NON-TIMBER FOREST PRODUCT RESOURCES: ABUNDANCE, DISTRIBUTION, AND THE IMPACT OF TIMBER EXPLOITATION

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SUMMARY

The integration of NTFP resource management is regarded as an important dimension of multiple use forest management. It should focus on securing local needs, conservation of forest resources and the development of extraction. Moreover, effective resource management should take into account the balance of competitive forest utilisation, especially commercial timber exploitation.

This paper examines the interests of logging companies and of local people for certain forest resources, as well as the impact of logging on the NTFP plant resource base. It is argued that logging does not always affect the availability in negative sense. Ecological data demonstrated a good regeneration of the majority of species after logging operations, as well as the appearance of other frequently used species. Many important NTFPs are provided by highly productive species reaching their maximum densities in secondary forest types. Some of these species even prefer the habitat of logged-over forest. A clear negative impact, however, may be expected for those species that occur in very low densities. Sustaining the production levels and effective control of damage of logging with an emphasis on rare species are proposed as management directions for natural forests, whilst the development of extraction should focus on anthropogenic vegetation types.

Keywords: Non-Timber Forest Products, resource inventory, logging, forest management, Cameroon.

RESUME

L'intégration des produits forestiers autres que le bois (NTFP) dans la gestion des ressources forestières est perçu ici comme une dimension importante de cette gestion à visage multiple. Elle doit s'intéresser à la sécurisation des besoins locaux, à la conservation des ressources forestières et au développement de l'extraction. De plus, une gestion efficiente des ressources doit tenir compte du caractère conflictuel des besoins vis-à-vis de la forêt, en particulier en ce qui concerne l'exploitation du bois d'œuvre.

Cette communication examine les intérêts des compagnies forestières et des populations locales au point de vue de certaines ressources forestières, de même que l'impact de la coupe du bois d'œuvre sur la production des ressources autres que le bois (NTFP). Il est démontré que l'exploitation forestière (bois d'œuvre) n'a pas que des effets négatifs sur la disponibilité des autres ressources. D'après les données écologiques, la majorité des espèces se régénèrent d'ailleurs bien après exploitation, de même que l'installation d'autres espèces fréquemment utilisées. De plus, des espèces hautement productives et atteignant leur densité maximum en milieu forestier secondaire

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sont sources de production de nombreux NTFP. Quelques-unes unes de ces espèces s'installent de préférence en forêt déjà exploitée.
Cependant, on peut s'attendre à ce que l'exploitation forestière affecte négativement les espèces productrices des NTFP qui ont une très faible densité par unité de surface. Des propositions sont faites en matière de gestion de la forêt naturelle, en vue de maintenir une production soutenue et un contrôle effectif des dégâts d'exploitation. Une attention particulière est accordée aux espèces rares pendant que le processus d'extraction doit se focaliser sur la végétation de type anthropogénique.

Mots clés : Produits Forestiers Non-Ligneux, inventaire des ressources, abattage, gestion forestière, Cameroun.

1. INTRODUCTION

At present it is generally recognised that non-timber forest products (NTFPs) play an important role for local communities in and around forests. These products may be used for subsistence purposes or for sale and thus providing cash income. The awareness is growing that sustainable forest management should include measures for effective conservation and management of NTFP resources in order to meet the actual and future needs of local people. Moreover, the development of commercial extraction of NTFPs is often considered as a means of improving rural people's living standards, as well as a suitable approach towards forest conservation (de Beer and McDermott, 1989; Ros-Tonen, 1999). In consequence, the integration of NTFP resource management is regarded as an important dimension of multiple use forest management. To effectuate the integration, attention should be paid to secure local needs, to develop NTFP extraction and to guarantee forest conservation.

These ideas are at present assessed in several research programs, including the Tropenbos-Cameroon Programme (TCP). The research activities should contribute to the development of NTFP production and exploitation systems that are ecologically sustainable and socially and economically attractive for the local communities. The research focuses on methods for incorporating their exploitation and production in land-use planning and on the options for the development of sustainable commercial exploitation of NTFPs.

In order to incorporate NTFP exploitation and production into sustainable and multiple-use forest management schemes, a broadly oriented NTFP study is carried out. The study consists of a NTFP identification and utilisation survey, an ecological inventory of NTFP plant resources, a case study on the impact of harvesting on a selected NTFP species and a socio-economic survey of NTFP users (van Dijk, 1999a). In this paper, some of the results will be summarised and analysed in view of the consequences for future forest management.

2. RESEARCH METHODS

The NTFP inventory aimed at identifying the names, type of products, functions and the importance of the NTFP species used by the various population groups. Data were collected with the help of interviews among the members of 29 households in five communities, ensuring a representation of the main ethnic groups in the area and the participation of both men and women, as well as people of different age-classes. The interviews were guided by a questionnaire including a checklist of potential uses, and a number of open-ended questions directed at the peoples' perception on the importance of various resources, the degree of commercialisation of NTFPs, the availability of resources and the need for conservation.

The objective of the ecological survey was to gain insight into the relative abundance and distribution of NTFP species and to get information on the impact of agriculture, logging, and NTFP harvesting on the availability of the resources. For data collection 32 one-hectare plots in the form of 1 km long and 10 m wide transects were selected on the basis of an aerial photo-interpretation map indicating the main soil and vegetation units in the study area. The selected plots included undisturbed forests and disturbed vegetation types such as logged-over forests, secondary forests, young fallow lands, food crop fields and cocoa plantations. In each plot the NTFP species of a diameter at breast height (dbh) of > 10 cm were located, identified, and enumerated according to their size-class. The individuals of smaller size classes were enumerated in ten evenly distributed subplots of 10 x 10 m and 4 x 4 m within each transect. In order to assess the factors influencing the variation in distribution and abundance of the NTFP species, data were collected on the vegetation structure and physiography. The analyses resulted in the identification of major habitat types. These include undisturbed forest of low (under 350 m above sea level (asl)), intermediate (350-540 m asl) and high altitude (over 540 m asl), swamp forests, secondary forests, young fallow lands and fields and cocoa plantations. The data were analysed by post-stratification using size-class distributions and environmental characteristics in order to get insight into the abundance and distribution, as well as indications on the impact of exploitation on the abundance and distribution (van Dijk, 1999a). Appendix I presents an overview of the characteristics of NTFP species that were taken into account for the analyses. They were selected on the basis of their subsistence or economic value, including as well those species that might be affected by logging or NTFP harvesting.

3. NTFP RESOURCES AND THE IMPACT OF LOGGING

3.1. Use and trade in NTFPs

During the NTFP inventory 200 animal species and over 500 plant species were recorded, the latter counting for 1200 different uses. These results demonstrate the great importance of NTFPs. In fact, they are part of almost every aspect of rural life, and they offer also a range of possibilities to earn an income. The following categories of NTFPs were distinguished:

Wild animal resources such as bushmeat, fish, crustaceans, insects, and molluscs. These resources serve as a major source of protein for household consumption. The trade is merely directed at satisfying the local demand. However, a temporal rise in hunting and trapping intensity may occur in order to meet increased demands by logging personnel. During a peak period of hunting on average 8.2 kg of bushmeat was captured weekly per hunter, which is about 60% more than the average in the TCP-area. During other periods of the year, fishing and collection of small animals gain interest. Although the importance of these animal resources is obvious, the study results on this subject will not be further elaborated in this paper.

Plant NTFPs used for food and beverages, such as seeds, fruits, bark, exudates and mushrooms. Various products are highly appreciated for their taste, and they are part of daily consumption. These products are not only harvested for household consumption, but also for trade. Some products are regularly traded to urban markets inside and outside the country. The use of other vegetable food NTFPs such as vegetables and root crops providing starchy food is less frequent and varied. These products are primarily harvested from cultivated species rather than from wild species.

Medicinal NTFPs: in total around 300 species are used for medicinal purposes. Their use is common in all households, and knowledge on their use is very well developed amongst all community groups.

Raw materials used for house construction and for household, agricultural, hunting and fishing equipment. For each of these applications clear preferences exist regarding the species to be used for

specific purposes. Industrial inputs. At the time of the survey, only one product is extracted for this purpose.

The harvesting of NTFPs is primarily directed at household consumption. Bushmeat and 38 plant NTFPs are also marketed. The sale of bushmeat and palm wine and its derivative liquor is the most important in terms of volumes and monetary value and thus they are the most important as a source of revenue (van Dijk, 1999b). For these products the trade is restricted to the village environment. The commercialisation of other products, merely condiments marketed in urban markets in and outside the country (Kempkes, 1995; Ndoye *et al.*, 1998), is not particularly well developed. For some of these products (e.g. 'njansang' kernels of *Ricinodendron heudelotii* and the palm wine additive *Garcinia lucida* bark), the number of people involved in the trade is restricted. For other commercial NTFPs (e.g. bush mango almonds of *Irvingia gabonensis* and the nuts of *Coula edulis*) the share of the total harvest sold is small (van Dijk, 1999b).

The trade in the single product actually extracted for industrial purposes, namely the seeds of *Strophanthus gratus*, is very restricted. The tedious working conditions and price fluctuations avoid a larger scale commercialisation.

3.2. Distribution and abundance of NTFP species

The ecological survey indicated that there exists a considerable variation in the distribution and abundance of NTFP species. There are two major factors affecting the distribution, i.e. ecological conditions and human impact. With respect to ecological conditions, differences in altitude and drainage conditions cause a significant variation in the distribution and abundance of NTFP species. Agriculture, including the creation of food crop fields and cocoa plantations, and logging are the human activities with the strongest impact. Table 1 presents the numbers of the important species in different density classes according to the maximum densities they reach in their preferred habitats. The table refers to those species that have an important subsistence and economic value and separately those providing marketable products.

Table 1. The distribution of important NTFP species in various size classes according to the maximum densities reached in their preferred habitat.

	% of total number of species providing important NTFPs (85)						**% of total number of species providing marketable NTFPs (29)**					
density in number of stems (> 10cm) or clumps/ha	**< 1**	**1-5**	**5-10**	**>10**	**n.a.**[1]	**Total**	**< 1**	**1-5**	**5-10**	**>10**	**n.a.**[1]	**Total**
Disturbed land types												
Young fallow land/fields	0	2	0	1	1	**5**	3	0	0	0	0	**3**
Secondary forest	1	8	4	5	1	**19**	0	10	14	0	0	**24**
Cocoa plantations	0	12	2	2	1	**18**	0	14	3	3	0	**21**
Logged-over forest	1	8	2	1	0	**13**	0	7	0	0	0	**7**
Subtotal	**2**	**31**	**8**	**9**	**4**	**54**	**3**	**31**	**17**	**3**	**0**	**55**
Undisturbed land types												
Forest low altitude	2	9	0	4	0	**15**	0	14	0	0	0	**14**
Forest intermediate altitude	4	5	0	0	0	**8**	3	0	0	3	0	**7**
Forest high altitude	2	4	0	6	0	**12**	3	7	0	10	0	**21**
Swamp forest	0	5	4	2	0	**11**	0	0	0	3	0	**3**
Subtotal	**8**	**22**	**4**	**12**	**0**	**46**	**7**	**21**	**0**	**17**	**0**	**45**

[1] n.a.: the density was not assessed

NTFP resources that can be harvested in a sustainable way and that yield high volumes of produce per unit of land are the most promising with regard to the development of commercial exploitation (Peters, 1996). In the Bipindi–Akom II area, however, the abundance of most NTFP species is rather low. The majority of the species occur with maximum densities of 0-5 stems/ha. Many species have even less than one producing individual per hectare. Only few species occur in higher densities (> 10 stems/ha) in specific habitat types. Examples are species as *Elaeis guineensis, Raphia montbuttorum*, *Coula edulis*, *Garcinia lucida* and *Scorodophloeus zenkeri,* from which various products are actually extracted for trade. Over 50 percent of the NTFP species reach their maximum densities in man-made habitat types, especially secondary forests resulting from agriculture and cocoa plantations.

3.3. The influence of timber exploitation on the availability of plant NTFP resources

In addition to the obvious impact of agriculture on the availability of NTFP resources, NTFP harvesting itself (see Guedje *et al*., 1999; Guedje and Nkongmeneck, 1999; van Dijk, 1999a) and commercial timber exploitation may also affect the abundance and distribution of NTFP species.

The direct effects of commercial timber exploitation on plant NTFP resources are threefold, namely:

- The elimination of individuals providing both commercial timber and NTFPs;
- The removal of and damage to other NTFP species as a result of the partial destruction of the forest;
- The altering of the forest environment by the creation of gaps, landings and roads resulting in changes in light and moisture conditions and soil compaction.

In consequence, the structure and the floristic composition of logged-over forests will change. In a first instance, the recruitment of light demanding species will be favoured while the regeneration of shade-bearers can be negatively influenced during the recovery process.

3.3.1. The perception of local people

The survey on the use and functions of NTFP species revealed that according to the respondents, many NTFPs are nowadays scarcer than in the past. Several people mentioned the irregularity in production of number of (fruit producing) NTFP species as the main cause of changes in the availability. Only one respondent, a Bagyeli man, stated that the decreased availability of certain products was uniquely due to agricultural activities. Few informants added that an increase in the level of extraction by the local population has also caused a decrease in availability. Some examples mentioned were *Aframomum citratum* (Mvongolo) and rattan species (Nlong).

The majority of people, however, declared that logging activities are the main cause of a decrease in availability of certain NTFP resources. In addition to a number of NTFP species that are effectively logged for their timber, also other NTFP species were mentioned as being negatively affected by logging operations (e.g. *Irvingia gabonensis, Coula edulis, Trichoscypha spp.*, see appendix I). However, the elimination of species providing both timber and NTFPs was perceived as the most severe (van Dijk, 1999a). Table 2 presents a comparison of the interests of the logging company that exploited the area during the survey period, ‘Gerard Wijma en Zonen’ (GWZ), and the local importance of the 19 species concerned by commercial exploitation and the use of their NTFPs.

The volumes exploited of *Lophira alata* are by far the most important. However, as can be concluded from Table 2, in spite of a relatively high use frequency, its exploitation does not seem to cause problems. Apparently, the exploitation of commercial timber is not perceived as an evil *sine qua non*, in case the exploited species does not have a very specific importance or the availability is not seriously affected. Also Biesbrouck (1999) states that Bagyeli do understand to some extent the interests of logging companies. Their main concerns are the waste of valuable medicinal and kernel

providing species, the disappearance of larger game as a consequence of the noise and the absence of a compensation for the loss of these valuable resources.

Table 2. The importance of tree species for commercial timber exploitation and NTFP harvesting

Scientific name	**Trade name**	**Importance for timber**[1]	**Importance for NTFPs (N=29)**		
		% of total volume of timber	Use Frequency[2]	Perception importance[3]	Wish for protection[4]
Antrocaryon klaineanum	Angongui	<0.01	24	3	
Baillonella toxisperma	Moabi	0.4	74	17	1
Canarium schweinfurthii	Aiele	1.4	10	-	
Distemonanthus benthamianus	Movingui	2.3	6	-	
Entandrophragma cylindricum	Sapelli	0.2	24	9	1
Eribroma oblonga	Eyong	0.5	10	3	
Erythrophleum ivorense	Tali	4.4	26	-	
Zanthoxylum heitzii	Olon	0.6	12	3	
Guibourtia tessmannii	Bubinga	0.02	44	8	1
Khaya ivorensis	Ngollon	1.2	3	-	
Lophira alata	Azobé	60.1	26	-	
Lovoa trichilioides	Bibolo/ Dibétou	3.3	7	-	
Milicia excelsa	Iroko	0.2	14	3	
Mitragyna stipulosa	Bahia	<0.01	39	-	
Nauclea diderrichii	Bilinga	3.1	13	-	
Piptadeniastrum africanum	Dabema	0.02	11	9	
Pterocarpus soyauxii	Padouk	1.8	22	6	
Staudtia kamerunensis	Niove	2.2	9	6	
Terminalia superba	Fraké	3.5	25	5	

Notes: [1] Figures of the logging company GWZ, referring to the quantities of logs which entered the Bidou sawmill and which were shipped directly from the Kribi port.
[2] Number of times a use of a species was indicated, including multiple-uses.
[3] Number of times a species was recorded as being important.
[4] Number of times a species was indicated as important to be taken into account for the control of damage of logging.

The trees appearing to be most vulnerable to conflicting interests are Moabi (*Baillonella toxisperma*), Bubinga (*Guibourtia tessmannii*) and Sapelli (*Entandrophragma cylindricum*). These three species were most frequently mentioned as species deserving appropriate protection in the future. *Guibourtia tessmannii* (Bubinga) is mainly of magic-religious value, and as such irreplaceable. This tree protects people against evil and witchcraft and it prevents diseases and misfortune. Besides these 'cultural' values, the tree has several direct medicinal functions. *Baillonella toxisperma* (Moabi) is a multi-purpose tree. Fruits and nuts are consumable, the cooking oil produced from the kernels is very valuable, and the tree has many medicinal properties. From *Entandrophragma cylindricum* (Sapelli) its timber is regularly used for furniture, doors and windows and as such competitive in use. In case the two firstly mentioned species would not be exploited any longer, the loss for logging companies can be estimated at 2-9% of the total stumpage value per surface unit (based on figures presented by Nef, 1997).

3.3.2. Abundance and distribution of NTFP species in logged-over forests

In logged-over forests, neither the diversity of NTFP species nor the total number of NTFP specimen appeared to be seriously affected. The figures on the species diversity are comparable with those of the undisturbed forest types and the species richness is only slightly lower (van Dijk, 1999a). The floristic composition of these forests, however, is different. The densities of individual species hold an intermediate position between undisturbed and secondary forests resulting from agriculture. Pioneer species are clearly favoured (see Table 3), such as for example *Antrocaryon*

klaineanum and *Ricinodendron heudelotii*), whilst the densities of shade-bearers as *Coula edulis* and *Scorodophloeus zenkeri* is significantly lower. For some species (e.g. *Aframomum citratum*, *Tetrapleura tetraptera,* and the rattan species *Ancistrophyllum secundiflorum*) the logging operations create apparently optimal growing conditions, as can be concluded from the maximum densities found in these logged-over forests.

With regard to the changes in the forest structure, merely the smaller size classes (10-30 cm dbh) are underrepresented compared to undisturbed forests. No serious impact on the regeneration of NTFP species was found. Even in the case of typical shade-bearers (e.g. *Coula edulis, Scorodophloeus zenkeri*), seedlings and saplings (dbh < 10 cm) were well represented (van Dijk, 1999a).

Table 3. Densities of some NTFP species in secondary, logged-over and undisturbed forest (in stems/ha of trees > 10 cm dbh).

Species name	Secondary forest	Logged-over forest	Undisturbed forest (all altitudes)
Antrocaryon klaineanum [1]	3.3	2.4	1.0
Coula edulis	1.1	4.6	8.5
Erythrophleum ivorense [1]	4.6	0.8	1.4
Irvingia gabonensis	1.3	3.0	2.4
Ricinodendron heudelotii	4.1	3.0	0.9
Scorodophloeus zenkeri	0.0	7.9	14.4
Terminalia superba [1]	8.0	0.3	2.0
Trichoscypha acuminata	0.9	1.4	1.6

[1] Species providing also commercial timber.

The major threatening of logging probably concerns the elimination of specific species, especially those occurring in very low densities even under undisturbed conditions. In the case of *Baillonella toxisperma* (Moabi or Adjap) and *Guibourtia tessmannii* (Bubinga or Oveng), the anxiousness of the local population is justified. The densities of these species found were very low, respectively 0.2 and 0.3 stems/ha of specimen with a dbh of > 10 cm. As both species reach their reproductive stage only at large diameters, > 70 cm in the case of *Baillonella toxisperma* (Debroux, 1998), their reproduction might seriously be endangered in the future, especially with regard to the actual frequency of logging cycles.

4. TOWARDS THE INTEGRATION OF NTFP RESOURCE MANAGEMENT IN FOREST LAND-USE PLANNING

Although the results presented focus mainly on plant NTFP resources, some conclusions can be drawn with regard to developing options for multiple use forest management:

The use of NTFPs is mainly directed at household consumption. Local trade in NTFPs is important and provides an important share of cash income, but only small volumes of produce reach the urban markets. Consequently, multiple use forest management systems should first of all take into account the subsistence value of NTFPs, and secondly incorporate the development of extraction.

The abundance of most NTFP plant species with a commercial value is low to moderate. Those species occurring more abundantly are, except for those occurring mainly in secondary vegetation types, often absent in large parts of the area. In addition to the scattered presence and low densities of NTFP species, the irregular production, the priority given to household consumption, prevailing exploitation rights and limited marketing opportunities are some of the factors limiting the actual level

of commercialisation and the sustainability of harvesting. Even if the marketing constraints are solved, it is still doubtful whether the restricted availability of NTFP resources in natural forests allows the development of economically efficient and sustainable extraction systems.

Anthropogenic vegetation types such as secondary forests and cocoa plantations are important as a source of many NTFPs and offer good growing conditions for the majority of NTFP species. In these habitat types, the collection of NTFPs can easily be combined with other livelihood practices. Moreover, the prevailing local tenure arrangements offer the best opportunities for a control on the exploitation (van den Berg, 1999) and thus sustainable harvesting.

Logging affects the availability of NTFP plant resources in various ways. The densities of individual NTFP species found in logged-over forests hold an intermediate position between undisturbed and secondary forests resulting from agriculture, indicative for the damage to the remaining forest resources and the appearance of pioneer species. The latter, however, are often highly productive and they provide many important NTFPs. As the level of recruitment of typical shade-bearers appeared to be good, a recovery of the populations of even these species at a longer term will probably take place.

A clear negative impact can be expected with regard to the logging of very rare species. For a number of species yielding both timber and NTFPs, the densities found were < 0.3 stems/ha at a dbh of > 10 cm. As the largest and most productive individuals are removed regularly, their future regeneration might be endangered. People indicated the same species as the most seriously threatened, asking urgently for a more effective protection in the future logging practise.

In view of these conclusions, the most appropriate for developing sustainable and multiple-use forest management systems in which attention is paid to NTFP plant resources management directed at securing local needs and an increase of benefits from extraction, is a dual approach.

In natural forests with or without a timber production function, the focus should be on sustaining the long-term NTFP production and exploitation. With regard to logging, special attention should be given to avoid as much as possible damage to NTFP-species. In this regard appropriate felling cycles, minimisation of damage in general and specially to the most valuable resources, ensuring the survival of vulnerable resources and an effective protection of rare and locally valuable or irreplaceable resources should be considered (Laird, 1999; van Dijk, 1999a). This asks for a careful integration in planning during logging operations, but especially in pre- and post-harvesting actions such as the identification of locally important NTFP resources and the consequences for forest resource inventories, monitoring and silvicultural treatments. Moreover, arrangements for community involvement in the elaboration of, approval of and control over the management planning and for compensation of the loss or damage to NTFP species should be developed.

For an increase of production levels and thus a raise in benefits, cocoa plantations, fields, fallow lands and their consecutive secondary forests seem to be the most appropriate land types. The variation offered in growing conditions, the relatively high level of security concerning access to and control over exploitation and production, as well as some degree of active management of specific resources (van Dijk, 1999b; van Dijk and Wiersum, 1999) indicate the opportunities. Thus, a further intensification of NTFP management and an increase of production might be a feasible option and could be supported by enrichment planting and the development of more productive and adapted varieties by domestication. This means that in all stages of forest management planning, attention should also be given to the NTFP exploitation and resource management in actually or formerly cultivated areas.

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Appendix I: Important NTFP species: names, functions and habit.

Family	Scientific name	Bulu/'Trade name'	Habit[3]	Parts[4] used	Types of uses
ANAC	*Antrocaryon klaineanum*	Ozakong/'Angongui'	m/l-sized tree	fr,ba,se	snack, medicines
ANAC	*Trichoscypha arborea*	Engong	m-sized tree	fr,ba	snack, medicines, equipment, re
ANAC	*Trichoscypha acuminata*	Mvut/Abut	s/m-sized tree	fr,ba,wo	snack, medicines, revenue (fr)
ANNO	*Anonidium floribundum*	Ebom afan	m-sized tree	ba,fr	medicines, snack
ANNO	*Enantia chlorantha*	Mfo	s/m-sized tree	ba,wo,le	medicines, furniture, equipment
ANNO	*Hexalobus crispiflorus*	Owe	m-sized tree	fr,wo	snack, condiment, lure, equipme
ANNO	*Monodora myristica*	Fio	m-sized tree	se	condiment, revenue (fr)
ANNO	*Pachypondanthium staudtii*	Ntom	m/l-sized tree	ba	medicines
ANNO	*Xylopia aethiopica*	Nkala	s-sized tree	wo,ba,fr	construction, furniture, medicine
ANNO	*Xylopia quintasii*	Mvomba	s/m-sized tree	ba,fr	condiment, medicines, construct
APOC	*Alstonia boonei*	Ekuk	l-sized tree	ba,ex	medicines, additive palm wine
APOC	*Funtumia elastica*	Etendamba	m-sized tree	ba,wo,ex	furniture, construction, medicine
APOC	*Picralima nitida*	Ebam	s-sized tree	ba,ro,st	medicines, equipment
APOC	*Rauvolfia caffra*	Esombo	m-sized tree	le,ba	medicines, equipment
APOC	*Rauvolfia vomitoria*	Obaton	s-sized tree	fr,ro,ba,le	medicines
APOC	*Strophanthus gratus*	Enay	Liana	se	hunting/fishing poison, revenue
APOC	*Tabernaemontana crassa*	Etoan	s/m-sized tree	ex,le,ba	medicines
BIGN	*Spathodea campanulata*	Esusuk	m-sized tree	ba,ex	medicines
BOMB	*Ceiba pentandra*	Dum	l-sized tree	ba	medicines
BURS	*Canarium schweinfurthii*	Otu/'Aiele'	l-sized tree	ex,se,ba,fr	fuel, witchcraft, medicines, com
BURS	*Dacryodes edulis*	Assa	m-sized tree	fr,ba	vegetable, medicines, revenue
BURS	*Dacryodes klaineana*	Tom afan	m-sized tree	fr	snack
BURS	*Dacryodes macrophylla*	Tom	m-sized tree	fr	snack, revenue (fr)
BURS	*Santiria trimera*	Ebaptom	m-sized tree	fr	snack, commercial (fr)
CAES	*Distemonanthus benthamianus*	Eyen/'Movingui'	m/l-sized tree	wo,ba,fr	construction, medicines
CAES	*Erythrophleum ivorense*	Elon/'Tali'	l-sized tree	ba,wo	medicines, furniture, constructio
CAES	*Guibourtia tessmannii*	Oveng/'Bubinga'	l-sized tree	ba,tr,ex,wo	witchcraft, medicines, equipmer
CAES	*Scorodophloeus zenkeri*	Olon	m-sized tree	ba,se	condiment, revenue (ba,se)
CECR	*Myrianthus arboreus*	Angokom	m-sized tree	fr,ba,le,wo	snack, medicines, construction,
EUPH	*Alchornea cordifolia*	Aboe	s-sized tree	le,wo,fr	medicines, equipment, lure
EUPH	*Discoglypremna caloneura*	Ata'a	m-sized tree	ba	medicines
EUPH	*Phyllanthus muellerianus*	Awum	Liana	ba,ex	additive palm wine, medicines
EUPH	*Ricinodendron heudelotii*	Ezezang	m/l-sized tree	se,ba	condiment, medicines, revenue (
EUPH	*Tetrorchidium didymostemon*	Dilik	s/m-sized tree	ba,wo	medicines, construction
GNET	*Gnetum sp.*	Ocok	vine	le	vegetable, commercial (le)

[1] s: small, m: medium, l: large.
[2] ba: bark, ex: exudate, fr: fruit, le: leaves, s: seeds, sp: sprouts, st: stem, th: thorns, wo: wood.

GUTT	*Garcinia kola*	Onyai	m-sized tree	se,ba	snack/aphrodisiac, additive palm
GUTT	*Garcinia lucida*	Esok	s/m-sized tree	ba,se	additive palm wine, snack/aphro
HUMI	*Sacoglottis gabonensis*	Bidu	m/l-sized tree	ba	additive palm wine, medicines
HYPE	*Harungana madagascariensis*	Atondo	s/m-sized tree	ba,wo	medicines, construction, furnitur
IRVI	*Irvingia gabonensis*	Ando'o	l-sized tree	se,fr,ba	condiment, snack, medicines, re
LOGA	*Strychnos asterantha*	Mfas	liana	wo,ex	equipment, drinking water
MARA	*Halopegia azurea*	Nken	herb	ro,st,ex	medicines, basketry
MARA	*Haumania danckelmaniana*	Se	liana	st	equipment, drinking water
MARA	*Megaphrynium macrostachyum*	Okakon/Nden	herb	le,st	food wrapping, basketry, equipn
MARA	*Sarcophrynium prionogonium*	Angwafan	herb	le,fr	food wrapping, snack, revenue (
MELI	*Entandrophragma cylindricum*	Asié/'Sapelli'	l-sized tree	wo,ba	furniture, carpentry
MELI	*Khaya ivorensis*	Ngollon/'Acaju'	l-sized tree	wo,ba	furniture, medicines
MELI	*Lovoa trichilioides*	Bibolo/'Bibolo'	l-sized tree	wo,ba	construction, furniture
MIMO	*Pentaclethra macrophylla*	Ebay	m/l-sized	ba,se,wo	medicines, witchcraft, furniture
MIMO	*Piptadeniastrum africanum*	Atui/'Dabema'	l-sized tree	ba	medicines
MIMO	*Tetrapleura tetraptera*	Kpwa'sa	m-sized tree	fr	condiment, medicines, commerc
MORA	*Milicia excelsa*	Abang/'Iroko"	l-sized tree	wo,ba	medicines, equipment, furniture
MORA	*Musanga cecropioides*	Asseng	s/m-sized tree	ex,ba,le	medicines, equipment, drinking
MORA	*Treculia africana*	Etui	m-sized tree	wo,se	equipment, condiment, medicine
MYRI	*Pycnanthus angolensis*	Eteng	l-sized tree	ba,wo	medicines, equipment
MYRI	*Staudtia kamerunensis*	Mbonda/'Niove'	m (?)-sized tree	wo,ba	construction, medicines
OCHN	*Lophira alata*	Okwa/'Azobé'	l-sized tree	ba,le,wo	medicines, construction
OLAC	*Coula edulis*	Ewomen	m-sized tree	wo,se,ba	construction, snack, condiment,
OLAC	*Ongokea gore*	Anguek	m/l-sized tree	fr,ba	lure, medicines
PALM	*Ancistrophyllum secundiflorum*	Nkan	liana	st, sp	construction, equipment, condim
OCHN	*Lophira alata*	Okwa/'Azobé'	l-sized tree	ba,le,wo	medicines, construction
OLAC	*Coula edulis*	Ewomen	m-sized tree	wo,se,ba	construction, snack, condiment,
OLAC	*Ongokea gore*	Anguek	m/l-sized tree	fr,ba	lure, medicines
PALM	*Ancistrophyllum secundiflorum*	Nkan	liana	st, sp	construction, equipment, condim
PALM	*Elaeis guineensis*	Alen	m-sized tree	ex,fr,se,le,st	palm wine, cooking oil, medicin
PALM	*Raphia montbuttorum*	Zam	s-sized tree	le,ex,fr	palm wine, construction, furnitu
PALM	*Rattan species*	Nlong	liana	st	construction, equipment, medici
PAND	*Panda oleosa*	Afane	m-sized tree	se,ba	condiment, medicines, revenue (
PAPI	*Pterocarpus soyauxii*	Mbe/'Paduk'	l-sized tree	wo,ex,ba,le	equipment, medicines, construct
PASS	*Barteria fistulosa*	Mekbenga	m-sized tree	ba	medicines
PIPE	*Piper guineensis*	Abominjang ndik	liana	fr,ba,le	condiment, additive palm wine,
POLY	*Carpolobia lutea*	Onong	s-sized tree	ro,fr,wo,le	aphrodisiac, snack, equipment
RHIZ	*Poga oleosa*	Angale	m-sized tree	se,wo	condiment, cooking oil, snack, r
RUBI	*Mitragyna stipulosa*	Afobezam/'Bahia'	m-sized tree	wo,ba	medicines, construction, furnitur
RUBI	*Morinda lucida*	Atjek	m-sized tree	ba,wo,le	medicines, equipment, construct
RUBI	*Nauclea diderrichii*	Akondok/'Bilinga'	m/l-sized tree	wo,se	equipment, construction, snack
RUTA	*Zanthoxylum gilleti*	Bongo/'Olon'	l-sized tree	wo,ba	equipment, medicines
RUTA	*Zanthoxylum heitzii*	Elelongo/Ngues/'Olon'	l-sized tree	st,ba,th	aphrodisiac, poison, medicines,
SAPO	*Baillonella toxisperma*	Adjap/'Moabi'	l-sized tree	se,ba,fr,wo	cooking oil, condiment, snack, r
STER	*Cola acuminata/C. nitida*	Abu	m-sized tree	se,ba	snack/aphrodisiac, medicines, re
STER	*Cola ricinifolia*	Akomngwoé	s?-sized tree	fr	snack, revenue (fr)
STER	*Cola spp.*	Mvoi	s?-sized tree	fr	snack, revenue (fr)
STER	*Eribroma oblonga*	Eyong/'Eyong'	l-sized tree	wo,ba	construction, medicines, furnitur
VITA	*Cissus sp.*	Fazo'o	liana	ex	drinking water
ZING	*Aframomum citratum*	Mvolong	herb	fr	condiment, revenue (fr)
ZING	*Aframomum melegueta*	Ndong	herb	fr	aphrodisiac, medicines, revenue
ZING	*Aframomum sp.*	Adjom	herb	fr,le,ex	snack, medicines, condiment