PROGRAMME FOR THE SUSTAINABLE MANAGEMENT OF NATURAL RESOURCES, SOUTH WEST PROVINCE, CAMEROON (PSMNR-SW)

An Ecological Assessment of Non Timber Forest Products (NTFPs) in the Proposed Nguti Council Forest

By

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EXECUTIVE SUMMARY

A survey of Non Timber Forest Products (NTFPs) was carried out in the proposed Nguti Council forest between February and March 2008. The main aim of the survey was to obtain relevant information that could be used to elaborate an NTFP management strategy for the council forest.

A systematic sampling technique, with transects established parallel to each other, at an equidistant of 1 km was used. The data was analysed using the MS EXCELL Software.

Twenty-Seven (27) different NTFPs were identified in the forest. However, most of them especially those with a significant contribution to household income were not found in commercial quantities. *M. acuminata* and *S. zenkeri* were the most abundant tree-related NTFPs in this forest while the genus *Hypselodelphys* and *Aframomum* were also very common.

Most NTFPs were also found to be distributed throughout the forest with slight habitat preference for some families like the Maranthaceae and Zingiberaceae.

Based on the results, the following recommendations are necessary:

- Need to carry out a study of NTFP availability in farm lands and adjoining forest of the Nguti CF area as a basis for a domestication programme;
- The exploitation of NTFP producing species like *B. toxisperma, I. gabonensis* etc should be discouraged as a means of protecting seed trees;
- Special measures to enhance NTFPs production (like domestication) in this area should be integrated in the Council forest management plan and Village Development Plans;
- A need to develop a strategy for value addition to main NTFPs . This could also include a marketing strategy.

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1.0 Introduction

Following the publication of the Public Notice reserving the Nguti Council Forest area last year (2007), efforts are being made by the PSMNR-SW technical team within the framework of its Result 3 to continue with the gazzetment process as well as commission and supervise the execution of relevant studies necessary for the preparation of a management plan for the council forest.

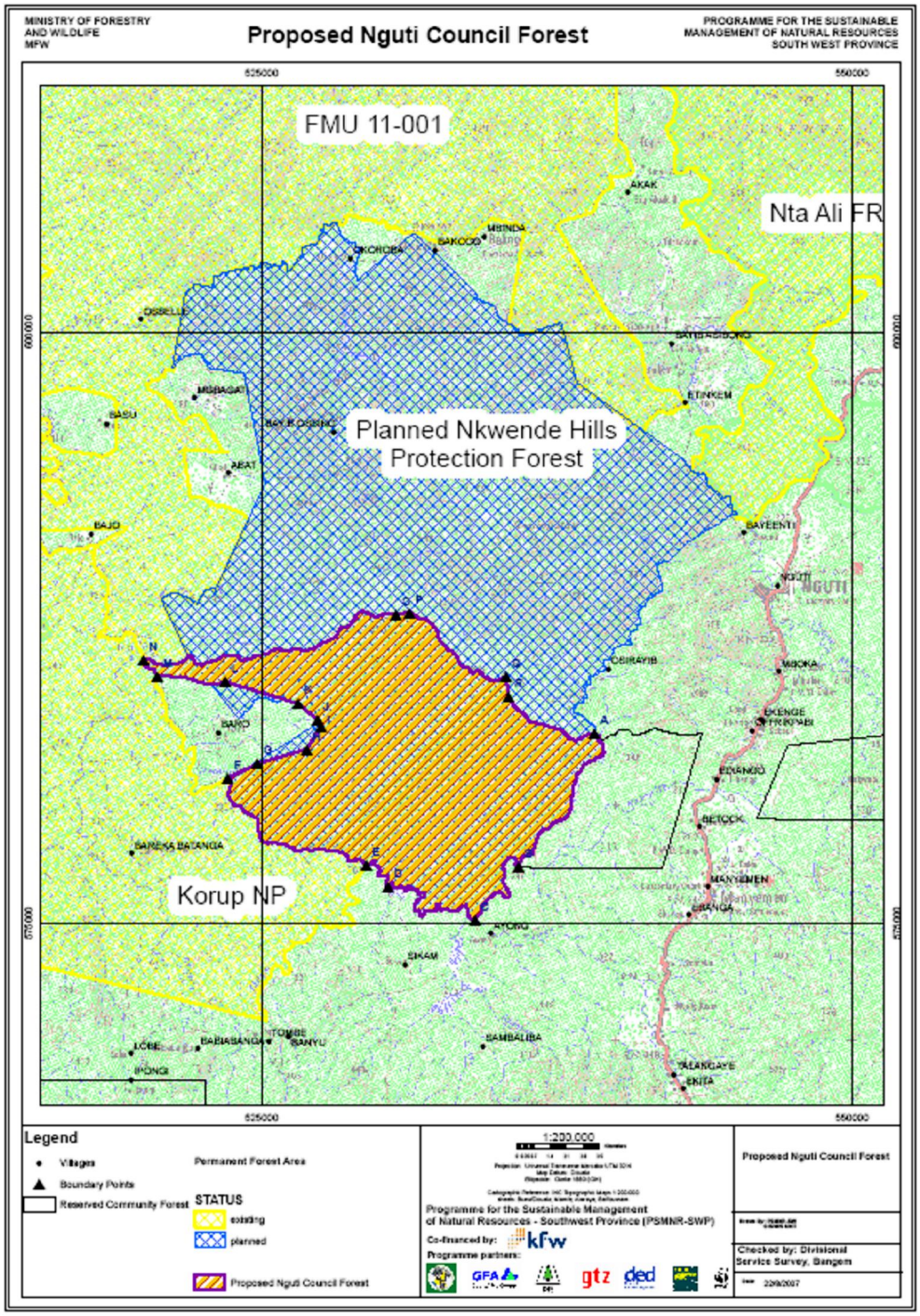
Because of the contribution of Non Timber Forest Products to the socio-economic life of the local communities (Tatah et al, 2007), the need to have ecological information on NTFPs in the forest becomes important and necessary for defining strategies link to NTFP use in this area.

This report therefore presents the findings of a recently conducted NTFP survey in the Proposed Nguti Council Forest. It is divided into four main parts: the methodology, data analyses, results, discussions and implications of findings to the management of the forest and finally recommendations.

2.0 STUDY AREA

The Nguti Council forest is situated in the Nguti Subdivision of the Kupe Muanengouba Division. It has a total surface area of 12083 ha and flanked by four villages; Baro, Osirayib, Sikam and Ayong. It is found south of the proposed Nkwende Hills PA. It is less than 25 kilometers from Nguti town.

Fig 1: Map showing the location of the proposed Nguti Council Forest.



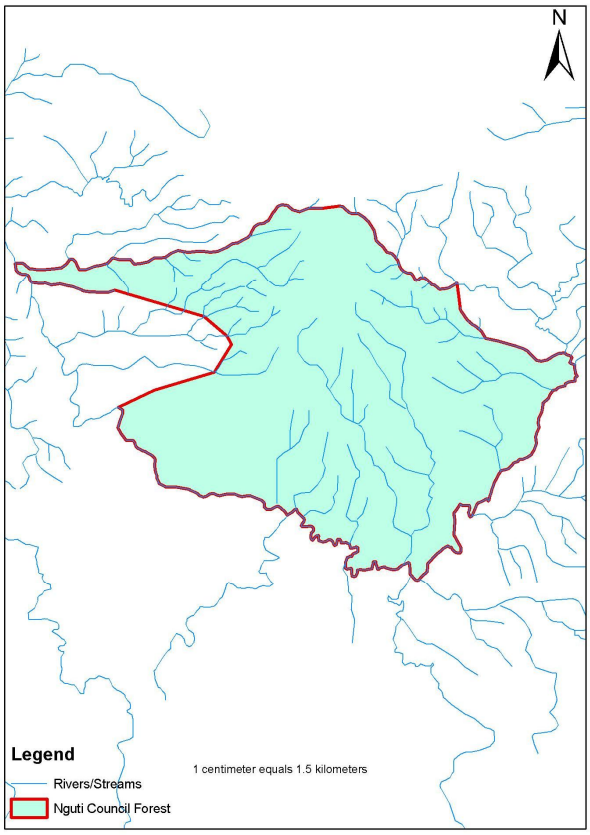
2.1 Topography

The topography of the Nguti council forest area is in its whole extension flat to undulating land. The highest point is a hill with 428 m altitude at the northern border.

2.2 Water Network

The rivers/streams network of the forest area is composed of the Bake river and its associated streams. Bake river originates from Nkwende Hills and flows in a southerly direction and starts marking the boundary of the proposed council forest to the south of Osirayib village. Downstream, Bakebe River joins Bake river near Ayong village, and Bake river continues flowing in a north-westerly direction. The proposed council forest is therefore enclosed by Bake River and some of its affluents.

Fig 2: Rivers/streams network in and around the proposed Nguti Council Forest

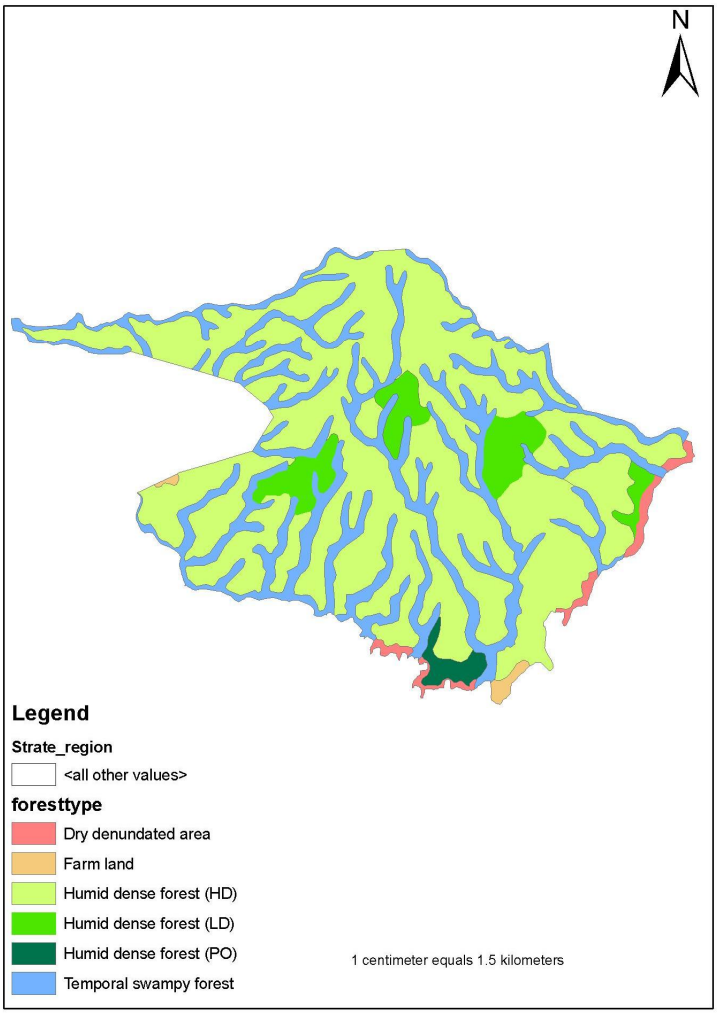


2.3 Vegetation

The forest is part of the Atlantic Biafran Forest as described by Letouzey and as such moist lowland evergreen forest, rich in Cesalpinaceae. It is typically a tropical lowland rainforest.

Lejoly (1996) proposes to call the zone ñatlantic lower-Guinean domainòto stress the influence of the Atlantic Ocean.

Fig 3: Forest classification based on Tchato (2008)



A recent forest classification of the Nguti Council forest, Tchato (2008) revealed the following forest types:

- DHS/b (High Density Moist Evergreen Forest) ;
- DHS/dchp (High Density Moist Evergreen Forest with gaps) ;
- DHS/dcp (High Density Moist Evergreen Forest with partial felling) ;
- MIT (Temporarily flooded forest) ;
- E (Dry denuded) ;
- CU (Farming).

Two main forest types stand out clearly; the High Density Moist Evergreen Forest and Temporarily flooded forest, which make up together about 90% of the surface area.

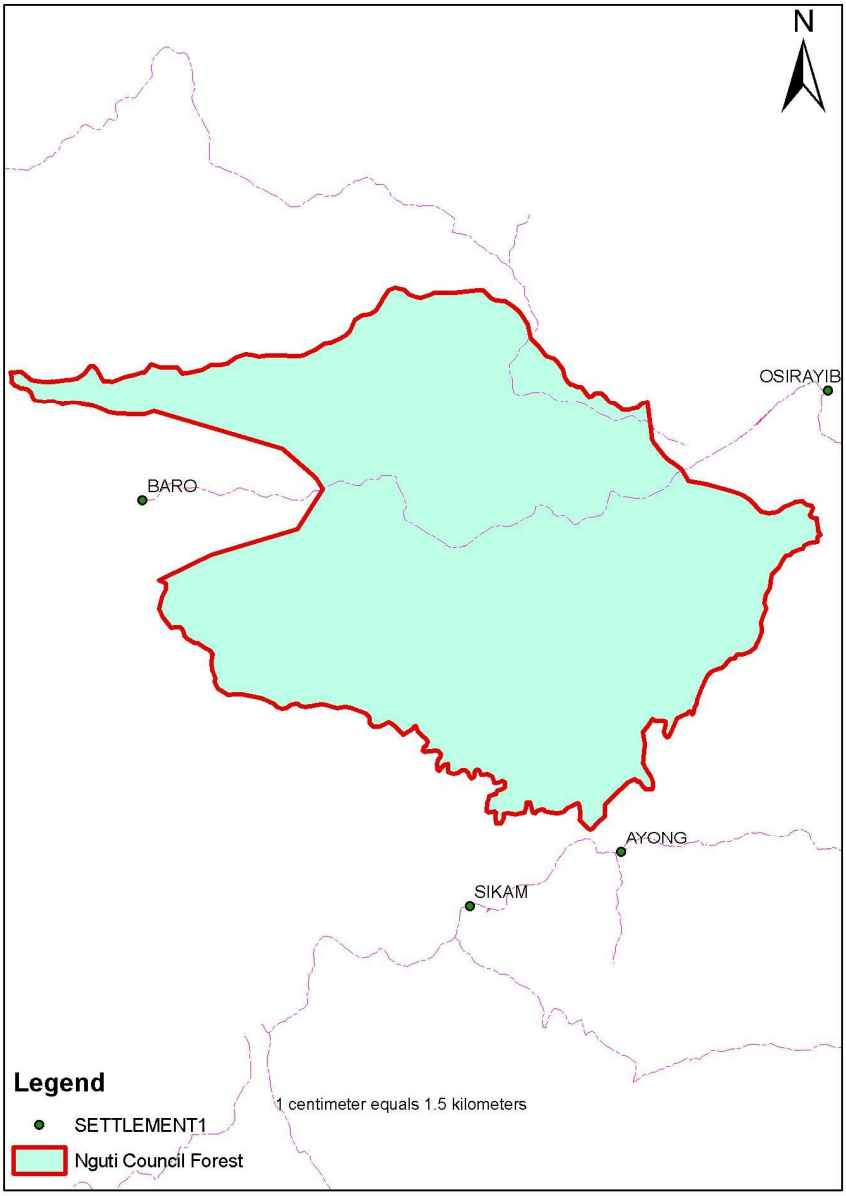
Frequently occurring species in the forest include; Azobe *(Lophira alata*), Ekop Naga (Brachystegia spp.), Tali (*Erythrophleum ivorensis)*, Okan (*Cyclodiscus gabonensis*), Framire (*Terminalia ivorensis*), Dabema (*Pipadeniastrum africanum*). Other occurring species are Bilinga (*Nauclea diderrichii*), Ilomba (*Pycnanthus angolensis*), Niove (*Staudtia stipitata*), Padouk (*Pterocarpus soyauxii*), Moabi (*Baillonella toxisperma*), Movingui (*Distemonanthus benthamianus*), Doussie (*Afzelia ssp*), Aiele (*Canarium schweinfurthii*).

2.4 Population and ethnicity

The Nguti Council Area is made up of 54 villages. However, four villages are directly concerned by the proposed council forest (Baro, Osirayib, Sikam and Ayong) together have a population of about 1,000 inhabitants.

The villages of Baro, Sikam and Ayong are part of the Upper Balong tribe, whereas Osirayib belongs to the Ejagham tribe.

Fig 4: Target villages for the Nguti Council Forest.



Strangers have settled in Sikam village in the quarter Mokwalibe coming from Itoki in Konye council, belonging to Bakundu tribe. In Ayong strangers from north west province are settling.

3.0 METHODOLOGY

3.1 Objectives of the survey

The main objective of the study was to collect relevant information pertaining to NTFPs in the proposed forest. This study therefore sought to provide answers to three main questions:

1. What type of NTFPs do we have in the proposed Nguti Council Forest?
2. How abundant are the NTFPs?
3. How are these NTFPs distributed in the forest?.

3.2 Sampling Design

A systematic sampling design with transects of varying lengths established parallel and at an equidistance of 1 km apart running east-west direction.

Fig 5: Transects layout plan

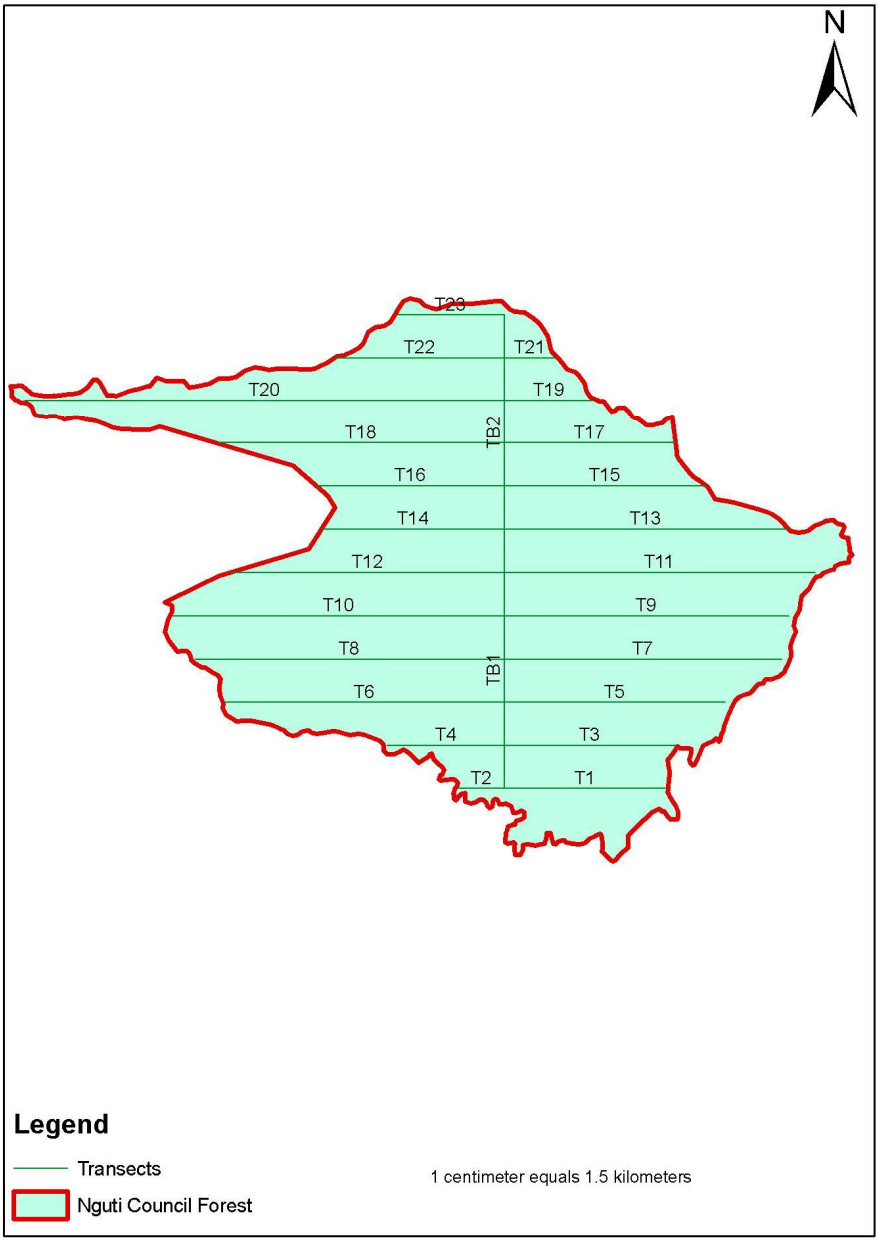
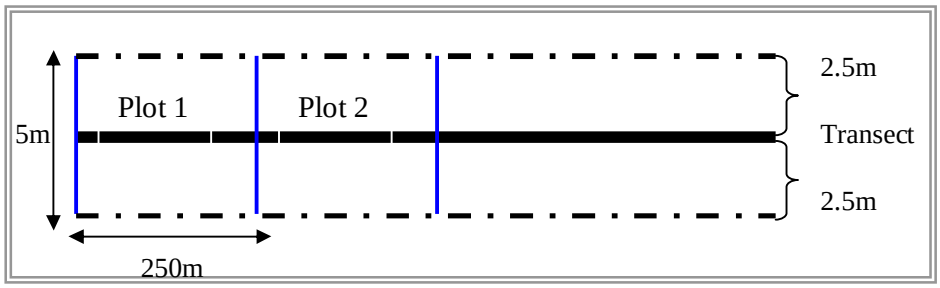


Fig 6: Layout of plots along a transect.



Sample plots of 250 meters long and 5 meters wide (2.5m on either side of the transect) were established throughout the whole length of the transects. These plots formed the basic unit for enumeration.

3.3 Pre-enumeration activities

Two main activities preceded actual field enumeration: the establishment of a reference list of NTFPs and training of local enumerators.

3.3.1 Establishment of a reference list of NTFPs

Based on the findings of an earlier socio-economic study and other studies carried out with the South West Province, a reference list of probable NTFPs was developed as a guide. This list was subsequently used for the development of an identification training module for local enumerators.

3.3.2 Training of enumerators

In a bit to involve the local inhabitants in all stages for the elaboration of a management plan (data collection is an important aspect), two indigenes of the forest area including the Nguti Council Forest Officer, were selected for NTFPs data collection.

Training was organised at two levels by a Specialist Botanist: first the identification of the NTFPs using mostly common names and later

the collection/measurement of the relevant data. The enumerators were drilled how to use the measuring tape to measure the circumference at breast height, in the absence of a diameter tape, how to control the width of the plots among others.

3.4 Enumeration

For the enumeration proper, all trees and treelets with a circumference at breast height (cbh) greater or equal to 12 cm were measured. The type of species (mostly common names) and the size were recorded in the field form (Annex 1)

For other taxa like herbs, rattans, grasses, etc, records of the type and the number of individuals encountered was indicated.

NTFPs data was complimented with an extract of all NTFP data collected during the timber inventory (see inventory Protocol). This was done to ensure that the whole range of NTFPs was captured.

3.5 Data collection team

Transects used for NTFPs survey were the same ones establish for timber inventory, so the personnel need for their establishment was included in the complete team for timber inventory.

Two (2) main staff and two (2) support staff were however used for enumeration. The enumeration teams made use of field forms, HB Pencils, measuring tapes, and 2.5m stick.

4.0 DATA ANALYSIS

Data analyses and management was done using the MS EXCELL Software. To ease analyses, the data set was pooled into two main categories: that from treelike life form and that from other life forms like vines, lianas, herbs etc.

Firstly, all circumferences at breast height measurements were converted to diameter at breast height (dbh).

In both cases, indicator of abundance like the number of individuals per hectare was calculated.

For treelets like *Masularia acuminata*, five (5) main diameter classes were considered as follows; 3-4, 4-5, 5-6, 6-7, >7 cm dbh, while for other tree-related species like *Irvingia gabonensis*, diameter class interval of 10cm was considered: 10-19cm, 20-39 cm, 40-49 cm, etc. Based on the forest classification map for the council forest (Tchato, 2008), data from each NTFP data collection plot was assign a forest type.

Complimentary data from the timber inventory data was pooled together for analysis. These included mainly data for the following species: *Scorodolphloeus zenkeri, Ricinodendron heudolotii, Irvingia gabonensis, Cola acuminate, C. lepidota*, and *Annickia chlorantha*.

Data analyses with respect to forest types revealed information about distribution of the main NTFPs as well as the preferred habitats.

5.0 RESULTS AND DISCUSSIONS

5.1 Results

5.1.1 General information.

Transect No	Start Point	End Point	Length (m)	No of plots	Area sampled (Ha)
1			425	2	0.2125
3			4000	16	2.0000
4			2500	10	1.2500
5			5250	21	2.6250
6			6225	25	3.1125
7			6250	25	3.1250
8			6750	27	3.3750
9			6780	28	3.3900
10			7000	28	3.5000
11			7400	30	3.7000
12			6300	26	3.1500
13			6850	28	3.4250
14			4300	17	2.1500
15			4575	19	2.2875
16			4360	18	2.1800
17			3635	15	1.8175
18			6300	26	3.1500
19			1630	7	0.8150
20			10500	42	5.2500
21			1116	5	0.5580
22			3780	16	1.8900
23			2195	9	1.0975
			108,121	**440**	**54.0605**

Table 1: *General transects information*.

About 90% of the sample plots (and transect length) were located within the High Density Moist Evergreen Forest and Temporarily flooded forest,

Following a total transect length of **108,121** km, about **54.0605** hectares are enumerated giving a sampling intensity of about 0.004%.

5.1.2 NTFPs availability

A total of twenty-seven (27) NTFP species belonging to sixteen (16) families were encountered during the study. Table 1 below gives a summary of he species and parts used.

Family	Species	Common Name	Local Name	Part (s) used	Use
Palmae	Lacosperma Spp	Big Cane	Echwak	Stem	Basket weaving, local construction etc
Palmae	Eremospatha Spp	Small Cane	Senche	Stem	Basket weaving, local construction etc
Piperaceae	Piper Spp	Bush Pepper	Bih	Leaves	Condiments
Maranthaceae	Megaphrynum macrostachynum	Ngongo Leaves		Leaves	Wrapping
Maranthaceae	Hypselodelphys Spp	Mandara Cane	Mbob	Stems	Wrapping
Zingiberaceae	Aframomum Spp	Aframomum		Seeds	Medicine
Pandanaceae	Pandanus Candelabrum			Leaves	Mat weaving
Palmae	Raphia Hookeri	Raphia	Nchu	Leaves, Stems	Local construction
Palmae	Bambusa vulgaris	Bamboo	Nyangya	Stems	Local construction
Rubiaceae	Masularia acuminata	Yoruba stick		Stems	Medicine
Guttiferae	Garcina mannii	Chewing stick	Eseeh	Stems	Local tooth brush
Guttiferae	Garcina kola	Bitter cola		Seeds	Stimulant, digestive aid
	Carpolobia Spp	Hausa stick		Stems	Medicine
Gnetaceae	Gnetum Spp	Eru	Eru	Leaves	Food
Palmae	Elaies guineensis	Palm tree	Sendaee	Fruits, Leaves	Cooking oil, broom
Euphorbiaceae	Tetracarpidium conophorum	Cashew	Kengak	Seeds	Food
Euphorbiaceae	Phyllanthus muellerianus	Mahom		Leaves/Vines	Additive to palm wine
Huacaceae	Afrostyrax kamerunensis	Bush onion		Seeds	Condiment
Caesalpiniaceae	Scorodophloeus zenkeri	Bush onion		Seeds	Condiment
Guttiferae	Garcina kola	Bitter cola		Seeds	Medicine
Irvingiaceae	Irvingia gabonensis	Bush mango	Nsenghe	Seeds	Condiment
Sterculiaceae	Cola acuminata	cola		Seeds	Stimulant
Sterculiaceae	Cola lepidota	Monkey cola	Monkey cola		Fruit
Annonaceae	Annikia chlorantha			Seeds	Condiment
Euphorbiaceae	Ricinodendron heudelotii	Njansang	Baisea	Seeds	Condiment
Sapotaceae	Baillonnella toxisperma	Njabe	Njabe	Seeds	Oil

Table 2: *NTFPs and their uses in the Council Forest area.*

Based on data collected during the standard NTFP survey, a total of 2,520 tree-related individuals belonging to 13 species and 10 families were enumerated meanwhile, another 1065 individuals were encountered during the timber inventory. Three main species dominated; *Masularia accuminata, Garcina mannii*, and *Scorodophloeus zenkeri*.

For the other life forms, 23,611 individuals were enumerated with *Hypdselodelphys spp* (33.84%), *Aframomoum spp* (22.33%), and *Lacosperma spp* (20.40%) dominating.

5.1.3 Stocking of tree-related NTFPs per forest type

Data for all tree-related NTFP species data[1] was jointly analysed to able to appreciate the abundance of these NTFPs with respect to the different forest types. The results are presented in table 3 below. The results of further analyse for specific NTFPs is presented in tables 4,5,6 &7 below.

	No of Plots	**Total area sampled (Ha)**	**Total no of individuals**	**Mean No trees/ha**
DENS	3	0.368	26	70
DHS/b	280	34.402	1645	48
DHS/chp	27	3.317	229	69
MIT	130	15.972	620	38
Total	**440**	**54.059**	**2520**	**46**

Table 3: Summary of data collected per forest type for tree-related taxa

N.B: DHS/b = High Density Moist Evergreen Forest, DHS/dchp= High Density Moist Evergreen Forest with gaps, MIT=Temporarily flooded forest, DENS= Dry denuded Forest.

[1] This does not include data extracted from the timber inventory data

5.1.3.1 Stocking of Yoruba stick (Masularia acuminata)

M. acuminata seemed to have a more or less uniform abundance in the forest, with a general mean number of individuals per hectare of 40 individuals while the mean dbh was 5.46 cm.

Considering that generally most stems with a dbh >=5cm are harvestable, about 50% of the forest stock can be harvested. Table 4 below summaries the findings.

Forest type	Total area sampled (Ha)	Total No of individuals	Mean No of individuals/ha	Mean No of individuals /ha with dbh>=5cm	Mean dbh (cm)
DENS	0.368	18	49	43	5.58
DHS/b	34.402	1275	37	27	5.53
DHS/chp	3.317	153	46	21	5.16
MIT	15.972	452	28	14	5.58
Whole Forest	**54.059**	**1898**	**40**	**26.25**	**5.46**

Table 4: Summary results for *Masularia acuminata*

5.1.3.2 Stocking for Chewing stick (Garcina mannii)

Forest type	Total No of individuals sampled	Mean No of individuals/ha	Mean No of individuals with dbh>20cm	Mean dbh
DENS	6	16	10	10.0
DHS/b	199	5	2	11.4
DHS/chp	43	13	11	10.9
MIT	77	5	2	11.9
Whole Forest	**325**	**9.75**	**14.50**	**11.05**

Table 5: Summary results for chewing stick.

Forest type	Total No of individuals sampled	Mean No/Ha
DENS	2	5
DHS/b	169	5
DHS/chp	33	9
MIT	89	5
TOTAL	**293**	**6**

Table 6: Summary of data for *Carpolobia spp*

5.1.3.3 Abundance of other tree-related NTFPs[2]

Further analysis of complimentary data obtained during the standard timber inventory revealed the following:

S/N	Species	Total No Enumerated	Mean No of trees/ha
1	Baillonnella toxisperma	8	0.04
2	Cola acuminata	50	0.4
3	Cola lepidota	161	0.7
4	Annickia chlorantha	139	0.6
5	Garcina kola	9	0.04
6	Irvingia gabonensis	129	0.6
7	Ricinodendron heudolotii	13	0.06
8	Scorodophloeus zenkeri	320	1.5

Table 7: Abundance of other tree-related NTFPs

5.1.5 Stocking of other taxa

These include the non-tree species like *Aframomum spp, Piper spp*, rattans, lianes, vines etc. Generally, their availability in the forest is more or less homogenous with a general mean of about 469 individuals per hectare with greater occurrences in forest areas with partial felling. Table ----below summarises the findings.

[2] This data was extracted from the timber inventory data

Forest type	No of Plots	Total area sampled (Ha)	Total no of individuals	Mean No /ha
DENS	3	0.368	181	491
DHS/b	280	34.402	15134	439
DHS/chp	27	3.317	1788	539
MIT	130	15.972	6508	407
Whole Forest	**440**	**54.059**	**23611**	**469**

Table 8: Summary of data collected per forest type for other taxa

5.1.5.1 Availability of Aframomum spp and Hypselodelphys spp

Members of this genus, used mainly for wrapping and local construction respectively, could be said to be generally available in this forest as shown in table ----below.

Forest type	**Total area sampled (Ha)**	**Total no of individuals**	**Mean No /ha**	**Total no of individuals**	**Mean No /ha**
		Aframomum spp		*Hypselodelphys spp*	
DENS	0.368	22	59	88	239
DHS/b	34.402	3622	105	5271	153
DHS/chp	3.317	380	114	528	159
MIT	15.972	1248	78	2104	131
Whole Forest	**54.059**	**5272**	**89**	**7991**	**170**

Table 9: Summary of results for *Aframomum spp* and *Hypselodelphys spp*

5.1.5.2 Availability of Gnetum spp and Piper spp

With a mean of five (5) individuals per hectare for Gnetum spp and two (2) individuals per hectare for Piper spp, these NTFPs could be said to be scarce in this council forest.

Forest type	Total area sampled (Ha)	Total no of individuals	Mean No /ha	Total no of individuals	Mean No /ha
		Gnetum spp		*Piper spp*	
DENS	0.368	0	0	0	0
DHS/b	34.402	284	8	98	3
DHS/chp	3.317	13	4	4	1
MIT	15.972	131	8	58	4
Total	**54.059**	**428**	**5**	**160**	**2**

Table 10: Summary of results for *Gnetum spp* and *Piper spp*

5.1.5.3 Availability of rattans

Rattans, mainly *Lacosperma spp* and *Eremospatha spp* are generally used for local construction, and weaving. The data revealed that these species exist in all forest types, with general means of 109 individuals/ha and 79 individuals/ha respectively.

Forest type	Total area sampled (Ha)	Total no of individuals	Mean No /ha	Total no of individuals	Mean No /ha
		Lacosperma spp		*Eremospatha spp*	
DENS	0.368	40	108	31	84
DHS/b	34.402	2841	82	2346	68
DHS/chp	3.317	537	161	275	82
MIT	15.972	1400	87	1330	83
Total	**54.059**	**4818**	**109**	**3982**	**79**

Table 11: Summary of results for *Lacosperma spp* and *Eremospatha spp*

5.1.4.4 Species richness

The species richness refers to the total number of NTFP producing individuals per hectare (Van Dijk, 1999).

Generally, for tree-related species, high species richness was observed in the Dry denuded and High density moist evergreen forest with gaps. However on a species specific level, *M. acuminata* showed the highest species richness while some of the economically

important NTFPs like Bush mango, Njansang and bitter kola were poorly represented.

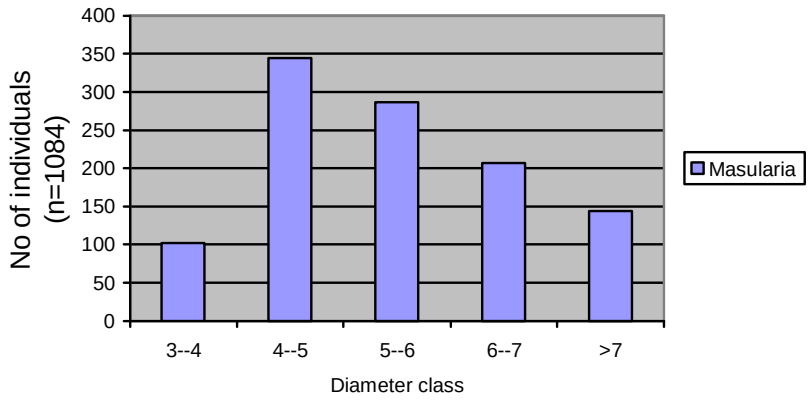
5.1.5 Diameter class distribution

The diameter class distribution was assessed to appreciate the population structure of specific species.

5.1.5.3 Yoruba Stick (M. acuminata)

The population structure of this species can be said to be fairly normal, though the 3-4cm diameter class was poorly represented while trees within the 4-5cm and 5-6cm diameter classes occupied a greater proportion of the population.

Fig 7 Diameter class distribution for Masularia accuminata (Yoruba stick)



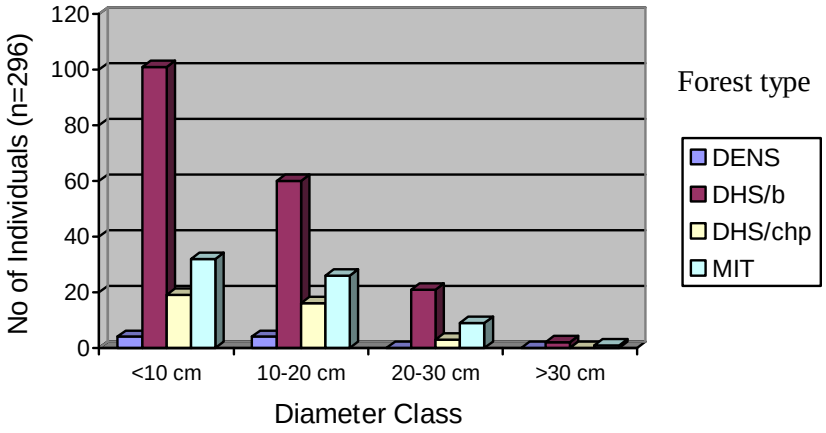
There hasn't been any recent report on the exploitation of this species, therefore the present distribution could be the result of a combination of factors ranging from the soil to the regeneration capacity of the species.

5.1.5.4 Chewing Stick (G. mannii)

Chewing stick finds its place in many local homes where it replaces tooth brushes. It is noted to be preferred by the elderly in the society, while most youths prefer using tooth brushes.

The population structure could be described as generally normal, with about 47% of trees having *dbh* greater than 10cm.

Fig 8: Diameter class distribution for Garcina manni (Chewing Stick)



5.1.5.3 Diameter class distribution for other species.

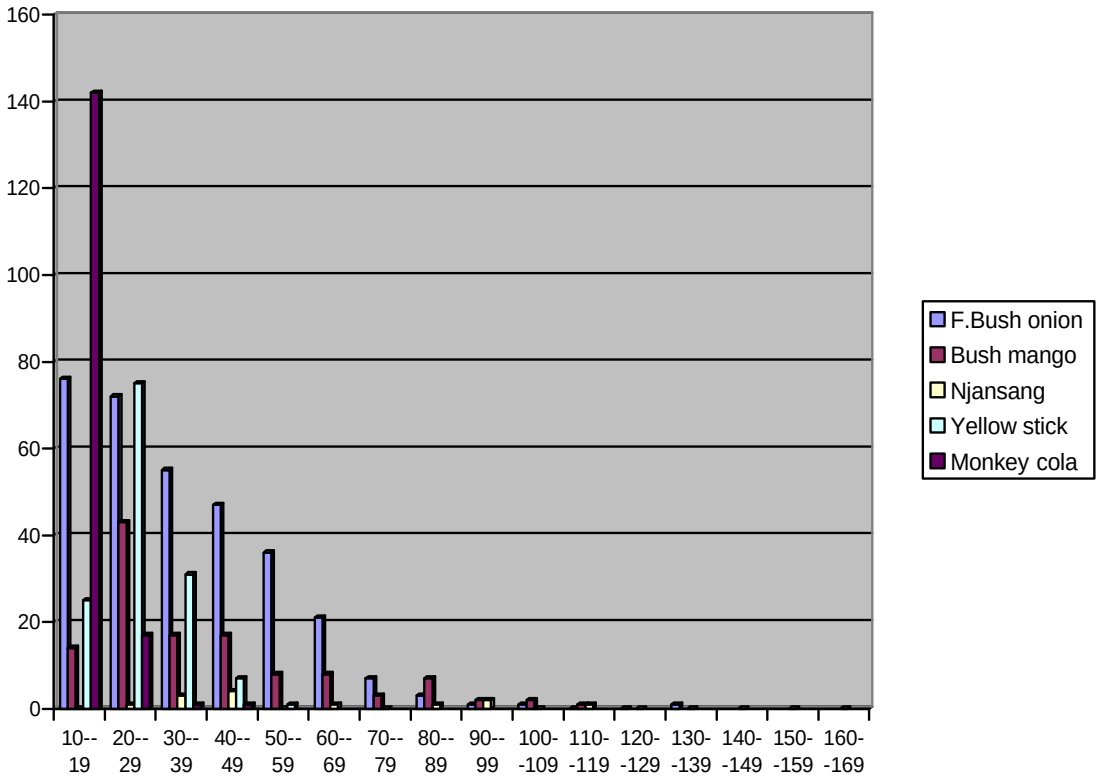
Some NTFP tree species were only recorded during the timber inventory. This included: S. zenkeri, I. gabonensis, R. heudolotii, C.lepidota, E. chlorantha. Detailed analysis of their diameter class distribution produced Fig 8 below.

From Fig ---below it could be seen clearly that the population of *S. zenkeri* presents a healthy diameter class distribution, while those of *I.gabonensis* and *C.lepidota* are more or less encouraging. However, more than 80% of trees enumerated had a DBH of less than 80cm.

On the contrary, the distribution of *R.heudolotii* points to unsuitable environmental conditions for the propagation of the species. *R.*

heudolotii is a light demander and therefore not commonly found in natural forest except in gaps.

Fig 9: Diameter Class distribution for some tree-related NTFPs[3].



5.2 Discussions

5.2.1 Availability and Distribution of NTFPs

Generally, the forest can be said to be diverse in NTFPs; up to twenty-six (26) species contribute to the socio-economic life of the dependent population[4].

The abundance of rattans, and other light demanders could be explained by the fact that this forest was logged more than 20 years ago rending forest conditions conducive for natural regeneration of some of these species.

[3] From timber inventory data
[4] This excludes many other species used for medicine as well as for local construction.

The abundance and near homogenous distribution of *M. acuminata* and *Scorodophloeus zenkeri* crowns these two species as the main NTFPs in this forest. Incidentally, both species do not have a significant local use but could be used as a source rural income if harvested in commercial quantities and marketing possibilities exploited.

NTFPs with common domestic uses like eru, bush pepper, *Afrostyrax kamerunensis* are generally scarce in this forest. Eru and bush pepper which are commonly preferred vegetable and soup condiment respectively are sparsely distributed in the forest. The situation might be different in farm lands and forest areas outside the Council forest.

The availability and distribution of plant species is closely linked to the biophysical environment. For the Nguti Council Forest, it is absolutely necessary to identify the environmental factor which contributes most significantly to the availability and distribution of the main NTFP species. This will be necessary especially if any domestication programme is envisaged for the unclassified forest areas within the target villages.

5.2.2 Habitat Preference.

Six (6) main forest types/land uses have been identified in the Nguti council forest. These include High Density Moist Evergreen Forest, High Density Moist Evergreen Forest with gaps, High Density Moist Evergreen Forest with partial felling, Temporarily flooded forest, Dry denuded areas and Partial openings/farmlands.

Plants, like animals, will prefer particular habitats but the survey results do not show strict and clear habitat preferences for the

species surveyed. The Maranthaceae and Zingiberaceae however showed some preference for High Density Moist Evergreen Forest and High Density Moist Evergreen Forest with gaps.

Other species like *R. heudolotii* (njansang) is known to strive well in conditions with adequate light, therefore forest areas interrupted with gaps could be preferred. *Gnetum spp* and *Piper spp* on the other hand do not strive in denuded forest areas.

This unclear habitat preference trends could also be explained by looking at the soil composition. A homogenous soil structure and the present water network may contribute to making the forest condition generally similar for plant life.

5.2.4 Contribution of NTFPs to the socio-economy of the surrounding villages.

With reference to the socioeconomic survey (Tatah et al, 2008) most of these NTFPs are generally used for local subsistence but some of them have a significant contribution to household income. These include *Irvingia gabonensis* (bush mango), *Ricinodendron heudolotii* (njansang), *Gnetum spp* (eru), *Baillonnella toxisperma* (njabe oil), and *Afrostyrax kamerunensis* (bush onion). Unfortunately, these NTFPs with a real market value are sparsely distributed in the Nguti Council Forest though the assessment through the socio-economic survey showed that most of them are abundant and close to the settlements.

The scarcity of marketable NTFPs in the forest but their availability in farms may suggest that either they were planted by farmers or that the farm environment is more conducive to their regeneration.

Masularia acuminata (Yoruba stick) is abundant in this forest but does not contribute to rural income because marketing of this produce is still alien to the local residents.

5.2.4 Product diversity

The socio-economic survey (Tatah et al, loc cit) identified a whole range of NTFPs which contribute to the socio-economic life of the inhabitants of the target villages. Interestingly however, these NTFPs are not found in economic quantities in the Nguti council forest. Therefore reliance on this forest to meet the NTFPs needs of these communities will mount an unnecessary pressure on the NTFP resources in this forest. In the proposed management plan for the Council forest, domestication of NTFPs and support to other alternative sources of income like bee farming could be some measures aimed at empowering the support zone communities.

5.2.5 Natural regeneration of NTFPs

Generally, the main reason for the scarcity of NTFPs in a forest area is the inability of the seeds (if produce) to germinate and grow to maturity. Many factors may hamper this transition from seeds to mature plant, among which may be soil, weather conditions, harvesting methods, canopy cover (for light demanders) etc.

Though natural regeneration was not specifically assessed, from the data on mature trees and the diameter class distributions, it could be deduced that the transition from seed to mature tree is generally interrupted in this forest.

If the management of the Council forest intends to increase the value of the forest by also providing some of the main NTFPs needs of the surrounding communities, then detailed species-specific studies on the regeneration potential of the forest could be worthwhile.

5.2.6 Sustainability of NTFPs harvest

Poor harvesting methods have been noted to contribute to the scarcity of NTFPs in some areas. The general scarcity of *I. gabonensis, G. kola, R. heudolotii* and *Gnetum spp* could be partly explained by the pressure of the communities on the few available individual trees in the forest.

For NTFPs harvested through seeds, much time may be spent in the forest all in a bit to collect every available seed. This can grossly slow down natural regeneration due to the lack of starting materials (seeds).

For NTFPs whose leaves are the products, harvesting may tend to be destructive as even the vines are cut.

6.0 IMPLICATION OF FINDINGS TO THE MANAGEMENT OF THE NGUTI COUNCIL FOREST.

During consultations and sensitisations for the establishment of the council forest, the right to NTFP collection for subsistence was assured. One of the main management measures with respect to NTFP collection could be to regulated access if uncontrolled harvesting posses a problem to the management of the forest especially during forest operations like exploitations. Also, a clear plan on how to manage the relationship between NTFP collection and hunting will be very necessary considering the fact that the council forest is just adjacent to the Korup national park and the difficulty of separating the two activities.

The main objective of managing the Nguti Council forest is timber production. Timber production and NTFPs exploitation are not really incompatible except for species such as Maobi (*Baillonnella toxisperma*), *Poga oleosa*, which may have conflicting uses; ie for both timber and NTFP harvesting.

The communities around the proposed council forest cherish the *Njabe oil* extracted from *B. toxisperma* which is also a high-priced timber species. From both the NTFP survey and timber inventory, it is clear that the population of this species is really small in the forest. These few trees could serve as seed sources for both natural regeneration and domestication of this species. In this respect, this species should be given special status in the management plan. In fact, they should be protected from exploitation for now.

Though a detailed study on the availability of NTFPs in the farm lands and adjoining forest of the council forest has not been done, the results of the socio-economic survey points to the fact that most of the economically important NTFPs are more abundant in the farm lands and adjoining forest that in the council forest. This trend could be very interesting in the management of the Nguti council forest because there will therefore be reduced local pressure on the forest for NTFP collection which which would have been difficult to manage. However, this situation will entail that a deliberated programme of domestication of these important NTFPs be given priority in the Village Development Plans (VDPs) in all the target villages.

The sparse distribution of NTFPs in the forest therefore makes it difficult to ascribe main areas for NTFP harvesting, making it also difficult to restrict local forest users to particular areas. Therefore if wildlife surveys reveal that particular forest areas are preferred by particular animals, it may be difficult to control access to this wildlife grounds as a means of protecting these animal species.

7.0 RECOMMENDATIONS AND CONCLUSION

7.1 Recommendations

- Carry out a study of NTFP availability in farm lands and adjoining forest of the Nguti CF area;
- Exploitation of NTFP producing species like *B. toxisperma, I. gabonensis* etc should be discouraged as a means of protecting seed trees;
- Special measures to enhance NTFPs production (like domestication) in this area be integrated in the Council forest management plan and Village Development Plans;
- Develop a strategy for value addition to main NTFPs . This could include a marketing strategy.

7.3 Conclusion

Based on the study, the following conclusions are worthy of mention:

- The Nguti council forest is diverse in NTFPs though most of the economically important species (except *M. acuminata*) were not found in commercial quantities;
- Most of the NTFPs were generally distributed throughout the forest with slight preferences for particular forest types;

- A deliberate plan to increase NTFP production and marketing in this area must be supported to increase household income for the target villages.

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ANNEXES

Annexe1: Field data collection forms

Annexe 2: *Abundance (Mean No of individuals per hectare) of non-tree species per forest type.*

	Forest Type			
Species	DENS	DHS/b	DHS/chp	MIT
Aframomum spp	59	105	114	78
Elaies guinensis	0	0.70	0.90	0.69
Eremospatha spp	84	68	82	83
Gnetum spp	0	8	4	8
Hypselodelpys spp	239	153	159	131
Lacosperma spp	108	82	161	87
Megaphrynum macrostachyum	0	15	13	8
Pandanus candelabrum	0	0.08	0	0.87
Phyllanthus muellerianus	0	0.46	0.30	0
Piper spp	0	2.85	1.20	3.68
Raphia hookeri	0	3.08	0.60	5
Tetracarpidium conophorum	0	0.03	0.60	0

Annexe 3: Socking of some NTFPs per transect.

Trans No	Species			
	Carpolobia spp	Garcina mannii	Masularia acuminata	Grand Total
3		4	64	68
5		17	102	119
6	2	10	94	106
9	3	57	186	246
10		32	130	162
13	5	88	197	290
15		28	86	114
17		22	94	116
19	1	18	33	52
21			34	34
22		15	34	49
23		5	30	35
Grand Total	11	296	1084	1391

Trans No	Species					
	Afrostyrax kamerunensis	Carpolobia spp	Garcina kola	Garcina mannii	Masularia acuminata	Grand Total
1					7	7
4					4	4
7		13			81	94
8		14			63	77
11		50		11	186	247
12		13	1	8	92	114
14					62	62
16		48		2	85	135
18	3	41		2	135	181
20		103		6	99	208
Grand Total	3	282	1	29	814	1129

Annexe 4: Summary of field data for palms, herbs, rattans etc, per transect

	Species												
Trans No	AFRSPP	ELAGUI	ERESPP	GNESPP	HYPSPP	LACSPP	MEGMAC	PANCAN	PHYMUE	PIPSPP	RAPHOO	TETCON	Grand Total
1	91		16	9		4							120
3	533	2	176	24	670	93	71			5	2		1576
4		2	16	15	270	150	47	15		15	40		570
5	505	6	193	13	557	135	38	2			1		1450
6	783	3	81	22	472	149	222		9		16	1	1758
7			294	24	343	245	11			15	5		937
8			294	46	259	83	28		1	26	17		754
9	225	4	115	2	685	277	24		1		6		1339
10	690	8	97	36	620	201	55		3		30		1740
11			749	29	716	583	12			30			2119
12		5	276	21	260	364	16			7	19		968
13	628	3	121	1	742	477	16				6		1994
14		1	80	29	135	201	8			3	15		472
15	497	1	91	1	459	203							1252
16	190		289	12	426	261	58			12	6	2	1256
17	457	1	74	4	546	260	26				4		1372
18	98		396	33	344	260	37			13	4		1185
19	85		26		13	97							221
20	33		517	100	419	568			1	34	6		1678
21	92		37			31	2						162
22	301	1	42	7	44	85					11		491
23	64	1	2		11	91	26		2				197
Grand Total	5272	38	3982	428	7991	4818	697	17	17	160	188	3	23611

Annexe 5: Summary analysis of NTFP data from timber inventory

		Diameter Class													
Transect	**Nom scientifique**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**Grand Total**
01	Enantia chlorantha	1													1
	Scorodophloeus zenkeri	1	1												2
01 Total		2	1												3
03	Cola acuminata	1	1												2
	Enantia chlorantha	2	1												3
	Garcinia kola			1											1
	Garcinia mannii	1													1
	Irvingia gabonensis	4	1		2					1					8
	Ricinodendron heudelotii		1												1
	Scorodophloeus zenkeri	6	5	3	3	1									18
03 Total		14	9	4	5	1				1					34
04	Cola lepidota	1													1
	Enantia chlorantha	2		1											3
	Garcinia kola	1													1
	Garcinia mannii	2													2
	Irvingia gabonensis	2													2
	Scorodophloeus zenkeri	6	6	6	3	1									22
04 Total		14	6	7	3	1									31
05	Cola acuminata	1													1
	Cola lepidota	1													1
	Enantia chlorantha	1													1
	Garcinia mannii	2													2

	Irvingia gabonensis	2	1	1		1			1						6
	Ricinodendron heudelotii							1							1
	Scorodophloeus zenkeri	5	4	2	4										15
05 Total		12	5	3	4	1		1	1						27
06	Cola acuminata	1	2												3
	Enantia chlorantha	1	1												2
	Garcinia mannii	4													4
	Irvingia gabonensis	4		3		1									8
	Scorodophloeus zenkeri	18	15	13	11	6	3						1		67
06 Total		28	18	16	11	7	3						1		84
07	Cola acuminata	4	1												5
	Enantia chlorantha	3													3
	Garcinia mannii	2	1												3
	Irvingia gabonensis	4	3				1								8
	Scorodophloeus zenkeri	4	1	3	2	1									11
07 Total		17	6	3	2	1	1								30
08	Cola acuminata	3	1												4
	Cola lepidota	2	1												3
	Enantia chlorantha	2	2												4
	Garcinia mannii	9	1												10
	Irvingia gabonensis	4		1	1						1				7
	Ricinodendron heudelotii			1							1				2
	Scorodophloeus zenkeri	9	7	5	4	4	2	2							33
08 Total		29	12	7	5	4	2	2			2				63
09	Baillonnella toxisperma				1										1
	Cola lepidota	1													1
	Enantia chlorantha	4	2												6

	Garcinia mannii	9	5												14
	Irvingia gabonensis	1	2		1										4
	Scorodophloeus zenkeri	6	5	5	4	3									23
09 Total		21	14	5	6	3									49
10	Cola acuminata	5	1												6
	Cola lepidota	2		1											3
	Enantia chlorantha	2	2	1											5
	Garcinia mannii	6	4												10
	Irvingia gabonensis	1			1	1			1						4
	Ricinodendron heudelotii		1												1
	Scorodophloeus zenkeri	8	4	4	3	2	1			1					23
10 Total		24	12	6	4	3	1		1	1					52
11	Cola acuminata	3													3
	Enantia chlorantha	4	1												5
	Garcinia mannii	13	3												16
	Irvingia gabonensis	3	1		1			1							6
	Ricinodendron heudelotii					1									1
	Scorodophloeus zenkeri	2	2	1			1								6
11 Total		25	7	1	1	1	1	1							37
12	Cola acuminata	3	1												4
	Cola lepidota	3													3
	Enantia chlorantha	6	2												8
	Garcinia mannii	12	2	1											15
	Irvingia gabonensis	3	1	1		1									6
12 Total		27	6	2		1									36
13	Baillonnella toxisperma												1		1
	Cola acuminata	1													1

	Cola lepidota	4													4
	Enantia chlorantha	6	4	1	1										12
	Garcinia kola			1											1
	Garcinia mannii	15	5												20
	Irvingia gabonensis	2		1		1	1		1			1			7
	Ricinodendron heudelotii	1													1
13 Total		29	9	3	1	1	1		1			1	1		47
14	Baillonnella toxisperma					1									1
	Cola acuminata	2													2
	Cola lepidota	1													1
	Enantia chlorantha	4	1												5
	Garcinia kola	1													1
	Garcinia mannii	10	1	1											12
	Irvingia gabonensis	1	1	1			1								4
	Ricinodendron heudelotii			1											1
	Scorodophloeus zenkeri	3	2	2	1	2		1	1						12
14 Total		22	5	5	1	3	1	1	1						39
15	Cola acuminata	2		1											3
	Enantia chlorantha	2	5												7
	Garcinia kola			1											1
	Garcinia mannii	8	2												10
	Irvingia gabonensis		1	1											2
	Ricinodendron heudelotii		1	2					2						5
15 Total		12	9	5					2						28
16	Cola acuminata	2													2
	Enantia chlorantha	5													5
	Garcinia kola			1											1

	Garcinia mannii	8	2	2											12
	Irvingia gabonensis	1				1			1		1				4
	Scorodophloeus zenkeri	2	1	2											5
16 Total		18	3	5		1			1		1				29
17	Cola acuminata	3													3
	Cola lepidota	1													1
	Enantia chlorantha	5	2	1											8
	Garcinia mannii	5	1												6
	Irvingia gabonensis	3	1			1									5
	Scorodophloeus zenkeri	2	2	1	1	1									7
17 Total		19	6	2	1	2									30
18	Cola acuminata	3													3
	Enantia chlorantha	8	2												10
	Garcinia kola	1													1
	Garcinia mannii	19	4												23
	Irvingia gabonensis	2	1	1				1	2						7
18 Total		33	7	1				1	2						44
19	Baillonnella toxisperma					1									1
	Enantia chlorantha	2	1	1											4
	Garcinia mannii	4	2												6
	Irvingia gabonensis		1												1
19 Total		6	4	1		1									12
20	Baillonnella toxisperma							1			1			1	3
	Cola acuminata	5	1												6
	Cola lepidota	1													1
	Enantia chlorantha	9	4												13
	Garcinia kola	1													1

	Garcinia mannii	21	2												23
	Irvingia gabonensis	6	2	4	1		5	1	1	1					21
20 Total		43	9	4	1		5	2	1	1	1			1	68
21	Enantia chlorantha	2													2
	Garcinia mannii	2	2	1											5
	Irvingia gabonensis		1	1		1									3
21 Total		4	3	2		1									10
22	Baillonnella toxisperma												1		1
	Cola acuminata	1													1
	Enantia chlorantha	2	1												3
	Garcinia kola		1												1
	Garcinia mannii	7	1												8
	Irvingia gabonensis			2											2
22 Total		10	3	2									1		16
23	Cola acuminata		1												1
	Enantia chlorantha	2		2											4
23 Total		2	1	2											5
Grand Total		411	155	86	45	32	15	8	10	3	4	1	3	1	774

Summary of NTFP data from timber inventory

	Diameter Class													
Scientific Name	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**Grand Total**
Baillonnella toxisperma				1	2		1			1		2	1	8
Cola acuminata	40	9	1											50
Cola lepidota	17	1	1											19
Enantia chlorantha	75	31	7	1										114
Garcinia kola	4	1	4											9
Garcinia mannii	159	38	5											202
Irvingia gabonensis	43	17	17	7	8	8	3	7	2	2	1			115
Ricinodendron heudelotii	1	3	4		1		1	2		1				13
Scorodophloeus zenkeri	72	55	47	36	21	7	3	1	1			1		244
Grand Total	411	155	86	45	32	15	8	10	3	4	1	3	1	774