household economics of local households. Thirdly, together with village heads, FGDs were organized. The purpose of these meetings was to understand better the linkages between forests and local households. Last, household survey was carried out.

3.1.3. Local markets in Ebolowa town and transect walks

Two main markets that are Mfoumou and Gare routiére d'Ebolowa II in Ebolowa were visited in order to find out the types of NTFPs that were available in the market and from which villages. After conducting interviews with the local market sellers commonly referred to as the buyam sellam, we concluded that Bityli, Nguet, Meyos and Azem were the ideal villages where the research could be conducted because households from these villages were responsible for the majority of the NTFPs that were sold in these markets. The aim of the transect walk that was carried out with the help of local experts was to understand which products were collected from the forest and the communities or villages that were involved in the collection. This was done by questioning, observation and listening to market vendors involve in products that were being collected from the forest.

Figure 7: Bush mango dried/displayed at Gare routiére Ebolowa II

Figure 8: Transect walks with tour guide and forest expert

3.1.4. Interviews with village heads

Village heads (chef de village) were visited and introduced with survey focus and purpose. Information on historical background, land-use systems, and population structure were gathered. Special attention was given to the role of local forest for local households' livelihood, both in terms of potential cash income generation and nutrition.

Figure 9: Image of the fermentation of palm wine

Figure 10: Picture of palm wine ready to be consumed

Figure 11: Crossing to Azem village

3.1.5. Focus group discussions on non-timber forest products collection and use

Focus group discussions (FGDs) were organized in cooperation with chiefs of selected villages. In every village, 7-12 persons were asked to join these consultations with research team, village head and field assistants. Criteria for choosing persons were: (i) willingness to participate, (ii) knowledge on forest products and their regular collection and use, (iii) living in the area for at least five years, and, (iv) be able communicate in local dialects

Table 2: Focus group discussions in selected villages in Ebolowa District

Village	Total population	Main ethnic groups	Female participant	Male participants	Number of participants in FGD
Bityli		Bulu	5	7	12
Nguet		Fang	2	5	7
Meyos		Ewondo	3	7	10
Azem		Fang	2	8	10

From table 2, Participants were purposively selected from different parts of the village to ensure diversity of the groups interviewed. Main reason for organising these discussions was to understand the main motivations of local people to collect and use forest products, particularly for cash and/or nutrition purposes. Main forest products were documented and consensus of the participants on their gathering places, prices, and uses were obtained. Furthermore, datasheets for household were modified according to the discussions as well. Organisation of focus group discussions followed previously published studies (Krueger and Casey 2014).

3.1.6. Household survey

For the purpose of the research we identified household as a group of people with same or similar economic purpose, sharing one kitchen and manage same resources. Household head was recognized as the most suitable and crucial respondent as this person was expected to play main role in decision-making process on non-timber forest production collection and use. Purposive and convenient sampling techniques were employed in the study to select the villages and the respondents. That is, we contacted four different villages, and in each ward, village market heads (one per ward) were interviewed to inform inhabitants of each ward before data collection at households' level begun. In all, a total of 174 respondents were sampled (Table 3).

Table 3 Respondents selection from focused villages

Village	Proximity of village to forest	Total number of households	Number of households identified
Bitily	Less than 1 hour, close	Approx. 800	50
Meyos	About 30 minutes close	Approx. 400	50
Nguet	About 1 hour close	Approx. 200	50
Azem	Less than 20 minutes close	Approx. 250	50

Information were collected via face-to-face interviews using a semi-structure questionnaire, which were pre-tested on four households in order to make necessary adjustments and assure effectiveness of data obtaining process (30). Structured

questionnaires were used as the main tool for data collection. It included a set of open-ended questions and close ended questions. The questionnaires included household resources, plant forest products collection, food security questions, farm calendar and income diversification. A total of 200 questionnaires were administered however, 174 were retrieved and process for data analysis (87% response rate). The main variables that were used for the study include gender of household head, age of household head, off-farm jobs, farming experience, education, kilograms of NTFPs collected, distance to nearest forest, years lived in the house and number of dependent members in the household.

Figure 12: Picture of monkey kola

Figure 13: Image of snail

3.1.7. Data analysis

In this study, we used descriptive statistics to answer our first and second objectives whereas the third objective was analysed using econometric modelling. The regression model was fitted by STATA version 14.

The relationship between household characteristics and kilograms of NTFPs collected was modelled using a multiple regression estimated by the OLS. The specification of the model is given (Green 2003) by

$$y_i = x'_i\beta + u_i \quad (1)$$

Where Y refers to as the dependent variable, β is vector parameters to be estimated and X denotes vector of explanatory variables and U is the stochastic disturbance term.

Following other studies (Quang and Anh, 2006; Morsello et al. 2012) that analysed relationship between NTFPs and household livelihoods. Formally, the empirical model of the linear regression is specified as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_7 X_7 + U \quad (1)$$

where y is the dependent variable (kilograms of NTFPs collected)

Explanatory variables include: off-farm job, dependency ratio, education, age of household head, gender of household head, farming experience, distance to nearest forest and duration of stay in the house. See details of variables used in Table 4.

Table 4 Overview and specification of explanatory variables used in the survey

Variable	**Description**
Qty NTFPs	Quantity of NTFPs collected in kg
NTFPs value	Estimated financial value of collected NTFPs (quantity collected in kg × expected price that collector could receive at the local market or farm gate)
Household size	Number o people living in a house
Female labour	Female household members involve in NTFPs collection.

Table 4 Continues

Variable	Description
Dependency ration	Number of household member younger than 18 and older than 60 divided by household labour force
Gender	Sex of household head (0 = male, 1 = female)
House head age	Age of the household head (years)
Residence time	Number of years living in the area (years)
Off-farm job	Household head having off-farm job (1 = yes, 0 = no)
Education	Education level of household head (1=primary, 2=secondary, 3=high school, 4= diploma, 5=university)
Farming experience	Number of years spent farming
Distnace to forest	Distance from house to nearest forest (kilometers)
Large animals	Number of large animals (cows, goats …) (yes/no)

4. Results

4.1.1. Results of focus group discussion, transect walks and key interviews

In this section, the qualitative data obtained during the focus group discussion is presented and the main issues discussed were: main motivation of local people to collect and use forest products that is particularly for cash and/or nutrition purposes, main forest products were documented and consensus of the participants on their gathering places, prices, and uses.

4.1.2. Main forest products documented, places of gathering and uses

Ten main forest products (Figure 2) such as bitter kola, monkey kola, cashew, snail, mushrooms, njansang, eru, palms, white pepper and bush mango were documented during the data collection. These products are gathered from the natural or primary forests and were amongst the most important NTFPs collected from the forest.

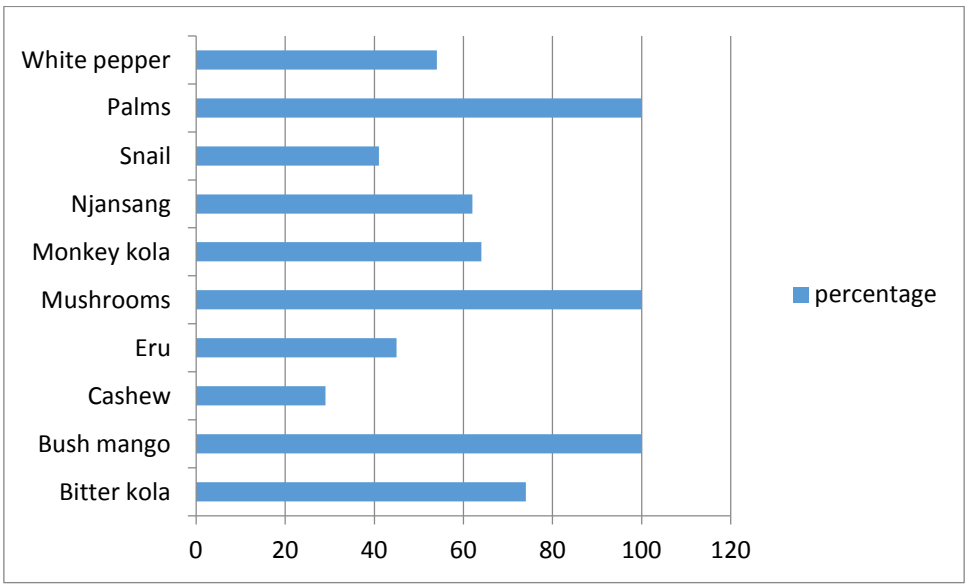

Figure 14: NTFPs collected by the respondents

4.1.3. Purpose of NTFPs collection in study area

In general, the main purpose of collecting NTFPs by households in the four communities is for medicinal purpose. Bityli had the highest (44) number of households that use the NTFPs collected as medicine out of its total sampled household of 58 while Meyos recorded the least (22) number of households which use NTFPs for medicinal purpose. Other reasons for collecting NTFPs showed a mixed result, for example while in Bityli the second most important reason for collecting forest products is for food consumption, in the other three communities, source of energy and fuel was the second most important reason for collecting forest products by households (Figure 2).

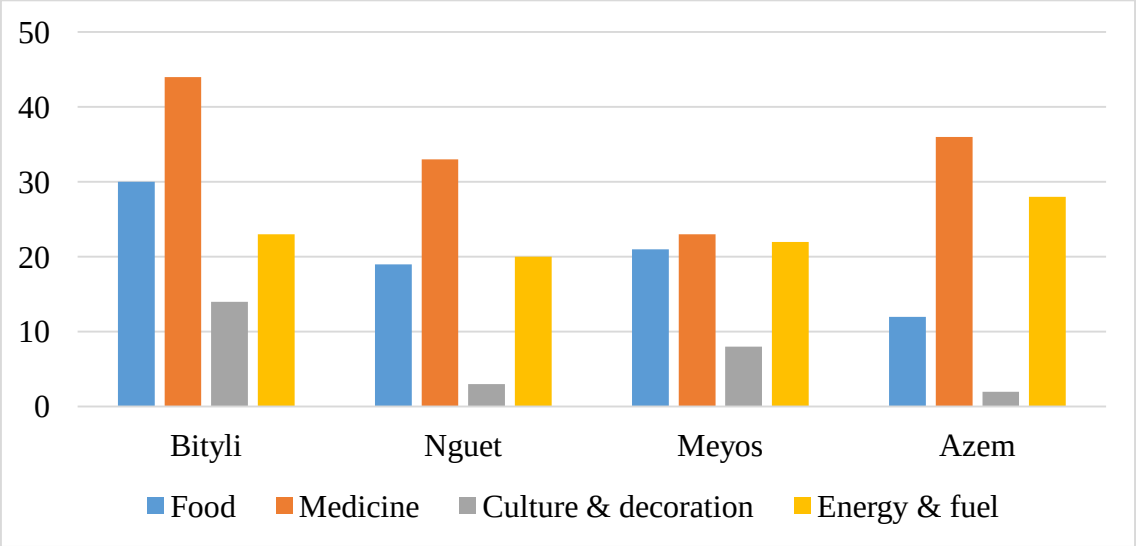

Figure 15: Purpose of NTFPs collected by households in the four wards

4.1.4. Part of NTFPs used by households

The result from table 5 below shows the part of plant used by HH. The respondents used fruits of palm, white pepper and cashew while seeds of bush mango and njansang were used and the leaves of white pepper and snail used for food

Table 5: Part of NTFPs used by households

NTFPs	Part of use	Frequency (%)
Bush mango	Fruits	126(72%)
	Seeds	173(100%)
Njansang	Fruits	121(69%)
	Seeds	173(100%)
Palm	Fruits	173(100%)
	leaves	173(100%)
White pepper	Fruits	173(100%)
	leaves	22(12%)
Cashew	Fruits	173(100%)
Monkey kola	Fruits	134(77%)
Bitter kola	Fruits	120(69%)
Mushrooms	Food	113(65%)
Eru	leaves	113(65%)
Snail	Food	56(32%)

4.1.5. Socio-economic characteristics of households in the study area

The result in table 6 shows the socio-economic characteristics of the respondents.

Table 6 Socio-economic characteristics of targeted households

Variable	**Item**	**Frequency** (%)
Gender	Male	69(39%)
	Female	103(59%)
Off-farm jobs	Yes	98(56%)
	No	76(43%)
Working in farm	Yes	96(55%)
	No	78(44%)
Ethnicity	Bityli	58(33%)
	Nguet	40(23%)
	Azem	39(22%)
	Meyos	37(21%)
Level of education	Non-formal	11(6%)
	Primary	44(25%)
	Secondary	41(23%)
	Diploma	31(17%)
	University	47(27%)

Table 7 Descriptive statistics of sampled household

Variable	Mean	Standard deviation	minimum	Maximum
Quantity of NTFPs	16.97	13.01	4	112
NTFPs values (USD/10kg)[1]	1.87	4.37	11.90	27.21
Dependency Ratio	2	1.32	0	6
Gender	0.60	0.49	0	1
Age	46.09	14.80	24	80
Number of years living in the house	15.47	10.70	2	63
Off-farm jobs	0.56	0.49	0	1
Education	3.34	1.29	1	5
Distance	9.41	7.42	2	60
Farming experience	12.56	10.07	2	50

[1] USD is equal to 588 FCFA

4.1.6. Results of multiple linear regression and household characteristics and NTFPs collected

Table 8 indicates results of multiple linear regression by the OLS estimates.

Table 8: Results of relationship between quantity of NTFPs collected and household characteristics

Variables	**Coefficient**	**p-value**
Age of household head	-0.340	.000
Constant	-	.000
Dependent members	-0.448	590
Farming experience	0.231	.009
Gender of household head	-0.300	.000
Household size	-0.501	.529
Level of education	-0.208	.004
Off-farm job	5.499	.001
Paid labour	-0.246	590
Working in farm	-0.004	.956
Years spent in office job	0.102	.156
R Square	0.256	
Adjusted R Square	0.206	

Note: *** denotes significance levels at 1%.

5. Discussion

5.1. Focus group discussion

Findings from the research show that a greater number of the respondents who participated in the FGD said that the motivations behind NFTPs collection are both for cash and nutrition purposes. This is in line with that of Ahenkan and Boon (2011) whose research findings concluded that NTFPs are still a very vital source of household food security, nutrition and health. This is because particular products are either just being consumed at home or sold in the market in order to generate cash income. For instance, products such as white pepper, eru, palms are consumed at home and parts are sold in the market to generate some income for the household. Bitter kola, njansang, bush mango and cashew are collected mainly for commercial purposes. They have high monetary values and cash generated from the sales of these products can help the households in purchasing food items which they are not able to produce such as rice or send their children to school.

5.2. Main forest products documented, places of gathering and uses

The result from figure 1 shows that palms, bush mango and njansang were NTFPs collected by all the interviewed households in the study area because they could generate high sums of money when sold. This is in line with the research carried out by Awono et al. (2016) whose findings concluded that NTFPs are a vital source of income to households in Cameroon because they constitute a regular source of income.

5.2.1. Purpose of NTFPs collection in study area

All households across the four communities collected for medicinal purpose. Bityli had the highest (44) number of households that use the NTFPs collected as medicine out of its total sampled household of 58 while Meyos recorded the least (22) number of households which use NTFPs for medicinal purpose., source of energy and fuel was the second most important reason for collecting forest products by households. Many households have resorted to plants or traditional medicine because it is ready available and at very little or zero price. This is in line with the work of Tabuti et al. 2003 who stated that report from the WHO shows that more than 80% of household in the third world use traditional medicine because it is less expensive and can be access easily by households.

5.2.2. Part of NTFPs used by households

Results from table 5 shows the parts of NTFPs used by households and bush mango and njansang, all the households in the study are were using the seeds. The fruits of palm, cashew and white pepper were used by all the households and 77% of them using the fruit of monkey kola while 72% were using the fruit of bush mango. This is because the seeds of bush mango and njansang when dried can last for a very long time and they also have high money value.

5.3. Socio-economic characteristics of targeted households

Results from table 6 revealed that majority (59%) of the respondents were female, 56% of them have an off-farm jobs and majority (55%) working in the farm, 27% of them had university education followed by primary education (25%) and only 6% had no formal education

5.4. Linkage between household characteristics and non-timber forest product collection

Table 8 shows the result of multiple linear regression by the OLS estimates. The goodness-of-fit shows that the explanatory variables provide good estimates of households' characteristics on NTFPs collected. The R-square indicated that the independent variables explain about 26% of the variation in the NTFPs collected.

Gender was significant at 1% with negative regression coefficient of -0.300. This means that male household heads are likely to collect more NTFPs than their counterparts female household heads. This maybe argued that given the numerous household activities of women coupled with the nature of some NTFPs collection, more males are involved in collecting NTFPs. This variable was also statistically significant at 1%.

Regarding household head age, the result shows that the age was significant at 1% with negative regression coefficient of -0.340. This means that increase in age of a household head will lead to a decrease of 0.34 on NTFPs collected. This is due to fact as they get older, they are unable to walk for very long distances since the forests are far away home.

Farming experience was statistically significant at 1% with positive regression coefficient of 0.231. This means that increase in farming experience of the household head will lead to an increase of 0.23 of NTFPs collected. As expected, households with several years of farming experience and had knowledge of economic and social importance of NTFPs were involved in the collection of non-timber forest products.

Level of education was statistically significant at 1% with negative regression coefficient of -0.208. This implies that an increase in level of education of household leads to a decrease 0.20 of NTFPs collected. This is probably because people with higher level of education maybe attracted to white collar jobs.

Off-farm job was statistically significant at 1% with positive regression coefficient of 0.227. This means that household heads with off-farm job is likely to collect more NTFPs by 0.22 than those households without off-farm jobs. This is due to the fact that household heads with off-jobs are financially fit to pay hired labour for NTFPs collection

5.5. Limitations

The results of the study cannot be generalized because convenient sampling procedure was used in selecting the respondents.

Self-report bias may not be totally eliminated due to the fact that maybe the respondents simply did not want to say something that will provoke someone to laugh at them or think that they are not living their best lives.

Not every product harvested from the forest is available throughout the year thus there is the issues of seasonal harvesting. So many products were not documented because the

respondents could only remember those products that were available at the time the research was being conducted.

Another serious issue faced during the period of the data collection was language barriers because most of the respondents didn’t want to respond to the question simply because the questions were not being asked in the native bulu language.

6. Conclusion

Female were the majority of the household heads with average age of 46 years in the study area, majority of them working on farm and the average dependent members were 3. Bush mango, mushrooms and palms were the major NTFPs collect and the main purpose of collection were medicinal and fuel/energy. Male household heads collected more NTFPs than female, farming experience and having off-farm jobs affected the collection of NTFPs in positive way. However, age of household heads and level of education affected the collection of NTFPs negatively.

Therefore, the study recommended that further research should focus on the quantity taken to the market and in which form, which is raw or processed, market information and factors affecting the availability of NTFPS.

Government or policy makers should introduce women empowerment programs.

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