Global Advanced Research Journal of Agricultural Science (ISSN: 2315-5094) Vol. 5(6) pp. 235-242, June, 2016 Issue.
Available online http://garj.org/garjas/home

Full Length Research Paper

Issues of Non Timber Forest Products of valorization community forest in South Cameroon

Amang A Mbang J[1]*, Neudjo RP, Nwegueh, A[1], Mounoumeck, P[1], Caspa R[1], Agodo Melingui JB[2], Foahom B[1], Woin N.[1]

[1]Institute of Agricultural Research for Development (IRAD), Cameroon.
[2]University of Yaoundé I Cameron.
*Corresponding Author's Email: mbang4@yahoo.com; Tel: 237 677 39 08 49.

Accepted 08 June, 2016

This study focuses on the valorization on NTFPs issues of valorization of non-timber forest products (NTFPs) around community forests in the Southern Region of Cameroon. The study aims to promote and develop community capacities in the valorization of NTFPs which are by definition biological originated products, that differs of wood and that are issued from forest and woodland. The objective was to evaluate the NTFP production potential relative to resource availability following 5 Land Use Types (LUT): Fallow to chromolaena, Annual Standing Cut (ASC), cocoa farms of 20 years old, cocoa under farms less than 20 years old and a virgin forest. The survey inventory device used for this purpose is made of plots in three study villages. A transect of 1 km long and 600 m wide was opened in each LUT and open 300 m on either side of these transects. A total number of 253 plants with NTFPs values were identified in the different LUTs. The total number represents 23 species five of which are represented with a percentage frequency of at least 5%. These are: *Gnetum africanum* (31 %) *Pentaclethra macrophylla* (11%), *Coula edulis* (9%), *Pachypodanthium staudtii* (9%), Ancistrophilon *okwakum* / *Scorodopheulus zenkeri* (6%). Classify the 253 plants collected under these categories of uses and show the importance that the community attaches to each. Show how the use of these products influences community livelihood (socio-cultural and economic) and the impact of harvesting on plants availability. Statistical analysis using SAS 9.0 software and the factorial analysis of correspondence, reveals that these 23 species were not statistically different in Duncan test at α = 5%, with a p-value = 0.29 (5.867 ± 1 73 cocoa under 20 years; 3933 ± 1.69 ASC, 3.933 ± 1.29 virgin forest, 2.067 ± 0.55 cocoa over 20 years, 2.000 ± 0.73 to chromolaena fallow). Sustainable management of community forest should be put in place through strong regulation to raise awareness of local population on other forest benefits instead of confining them only to agro forestry activities.

Keywords: AFCO community forest-E2M, NTFPs, Cameroon

Résumé

Les enjeux de la valorisation des Produits Forestiers non Ligneux (PFNLs) autour de la Forêt Communautaire dans la Région du Sud Cameroun.

Une étude a été conduite dans le but de chercher à promouvoir et à valoriser les Produits Forestiers non Ligneux (PFNLs) qui sont par définition, des produits d'origine biologique, autres que le bois, dérivés des forêts ou des terres boisées. L'objectif était d'évaluer le Potentiel de production en PFNL par rapport à la disponibilité de la ressource suivant 5 Types d'Utilisation de Terre à savoir TUT : Jachère à chromolaena, Assiette Annuelle de Coupe (AAC), cacaoyère vieille d'au moins 20 ans, cacaoyère vieille de moins de 20 ans et des forêts vierges. Le dispositif d'inventaire utilisé à cet effet est celui de placettes dans les trois villages d'étude. Il consistait à tracer un layon de 1km dans chaque TUT et à ouvrir de part et d'autres de ces layons des transects de 300m de long. Sur les transects, des placettes de 50*50m soit, 0,25ha ont été délimitées à une distance de 100 m chacune. Des PFNLs d'origine végétale ont été ensuite inventoriés dans la surface des placettes. Les résultats obtenus montrent que sur près de 253 individus répartis dans les différents TUT, répertoriés et qui sont répartis dans 23 espèces dont 5 sont plus représentées avec un pourcentage de fréquence d'au moins égal à 5% : ce sont : *Gnetum africanum (31 %), Pentaclethra macrophylla (11 %), Coula edulis (9 %), Pachypodanthium staudtii (9 %), Ancistrophilon okwakum/ Scorodopheulus zenkeri (6 %).* Et chaque essence a sa catégorisation d'usages (Ecorce, graines, fruit, feuilles). L'analyse statistique avec le logiciel SAS 9.0 et l'analyse factorielle de correspondance, ressort que ces 23 essences ne sont pas statistiquement différentes au test de Duncan à α=5% avec un p- value = 0,29 (5.867 ±1,73 Cacaoyère de moins 20ans; 3.933 ±1,69 AAC, 3.933 ±1,29 Forêt vierge, 2.067 ±0,55 Cacaoyère de plus 20 ans, 2.000 ±0,73 Jachère à chromolaena). De plus, il ressort que ces essences ne sont pas spécifiques aux trois villages et aux 5 TUT (Coefficient de corrélation de l'Analyse Factorielle de Correspondance égal à 3,1 % pour les essences/villages et pour les essences/ TUT des deux axes de dimension). De cette étude, il ressort que la Gestion durable des Forêts Communautaire devrait être mise en place en mettant un accent fort sur la sensibilisation de la population riveraine sur d'autres avantages forestiers au lieu de les confiner seulement aux activités agro forestières.

Mots clés. Forêt communautaire AFCO-E2M, PFNL, Cameroun

INTRODUCTION

This research is based on data collected from the forest in a village community consumer of non-timber forest products. It requires an inventory of species used and their contribution to food security Caspa and al. (2014, 2015a, 2015b). The harvesting of Non-Timber Forest Products (NTFPs) from natural forests is a normal subsistence activity of communities inhabiting forests around the world (Ticktin, 2004; Nkwatoh, 2010). Or simply stated these NTFPs harvesting provides a "green social security" to billions of people in the form of low-cost building materials, income, fuel, food supplements, traditional medicines, cultural symbols and ritual artefacts (Ahenkan et al., 2011; Brites,.et al., 2012). Although harvesting seeds and fruits only adds to the normal high seed mortality, which may not adversely impact plant regeneration, unsuitable harvesting techniques can put some fruit and seed NTFP species at risk (Clark and Sunderland, 2004). The NTFPs species (*Irvingia gabonensis, Ricinodendron heudelotii* and *Gnetum africanum/G. buchholzianum*) have also been recognized amongst other species in other parts of Cameroon by other authors (Clark and Sunderland, 2004; Fondoun and *al.,* 1999, 2000) as important particularly to the local communities. Community forests of the Ntem Valley are fragile ecosystems as indeed most ecosystems of the Congo Basin. This fragility is first imposed by its ecological features and critical socio-economic needs of a growing population with a significant proportion of requirements satisfied by the operation or marketing of NTFPs (Van *et al*., 2001; Sheil and Wunder, 2002). In Central Africa, 65 million people live within equally fragile ecosystems or near tropical forests and depend on these forests that play many roles: a source of energy, food, medicine and service products like construction, crafts and dyeing (Caspa et al; 2014, 2015a, 2015b).

This study at the Community Forest (CF) AFCO-E2M is primarily a management tool to improve performance and guide the sustainable management of FC Cameroon. The study presents an overview of said potential to enable people to participate in the management of natural forest resources and contribute to the expression of biological diversity. It provides priorities to be developed in other to better focus initiatives building activities in community forests.

The objectives of this study are Of the AFCO-E2M and categorize them by species and parts used to show their importance to the community and impact on socio-cultural and economic livelihood of the people of the forest community and explore these NTFP.

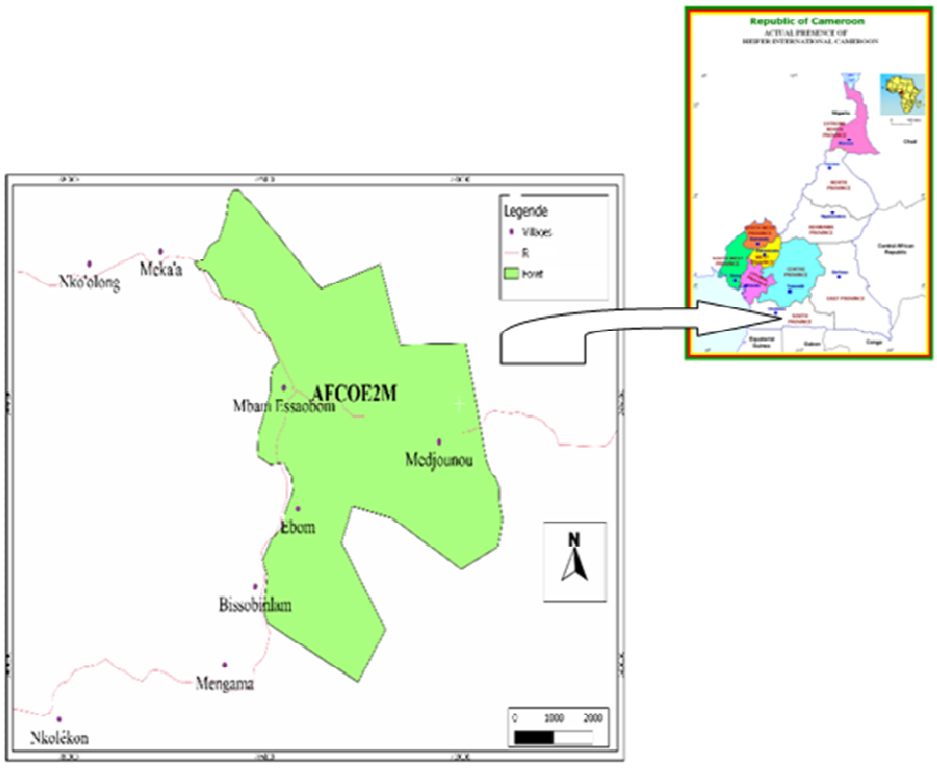

Figure1. localization area

MATERIAL AND METHODS

Study Location

AFCO-E2M, with an area of 3155 ha (see Figure 1) is a community forest in the South Region, Ntem Valley Division, Ambam District in Cameroon. The three study villages are FC Mbam - Essaobam, Ebozy 2 and Mejounou, situated approximately at 44 km from the administrative Center of Ambam, specifically between latitude 20 ° 40 ' East and longitude 11 ° 58' west.

Field data Collection

This phase focused on interviews with some stakeholders in community forestry (administration, NGO partners and members of the legal entity) and direct observations in the Types of Land Use (TLU) previously identified. Any usable fuel according to the plot device through the randomization method developed was listed. For each tree, the following information was collected and reported on the data sheet: local name, TLU, the circumference at breast height (DBH), the date of identification, health status, mode of spread, the village, the transect number (transect) and the plot (Neudjo, 2013).

Sample Selection

The land use map of the AFCO FC-E2M was used to determine the points to be sampled on the basis of stratification. Thus, in the AFCO-E2M, five TLU were involved: the chromolaena fallow, AAC (Annual Standing Cut), cocoa plantation of < 20 years old, cocoa plantation of > 20 years old and a virgin forest. Each TLU is selected independently. Cultures, ponds, bare soil, communities and any other non- forestry occupations were considered in the areas to be sampled.

METHODOLOGY

The inventory was conducted on the basis of a guide maintained in the forward 5 TLU above with a sampling rate of 0.0024 for a total area of 3155 ha. The study was finally conducted on a net surface area of 7.75 ha randomly selected from the community forest. The

transect was drawn by implementing the alignment milestones whose path was followed while measuring and marking out each unit value of 25 meters. It was for this purpose, drawing five transects of 1km each corresponding to 5 TLU connected by 14 transects of 300 m which 30 were associated 50x50 m plots equidistant 100m. Each transect provided for the survey design had a starting point. Each base line was then marked on the ground by a pole. This was then followed by the placement of transects. This phase was to draw corridors clearly generated by bending shrubs, vines and branches obstructing the passage to the demarcation of plots. The orientation of transects on the map was made perpendicular to question that reflects all the vegetable range involved. So we could keep us access point each plot to oversee the development of the team on the field. Two people were moving on each side of the same plot and conducted in turn counts on 25 meters. When one of them identifies a species, he measures the DBH, states its name and the value of the DBH. Along each transects the different types of land use (TLU) that correspond to various habitats were identified. The data collected for this purpose were directly recorded on collection sheets. After marking the point of materialization of the square measures were performed. Each square was marked by milestones following the four cardinal directions (N, E, S, and W). Then the tree measurements were taken within each square. The sides were materialized into a horizontal tape measure while paying attention to the limit trees. Species that were exactly on the boundary were recorded only in the northern half of the plot but not in the southern half.

Samples of the species were identified by the National Herbarium or biotechnology laboratory of the Institute of Agricultural Research for the Development (IRAD) in Cameroon.

Data analysis

Variables such as: Types of Land Use (Chromolaena fallow, Annual Standing Cut (ASC), 20 years old cocoa, cocoa plantation under 20 years old and virgin forest and NTFPs species.

Data were analyzed using primarily indices of descriptive statistics including frequency and percentages for the results of abundance of species. Secondly, Factorial Analysis of Correspondence (AFC) of SPSS version 16 software was used to identify possible correlations. This was to verify the similarity between species groups and villages on the one hand and other shares between the species and the TLU. The relationship between the different dimensions was examined from the Chi^2 test. The software SAS version 9.0 with the Generalize Linear Model procedure by the Duncan test separated means at significance level $\alpha = 5\%$ which compares differences between mean numbers of seven useful species in the community in all the TLU.

RESULTS AND DISCUSSIONS

Abundance of NTFPs in the site

Table 1 shows the distribution according to the variables used for this purpose. The abundance of all the species identified in this community forest was 259. However we note the gradual decrease on their rate of percentage per this total number, from 31% to 1%. It is clear that, the NTFPs species vary in abundance and quality according to the TLU.

From this table, 259 individuals were collected. These individuals made up 25 species with 5 having a percentage frequency of at least 5: *Gnetum africanum* (31%), *Pentaclethra macrophylla* (11%), *Coula edulis* (9%), *Pachypodanthium staudtii* (9%), *Ancistrophilon okwakum* / *Scorodopheulus zenkeri* (6%).

The letters on the histograms of TLU are the same and the TLU are not significantly different with the Duncan test at the level of $\alpha = 5\%$ with a p- value = 0.29. The lower and upper limits of the standard error show that, data is closer to the average. The coefficient of determination $R^2 = 89$ % obtained for the different TLU indicate that a total number of NTFPs trees could to some extent explain the variation in these 5 TLU in this community.

Distribution of NTFPs species in the different TLU

Figure 3 represented the distribution of seven species with two dimensional axes after Factorial Analysis of Correspondence (AFC). We obtain these seven species after the survey in 3 villages according to their importance part used, and their scores respectively: (*Baillonella toxisperma* (3^{rd}); *Coula edulis* (7^{th}); *Dacryodes* sp (4^{th}); *Irvingia* gabonensis (1^{st}); *Pentaclethra* sp (5^{th}); *Piper* sp (6^{th}); *Ricinodendron* sp (2^{nd}).

It appears that the proportion of inertia (variability) is 94 % for the dimension 1and 2, $\chi^2 = 63.24$ to 12 degrees of freedom and p-value = 0,001, is highly significant. The correlation coefficient is 3.1% between these two axes. This shows that all species are not specific to a village. Dimension 1 was 34.5% Eigen value and dimension 2 give 2.3 %.

Percentages of inertia of species are: 0.4% of *Baillonella* toxisperma, 1.1% of Coula edulis, 3.9% of Dacryodes sp, 4.8% of *Irvingia* sp, 0.3% of *Pentaclethra macrophylla*, 23.1% of Piper sp, 3.2% of *Ricinodendron* heudelotii.

Figure 4 represents the distribution of 5 Types of Land Use (TLU) and 7 species with two dimension axes after Factorial Analysis of Correspondence (AFC). These TLU are: the chromolaena fallow, ASC (Annual Standing Cut),

Table 1: Percentage of NTFPs identified in AFCO - E2M according to usage categories.

Scientific names	Local names	useful part	Frequency	% of presence in 259 inviduals
Alstonia boonei	Ekouk	bark	2	1
Afromomum melegueta	Ndong	seed	2	1
Allanblackia floribunda	Nsangom	seed	2	1
Ancistrophilon okwakum/ Scorodopheulus zenkeri	Olong	liana/ fruit	15	6
Annikia chloranta/ Enantia chloranta	Nfo'o	bark and fruit	3	1
Baillonella toxisperma	Adjap/Moabi	bark and fruit	7	3
Canarium schweinfutii	Fruit noir	fruit	10	4
Coula edulis	Ewomé	seed	22	9
Dacryodes edulis	Sa'a	fruit	10	4
Dacryodes macrophylla	Atom	fruit	2	1
Garcinia kola	Onien	bark and fruit	3	1
Garcinia lucida	Essok	bark and fruit	2	1
Gnetum africanum	O'kok	leaves	80	31
Irvingia gabonensis	Ndo'o	fruit	4	1
Maranthaceae sp	Nken/Akein	leaves	4	1
Myrianthus arboreus	Ozakon	fruit	7	3
Pachypodanthium staudtii	Tom	bark	22	9
Pentaclethra macrophylla	Ebaye	fruit	27	11
Pipper guinensis	Poivre noir	fruit	7	3
Raphia spp.	Rotin	bamboo	7	3
Ricinodendron heudelotii	Njangsang	fruit	8	3
Tetrapleura tetraptera	Saka'a	fruit	4	1
Trichoscypha acuminata	Ngonn	fruit	2	1
Trichoscypha arborea	Mvutt	fruit	6	2
Cola acuminata/nitida	Cola	fruit	1	1

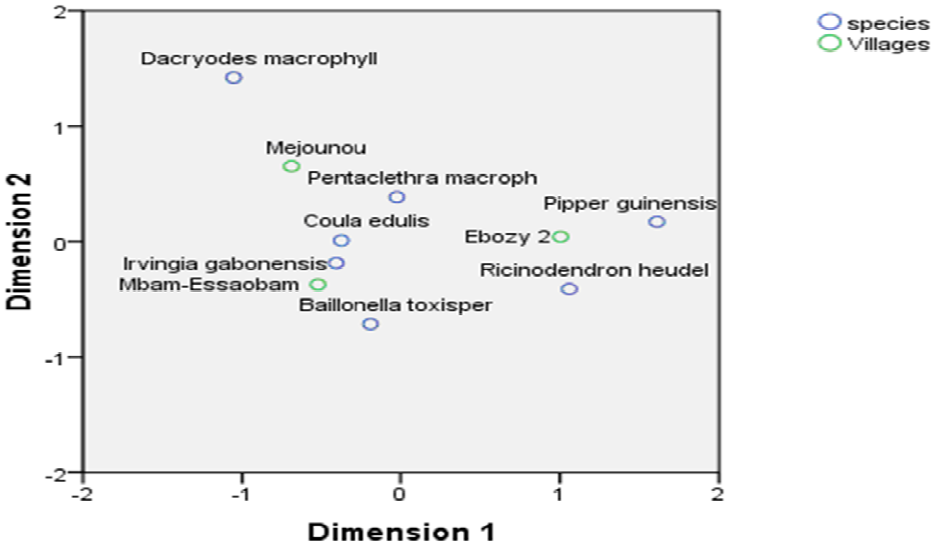

Figure 3: AFC distribution of species in the villages

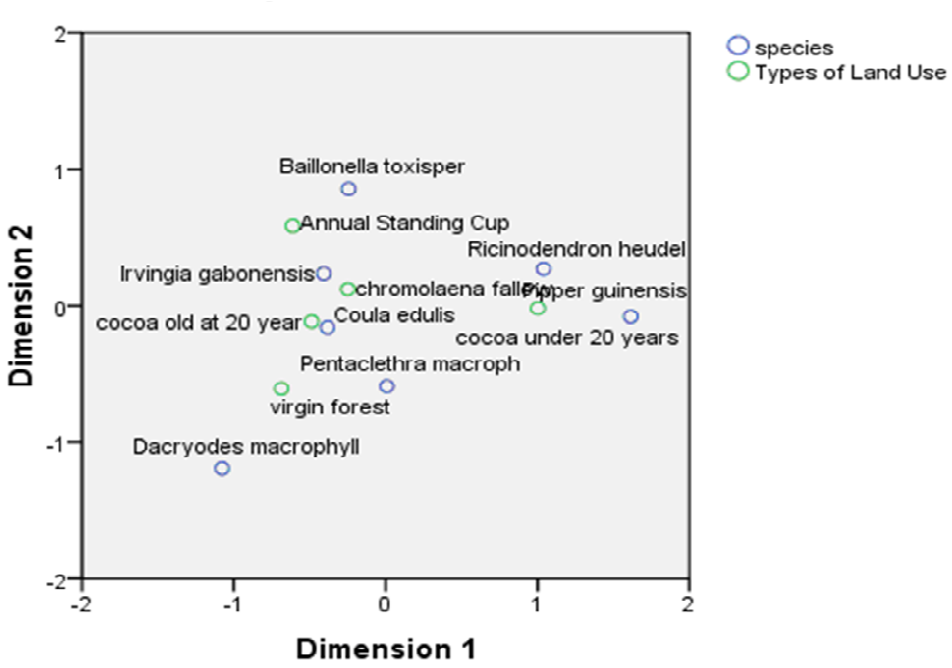

Figure 4: AFC distribution of species in TLU

cocoa plantation of less than 20 years, cocoa plantation under 20 years and the virgin forest. This arrangement shows that all the TLU tend towards the axis of the second dimension.

It appears that the proportion of inertia is 87 % for the dimension 1and 2, with χ^2 = 68.84 to 24 degrees of freedom and p-value = 0, highly significant 0001. The correlation coefficient is 3.1%. This shows that all species are not specific for TLU. Dimension 1 have 59% of Eigen value while dimension 2 have 2.7 %. The percentages of inertia: *Baillonella* toxisperma 1%; *Coula edulis* 1.6%, *Dacryodes* sp 4.2%, *Irvingia* sp 5 , 3%, *Pentaclethra* macrophylla 1%, *Piper* sp 23.4% and *Ricinodendron heudelotii* 3%.

Community forests characteristics such as secondary formations have a diversity of NTFPs of plant origin less important than the former. This can certainly be explained by the disruption of the original vegetation that often accompanies the loss of certain products and knowledge of their use. It follows that the extent of the collection of forest products is low during the harvest phase of NTFPs growth and become more important when the forest becomes older.

In cocoa plantations, NTFP species are often preserved during harvesting. They also generally have the advantage of being located closer to the rainforest villages. The chromolaena fallows are also present locations. Figure 4 below show histograms mass of seven species in the TLU.

According to Figure 5, *Irvingia* sp has a mass of 0.46 on a total active mass 1. This species is abundant in this community forest. In figure 4, there is no clear pattern in the relationship between mass and species in these TLU. The coefficient of determination (R^2=0, 7%) obtained indicated that these species cannot be used alone to predict a useful part in this community. This suggests the presence of other factors such as presence of others useful species, preference to used or liking for this species.

The species *Irvingia gabonensis* plants is according to Figure 4, the most representative species of forest harvesting activities. Wild food species as well as wild fruit such as *Baillonella toxisperma, Dacryodes macrophylla* also recruit in the jungle while wild species including the edible leaf, *Gnetum africanum* longer found in the younger formations occurrence cocoa ensure less than 20 years?. We note that in the end the community forest, the presence of species used in crafts and construction is greater in the virgin forest. The raffia is used mainly for the construction of boxes and roofs. This can be explained by the high frequency.

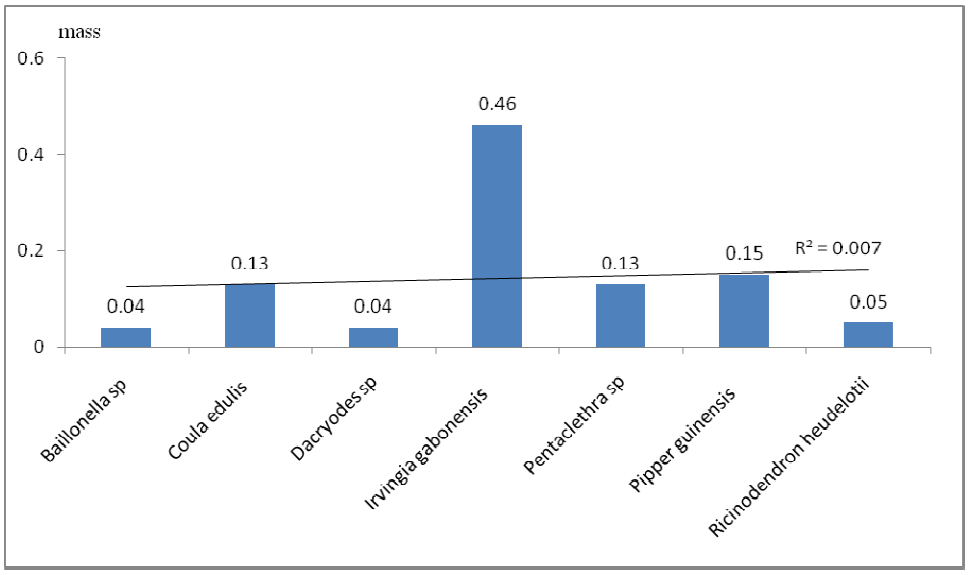

Figure 5: histogram of species weight of AFC in TLU

The variable circumference is neglected in this case because we focused on NTFPs and maturity of a species is independent of its circumference.

CONCLUSION AND RECOMMENDATIONS

Various useful species spread over 5 TLU reveal patterns compared to potential of the community forest AFCO-E2M. This CF (community forest) plays by the presence of NTFPs of plant origin, an essential function in its natural resource production system. From result analysis, all this Types of Land Use in this study area do not show any difference in the species that exists after the Factorial Analysis of Correspondence (AFC). However, our data allow us to make the observation that what the virgin forest disturbed and little or no cocoa ensure under 20 years remain for the local population of the collection sites of choice for NTFPs?. And also collected NTFPs are largely well spread whatsoever at village, only different levels TLU. CF Sustainable management should be implemented through strong regulation to raise awareness of the local population on other forest benefits instead of confining them only in agroforestry.

ACKNOWLEDGEMENTS

We gratefully acknowledge the cooperation of the Japanese International Cooperation Agency project (JICA) - Forest and Savannas Sustainability (FOSAS) and Institute of Agricultural Research for Development (IRAD) which granted all logistical facilities of land to carry out this study.

REFERENCES

Ahenkan A, Boon E (2011). Non-Timber Forest Products (NTFPs): clearing the confusion and semantics. J. Hum Ecol, 33(1):1-9

Brites AD, Morsello C (2012). The ecological effects of harvesting non timber forest products from natural forest: A review of the evidence. VI Encontro National da Anppas, 18 a 21 de setembro de 2012, Belém - PA – Brasil

Caspa RG, Isaac RT, Jean-Pierre MM, Joseph MA (2014). The ecological status and uses of *Ricinodendron heudelotii* (Baill.) Pierre and *Gnetum* species around the Lobeke National Park in Cameroon. Agriculture, Forestry and Fisheries. Science Publishing Group 3(6): 469-480.

Caspa RG, Tchouamo IR, Mate MJP, Amang MJ (2015a). Collection and commercialization of two major non timber forest products around the Lobeke National Park in Cameroon. Global Science Research Journal ISSN: 2408-5480 Vol. 3 (8), pp. 283-294.

Caspa RG, Isaac RT, Jean PMM, Joseph MA, Marley NN (2015b). The place of *Irvingia gabonensis* in village communities around the Lobeke National Park in Cameroon. BOIS ET FORÊT S DES TROPIQUES, N° 324 (2)

Clark LE, Sunderland TCH Eds. (2004). The Key Non-Timber Forest Products of Central Africa: State of the Knowledge. Technical Paper No. 122, SD Publication Series.

Fondoun JM, Tiki Manga T, Kengue J (1999). *Ricinodendron heudelotii* (Djansang): ethnobotany and importance for forest dwellers in southern Cameroon. *Plant Genetic Resources Newsletter* 118: 1–6.

Fondoun J, Tiki TM (2000). Farmers' indigenous practices for conserving *Garcinia kola* and *Gnetum africanum* in Southern Cameroon. Agroforestry Systems, 48: 289-302.

Metse PA (2009). Analyse couts/bénéfices de la foresterie communautaire au Cameroun : cas des forêts communautaires d'Akak et de Ntang. Mémoire de fin d'études, Université de Dschang. 97 p.

Neudjo R (2013). Evaluation des Produits Forestiers Non Ligneux de la forêt communautaire au cas de la forêt communautaire d'AFCO-E2M à Ambam, Cameroun. Mémoire présenté et soutenu en vue de l'obtention du diplôme de Master Professionnel Université de Yaoundé I 47pp

Nkwatoh AF (1998). The role of processing and storage in NTFPs market price determination in Ejagham Forest Reserve Cameroon. Paper presented at the International workshop on Non-wood-forest Products at the Limbe Botanic Garden, Cameroon, 17. SAS version 9. 0, version for window.

Sheil D, Wunder S (2002). The Value of Tropical Forest to Local Communities: Complications, Caveats and Cautions. *Cons Ecology.* 2: 1-9. SPSS version 16, for Window, INC. 2007.

Sunderland TCH (2001). *Cross River State Community Forest Project: non-timber forest products advisor report*. Department for International Development/Environmental Resources Management/Scott Wilson Kirkpatrick and Co Ltd.

Ticktin T (2004). The ecological implications of harvesting non-timber forest products. Journal of Applied Ecology 41, 11-21.

Van den Berg JH, van Dijk GP, Dkamela Y, Ebene Y, Ntenwu T (2001). The role and dynamics of community institutions in the management of NTFP resources in Cameroon. In L. Clark (Ed.). *Non-timber forest products in Central Africa: research results workshop for the Central African Regional Program for the Environment*. USAID/CARPE, pp. 54–9.