Non-Timber Forest Products in the Bipindi-Akom II Region, Cameroon

A socio-economic and ecological assessment

J.F.W. van Dijk

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The Tropenbos-Cameroon programme
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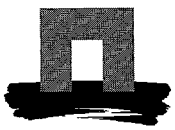
The Tropenbos-Cameroon Series publishes results of research projects carried out in the framework of the Tropenbos-Cameroon programme (TCP). The TCP operates within the framework of the international programme of the Tropenbos Foundation. The multidisciplinary Tropenbos-Cameroon programme contributes to the conservation and wise utilisation of forest resources in Cameroon by conducting strategic and applied research and building capacity in Cameroon in the field of forest-related sciences.



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PREFACE

This book is the result of the first phase of a research project on non-timber forest products (NTFPs) which was carried out within the framework of the Tropenbos-Cameroon programme (TCP) and financed by the Tropenbos Foundation in the Netherlands. The main implementing agencies of the TCP are the Wageningen Agricultural University (WAU) and the 'Institut de la Recherche Agricole pour le Développement' (IRAD). The non-timber forest product (NTFP) project was closely linked to the part of the ITTO Project PD 26/92 which dealt with peoples'perspectives of the forest (S1). The 'Office National de Développement des Forêts (ONADEF)' is the 'Agence d'Exécution' of this project.

Without the support of the staff, my fellow-researchers and the supporting personal of the Tropenbos Cameroon Programme team this ambitious study could never been conducted. The field surveys were carried out with the assistance of many people. I am much obliged to Nicole Guedje who assisted me almost from the beginning. She spent many hours in the field for the general ecological inventory. Moreover, she conducted the survey on *Garcinia lucida* and *Aframomum* spp.

I am very grateful for all the contributions of the students who participated in the project. Valérie Marrel executed the fieldwork for the hunting survey. I would like to thank especially Maaike Kempkes. She not only carried out the market survey, but she also has summarised her experiences resulting from her field survey in this book. A number of contributions of students could not yet be included in this book. However, I would like to thank Cécile Ndjebet Ntamag and Oscar Tchuisseu for their enthusiastic participation and the work they have accomplished.

Very special thanks go to Marcel Mva and Clindor 'Dieudonné' Ndoum. Participating from the very first beginning, they formed the core of all the people who assisted me in the field surveys. They made it possible to enter the 'kitchens' of many people, to conduct the forest inventories and without their incredible knowledge of the useful plant species the work could never have been accomplished. Many other people have assisted in the field surveys. Unfortunately they cannot be mentioned all by name. However, I am also much obliged to Michel Mba and Césaer Mbetti.

This book had never appeared without the more than substantial contribution with regard to comments, corrections, editing, solving computer struggles and lay-out of Wyb Jonkers, Freerk Wiersum, Joke Jansen, Mirjam Ros-Tonen, Wim van Driel, Ruud van Dijk, and Wanda Tammens, as well as the finishing touch of Wilma Heerding who provided the cover photograph of one of the eleven hundred identified vegetable NTFPs: a shrimp basket. Finally, I would like to thank all those people in the villages who spent many hours patiently answering all my questions, especially the people of Ebom, Ebimimbang, Mefane and Nyangong.

ABSTRACT

This book presents the first results of a non-timber forest product (NTFP) research project executed in the south of Cameroon. The overall study aims to enable the integration of NTFP resources management in future management schemes in view of the needs and interests of people depending on these resources for both subsistence and commercial purposes.

The present book presents the results of the first phase of the study. Firstly, commonly used NTFP species were identified. As the range of products used is enormous, which is largely confirmed in this study, it will not be possible to take them all into account in forest management. For this reason, an attempt was made to determine the relative importance of these species. Secondly, the results are presented of an ecological inventory of the NTFP resources providing information on the abundance and distribution of the species with regard to the environmental variation and some indications of the impact of various types of exploitation such as agriculture, logging and harvesting of NTFPs on the availability.

The book starts with a general outline of the NTFP study. In addition, a description of the area is given, with a special emphasis on those aspects which are of importance for the ecological and socio-economic aspects of NTFP extraction.

The second part deals with the uses of NTFP species in the area. They were classified in food plants, animal resources, forest medicines, construction materials and household equipment. The uses of the most important NTFP species are described in detail. A complete presentation of the uses is included in the appendices. In addition, the people's opinion on the most important NTFP resources, their availability and management is described, and the commercialisation of NTFPs in the area.

The third part reflects the results of the overall ecological assessment. Based on the differences in species richness and diversity, as well as the distribution patterns of individual NTFP species, the major habitat types were identified. The abundance of NTFP species was related to these major habitat types. The impact of exploitation, especially logging and harvesting of NTFPs on the population structure was examined for a restricted number of species.

Parts two and three of the book are concluded by syntheses of the results and conclusions, referring to management issues and implications for further research.

I. INTRODUCTION

I.1 FRAMEWORK OF THE RESEARCH

This study was executed within the framework of the Tropenbos-Cameroon programme (TCP). The Tropenbos Foundation is a Dutch Non-Governmental Organisation which participates in research programmes with several governments for the conservation and wise use of tropical rain forests. The Tropenbos-Cameroon programme is one of the Foundation's ongoing research programmes and was initiated in collaboration with the Cameroonean Ministry of Environment and Forests (MINEF).

Actual forest management of tropical rain forests focuses mainly on the exploitation of timber, as it generates high income in the short term. In current forest exploitation systems, the interests of local people, the role of other forest products and services and the sustainability of timber exploitation are hardly taken into account. The aim of the Tropenbos-Cameroon programme is to develop methods and strategies for natural forest management directed at the sustainable production of timber and other products and services (Foahom and Jonkers, 1992).

The programme consists of fourteen interrelated projects and is carried out by Wageningen Agricultural University, the 'Institut de la Recherche Agricole pour le Développement' (IRAD) and several other institutes and universities in Cameroon and the Netherlands.

This book reflects the results of the first phase of a sub-project on non-timber forest products (NTFPs).

I.2 OUTLINE OF THE NTFP RESEARCH PROJECT

The present book reflects the results of the first phase of the NTFP study. In this chapter an overview of the NTFP research project is presented (Section I.2.2) as well as a brief description of the research activities which resulted in the present book (Section I.2.3).

I.2.1 Justification

NTFPs contribute to many aspects of rural life. They are important for both subsistence and cash income. In this document NTFPs are defined as: *all the forest products which are or could be extracted by local people, excluding the exploitation of industrial timber and its derivatives (free after Falconer, 1990).*

The integration of the management of NTFP resources in the development of methods and strategies for sustainable land use is of vital importance. In the south of Cameroon,

both Bantu and Bagyeli (Pygmy) societies rely to a great extent on NTFPs. The development of sustainable forest management systems and strategies should include the effective conservation and management of NTFP resources which meets first of all at the needs and interests of local people.

For management systems in which the exploitation of both timber and non-timber forest products are considered, the importance and value of NTFPs must be highlighted in an accessible way to decision and policy makers. Considering their value, NTFPs can make the difference between socially acceptable and sustainable timber exploitation and a logging enclave resented by the local population (Panayotou and Ashton, 1992). In order to understand this value more precise quantitative information on the local use of NTFPs is needed. Where relevant, they should be expressed in comparative economic terms (Panayotou 1991; Peters, Gentry and Mendelsohn, 1989). Also the interaction between the two exploitation types has to be taken into account. Logging affects the NTFP resources, as timber exploitation includes also commonly used NTFPs (host) species, causes damage to and disturbs the forest-ecosystems, which in its turn changes the growing conditions negatively or positively.

The development of commercial extraction of NTFPs could be an important economic incentive to manage rain forests sustainably, helping to conserve the biodiversity and improving the well-being of forest people at the same time (Ambrose, 1994; Allegretti and Schwartzman, 1989). Many NTFPs are extracted in small quantities and have a relatively high economic value per unit of weight. In general, the harvesting does not cause a great disturbance or damage to the forest environment, although it is not always evident that the harvesting levels are ecologically sustainable (Hall and Bawa, 1993).

Until recently, research on the use of forest resources by local populations was uniquely confined to anthropologists. Also in the south of Cameroon, such studies have been executed (e.g. Coustix, 1961).

Although these kinds of studies provide interesting information, they hardly provide data that are of practical use for the integration of NTFP extraction into sustainable forest management systems.

The integration of the management and development of NTFP resources in forest land-use planning requires information on the role and (potential) uses of NTFPs, the current management by local people and the impact of exploitation types on NTFP resources. The uses of NTFPs must be determined by an socio-economic and ecological assessment founded as much as possible on solid quantitative and statistical data.

I.2.2 Objectives and research questions

The aim of this research project is to contribute to the socio-economic and ecological assessment of NTFPs in order to formulate concrete recommendations for the

integration of NTFP resources management in sustainable forest management systems and strategies. The specific objectives are to:

- identify the names and uses of commonly used NTFP species;
- determine the actual and potential value of NTFP resources for local people;
- assess the impact of exploitation on NTFP resources;
- identify opportunities to increase the benefits of extraction for local people.

The specific research questions are:

1. What are the names and uses of commonly used NTFP species?
2. To whom and to what extent NTFPs contribute to subsistence and cash income for local people?
3. What is the actual and potential value of forest lands for NTFP extraction?
4. What is the impact of logging on NTFP resources?
5. How and to what extent the extraction of NTFPs affects the available resources?
6. Can local and other existing NTFP management systems of tree- and forest resources be distinguished which could provide a base to maintain or increase the production?
7. What are the constraints of extraction, processing and marketing at community level?
8. Are there opportunities to increase the level of extraction?

As stated above, this book deals with the results of the first of two phases (1994-1996), so not all research questions will be dealt with here. This book answers the first, fourth and fifth research question. With respect to the other questions, the present results will provide important but partial answers.

The aim of the first phase was to identify the use and names of NTFPs, their importance for the local population, as well as to assess the availability of the NTFP resources and the influence of various exploitation types such as agriculture, logging and NTFP extraction on this availability. The research activities included reconnaissance surveys on NTFP use in households and marketing. Information was collected on forest foods (including bushmeat), medicines, construction and equipment materials, commercialisation and the peoples' perception of the importance of the various products. Hunting was studied separately by a survey on the species composition and the level of extraction. The market survey provided an overview of NTFPs commercialised in the south of Cameroon and insight into the marketing of a number of NTFPs. Also, an overall NTFP resources survey was carried out which included the potential variation in natural and human influences on growth conditions. A general ecological assessment of NTFP resources should provide the necessary information to select the most important species to be studied in the second phase of the project.

The second phase of the project consists of in-depth studies on the role of NTFPs in the rural economy and on a number of ecological parameters such as the productivity and

the impact of NTFP extraction on some specific resources. This phase commenced in 1997.

I.2.3 Methodological framework

The growing awareness that the importance of NTFPs for local communities should be taken into account in forest management, and that NTFP extraction may be developed into an economically, ecologically and socially sound strategy for sustainable forest management, was a stimulus to NTFP research. Most research of this kind has been carried out in Latin America and Asia. Methodological concepts from these studies are used to study NTFPs in the particular context of south Cameroon.

I.2.3.1 The functions and value of NTFP resources

In recent years, many researchers have developed methods to value NTFPs for a wide variety of purposes (de Beer and McDermott, 1989; Godoy and Lubowski, 1992; Philips and Gentry, 1993; Prance, 1989; Peters *et al.*, 1989). Elements of these methods are used in the present study. In this study, the value of NTFPs is examined with regard to the actual and potential contribution to household economies, as well as to the actual and potential economic value of forest lands.

For this purpose, the current value of NTFPs is determined by using a number of quantitative and qualitative indicators, as well as a partial monetary valuation. The rates of extraction, the prices, the costs and the sustainability of extraction are assessed separately. A number of qualitative and quantitative indicators, such as the functions, frequency and quantities extracted, consumed and sold are determined. The assessment takes into account by whom the products are extracted, processed and commercialised, as the use of NTFPs is strongly ethnic, gender and age class related (Falconer, 1992; Kainer and Duryea, 1993).

The assessment of the monetary value is restricted to those products, which have a known market value. The economic value of forest lands for NTFPs can be estimated by relating the returns and revenues to the extraction area.

The potential value of commercially interesting NTFPs is assessed by estimating the production per unit of land, determined by the density and distribution, productivity and phenology of the species concerned.

I.2.3.2 NTFP resources and the influence of various exploitation types on these resources

The availability of NTFPs depends to a large extent on the productivity, the distribution and the abundance of the species. The distribution and abundance of species depend on differences in growth conditions, management practices and various types and intensities of exploitation.

Therefore the assessment pays attention to:
- the spatial variation in abundance in relation to habitat types and the influence of various exploitation types (e.g. logging, harvesting of NTFPs and agriculture);
- the comparison of population structures. Harvesting of NTFPs and timber species used as NTFPs affects specific age class and size stages within the population. Differences in the distribution per age/size class under different exploitation intensities provide insight into the impact of extraction;
- the phenology and productivity of a number of important plant species.

I.2.3.3 Opportunities to increase the benefits of commercial extraction of NTFPs
The benefits of extraction of commercial NTFPs are determined by the availability of the products and the cost/benefit ratio of their extraction. An increase of the benefits of extraction could be realised by an increase of the returns and revenues per unit of land, for which several options exist:
- to increase the quantities extracted of NTFPs with an economic value. This can be determined by comparing the actual level of extraction with the potential production per unit of land (see I.2.3.1.);
- to increase the production of NTFP species by enrichment and improvement of forest resources and domestication of species. For this purpose, the local management systems of tree and forest resources need to be identified, as well as the relevance of management techniques developed in similar regions;.
- to improve of processing and marketing. To achieve this, the efficiency and the constraints with regard to the processing and marketing of NTFPs in the study-area need to be examined.

Part of the information needed was available from literature. Other aspects needed to be determined by field surveys.

I.3 DESCRIPTION OF THE AREA

I.3.1 Location

The study area is located in the South Province of Cameroon between the villages Bipindi, Lolodorf and Akom II, approximately 50 km east of Kribi and the Atlantic Coast (see Figure I.1). Administratively it belongs to the Department Océan with the Districts Bipindi and Akom II and the Department Mvila with the District Ebolowa. The area includes two logging concessions operated by Wijma-Douala SARL (GWZ) and cover an area of approximately 200,000 ha.

The area is accessible from the urban centres of Ebolowa (located east of the area) and Kribi by dirt roads. In the rainy season, when the roads become muddy, access is difficult. A few minor roads cross the area. In addition, the logging company created and improved a number of roads. These roads degrade, however, very quickly once the

logging operations have finished. In general, transport facilities available to the people living inside the study area are very limited.

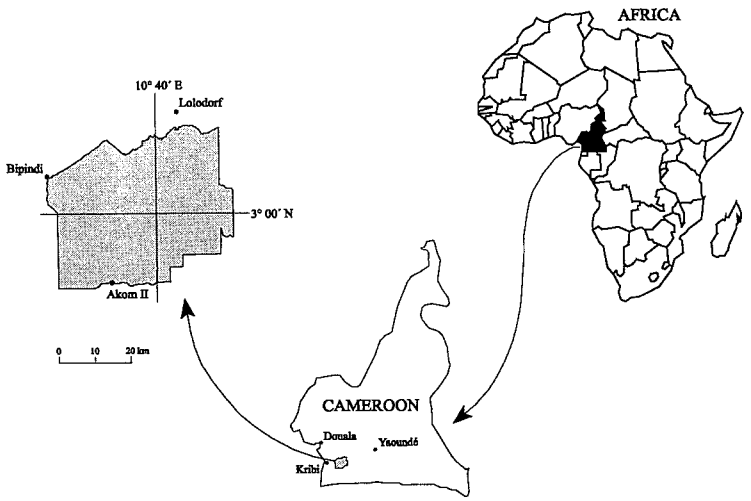

Figure I.1 Map of the study area of the Tropenbos-Cameroon programme

I.3.2 Natural environment

I.3.2.1 Climate

According to the classification system of Köppen, the climate can be characterised as a tropical monsoon climate (Jonkers and Foahom, 1992). The mean annual temperature is about 25°C with a variation of only 3°C during the year.

Although rain is falling throughout the year, there is a distinct seasonal variation in precipitation. A long and heavy rainy season extends from September to November. A shorter and less intensive rainy season can be distinguished in the months April-May. The long dry season starts in December and ends in March. The months July and August form the short dry season. In this period the temperatures are the lowest.

The climate gradually changes with increasing distance from the coast and with elevation. Inland, the annual rainfall and the temperatures tend to decrease. Preliminary data analysis of the distribution of rainfall shows that the lowland (Bipindi) and the upland (Nyangong) receive less rainfall than the transition zone (M. Waterloo, personal communication).

The annual rainfall in the study area is estimated at about 2,000 mm, based on the long term data from the meteorological stations in Kribi (2,836 mm), Lolodorf (2,096 mm) and Ebolowa (1,719 mm) (Olivry, in van Gemerden and Hazeu, 1997).

I.3.2.2 Geology, geomorphology and soils[1]

The geological formations which occur in the study area belong to the Precambrian basement complex. The most important rock formations are migmatites, ectinities, gneisses and migmatites. In addition, some old granites can be found. The overall tectonic direction is NNE-SSW.

The western part of the study area belongs to the coastal lowland of the late Tertiary-Quaternary age, whereas the eastern part belongs to the interior plateau of Eocene age. The physiognomy of the landscape is still developing, mainly by water erosion which results in the dissection of the area.

Table I.1 Landforms and their relief characteristics in the study area

Landform Units	**Slope length (m)**	**Slope (%)**	**Relief intensity (m)**	**No. of inter-fluves per km²**	**Altitude range (m)**	**Surface area (km²)**
Dissected erosional plains (pd)	50-200	5-15	20-30	3-4	40-280	110
Uplands (u1)	100-200	10-20	20-30	3-4	120-700	370
Uplands (u2)	150-300	10-30	30-80	2-3	120-700	540
Isolated hills (h1)	250-500	>30	120-300	-	200-900	120
Complex of hills (h2)	200-350	20-40	80-200	1	350-700	130
Mountains (m)						
- outside slopes	>400	>30	>250	-		
- inside slopes	250-400	30-60	120-250	-	>500	100
Valley bottoms (v)	-	0-2	<10	-	40-700	14

Source: van Gemerden and Hazeu (1997)

In Table I.1, the characteristics of the landforms are summarised. The landforms were distinguished on the basis of differences in slope steepness and length, relief and valley intensity.

The dissected erosional plain at altitudes of < 280 m above sea level (asl) is relatively flat and prominent elevations or depressions are lacking. The plain is restricted to the western part of the area. The relief can be characterised as undulating to rolling. This landform covers about 8% of the study area. The uplands cover the central part at altitudes of 350-500 m asl. Within this type, moderately dissected uplands with a rolling relief and strongly dissected uplands with a hilly relief were distinguished. About 27% of the study area is covered by the rolling uplands.

[1] Source: van Gemerden and Hazeu (1997)

The hills consist of isolated hills or complexes of hills. The first type can be found scattered all over the area. Rock outcrops are a common feature. The complexes of hills are mainly situated in the transition zone between the uplands and the mountainous eastern part of the TCP at altitudes of 500-700 m asl. The hills cover about 18% of the study area.

The mountains in the eastern part at altitudes of > 500 m asl are characterised by abrupt rises in altitude. The slopes are very steep and rock outcrop is common. This landform covers 7% of the area.

Only the largest valley bottoms were identified as a separate landform. As such, they cover only 1%. They are characterised by the stagnation of water. This landform can be found predominantly in the south-east and in the western lowlands.

Table I.2 Soil types of the TCP research area and their diagnostic criteria

Soil type	Drainage	Texture (% clay topsoil)[1]	Texture (% clay B horizon)[2]
Nyangong	Well drained	35-70%	50-80%
Ebom	Moderately well to well drained	20-50%	35-60%
Ebimimbang	Moderately well drained	0-25%	20-45%
Valley bottom	Poorly to very poorly drained	Variable	Variable

Notes: [1]0 – 10 cm; [2]20-60 cm.
Source: van Gemerden and Hazeu (1997)

The soils in the study area are remarkably uniform throughout the region (Touber, 1993). They are well drained, very deep, yellowish brown clay loams to light clays. Based on the variation in texture and drainage capacity, four main soil types were distinguished, named after the villages in which surroundings they occur commonly (see Table I.2). The distribution of these soil types corresponds with the gradual transition in climate, altitude and geomorphology.

The Nyangong soil type is deep to very deep and well drained and is developed on fine grained gneisses and on diorite and granite rich in pyroxene. The clay content in both the topsoil and subsoil is very high. These soils are extremely acid and the pH (3.5 to 4.5) presents the lowest value of all the soil types which occur in the area. The mineralisation is retarded, resulting in low nitrogen and relatively high organic carbon concentrations. The available phosphorous amount is the lowest of all soil types.

The Ebom type resembles the previous one, but the clay content is somewhat lower. It is developed on gneisses and migmatites. The chemical characteristics hardly differ from the Nyangong type. The only differences are a slightly lower carbon content which results in a lower C/N value. The available phosphorous is somewhat higher.

The Ebimimbang soil type consists of moderately deep to deep, moderately well drained sandy clay loams to sandy loams and it is developed on coarse gneisses. The chemical properties indicate a relatively higher fertility, mainly based on a higher level of available phosphorous and calcium. The pH is, especially in the top soil, higher with a range of 5-6.

The soils of the valley bottoms are developed on unconsolidated recent alluvium in which sand layers are often dominating. Flooding and high ground water levels are characteristic for this soil type. As for the chemical properties, the relatively high amount of available phosphorous is distinctive.

I.3.2.3 Vegetation and landscape ecology

The vegetation in south-west Cameroon forms part of the domain of the humid evergreen forest (Jonkers and Foahom, 1992). Based on the differences in floristic composition, six forest types can be distinguished in the study area and its direct surroundings, of which the Atlantic Biafran forest rich in Caesalpiniaceae at altitudes ranging from 200-500 m asl s the dominant forest type. In the western part of the study area the forests belong to the Dense Evergreen Atlantic Biafran district with Caesalpiniaceae and *Sacoglottis gabonensis* at an altitude of 20-200 m asl. Mixed Evergreen Atlantic forests are restricted to the mountainous region at altitudes above 500 m asl in the south-eastern part of the study area (Letouzey in van Gemerden and Hazeu, 1997).

Table I.3 Vegetation types of the TCP study area

Denominations	**Observations**
I. *Anisophyllea* community group	Submontane primary and old secondary forest; altitude > 700 m asl; well drained soils
II. *Polyalthia* community group	Primary and secondary lowland forest; altitude < 700 m asl;
IIa. *Podococcus-Polyalthia* community	- altitude 500-700 m asl; well drained soils
IIb. *Strombosia-Polyalthia* community	- altitude 350-500 m asl; well drained soils
IIc. *Diospyros-Polyalthia* community	- altitude <350 m asl; moderately well drained soils
III. *Carapa-Mitragyna* community group	Swamp forest; most common on low altitudes; valley bottoms
IV. *Xylopia-Musanga* community	Young secondary forest; throughout the area, most common on low altitudes
V. *Macaranga-Chromolaena* community	Thicket on recently abandoned fields and plantations throughout the area, most common on low altitudes

Source: adapted from van Gemerden and Hazeu (1997)
Note : *Polyalthia suaveolens* = *Greenwayodendron suaveolens*

Van Gemerden and Hazeu (1997) give a more detailed description of the vegetation, based on an overall vegetation survey of the area. An overview of the vegetation types is presented in Table I.3.

The characteristics of the vegetation types are summarised here with a special emphasis on those aspects that are of major importance for the NTFP study.

The sub-montane forest at the level of >700 m asl consists of the *Maranthes-Anisophyllea* community (I. in Table I.3). In these forests, emergents are absent. The tree layer reaches a height of 15-20 m and occasionally 35 m. These forest are very dynamic with a high level of natural tree fall and it is rich in climbers (e.g. *Ancistrophyllum secundiflorum*) and epiphytic mosses. Some characteristic species of the tree layer are *Anisophyllea polyneura, Maranthes glabra, Scorodophloeus zenkeri, Monopethalanthus* spp. and *Santiria trimera*. In the understorey (3-7 m) small trees, such as for example *Garcinia lucida, G. mannii* and *Treculia obovoidea* dominate.

In the *Podococcus-Polyalthia* community (IIa), emergents with species as *Klainedoxa macrophylla* and *Monopethalanthus* spp. occur. This community is found at altitudes of 500-700 m asl. The tree layer forms a canopy at 25-40 m in which species such as *Pycnanthus angolensis, Santiria trimera, Dichostemma glaucescens, Plagiostyles africana* and *Uapaca* spp. dominate. For the understory (2-10 m) palms (*Raphia* sp. and *Podococcus barteri*) are characteristic, but tree species such as *Polyalthia suaveolens, Ptychopetalum petiolatum* and *Cola hirsuta* dominate.

The *Strombosia-Polyalthia* community (IIb) occurs in the central part of the study area, at altitudes from 350-500 m asl. The community is characterised by the species *Grewia coriacea* and *Sacoglottis gabonensis*. The physiognomy resembles the previous forest type. The tree layer is dominated by species such as *Plagiostyles africana, Coula edulis, Staudtia kamerunensis* and *Erythrophloeum ivorense*. In the understorey the same species dominate as in the previously described community.

In the north-west at the level below 350 m, the *Diospyros-Polyalthia* community (IIc) is found for which *Picralima nitida* is one of the characteristic species. The structure of this vegetation type also resembles the two previous described types. Characteristic emergents are *Klainedoxa gabonensis, Desbordesia glaucescens* and *Distemonanthus benthamianus*. In the canopy layer species as *Plagiostyles africana, Coelocaryon preussii, Staudtia kamerunensis, Pycnanthus angolensis, Eribroma* sp. and *Hylodendron* sp. dominate. In the understorey (3-8 m), species such as *Rinorea kamerunensis, Scaphopetaleum blackii, Tabernaemontana crassa* and *Anthonotha macrophylla* are dominant.

The swamp forests are described as the *Carapa-Mitragyna* community (III) in which for example *Mitragyna stipulosa, Carapa* sp. and *Trichilia heudelotii* were distinguished as characterising species. Emergents are absent and the tree layer is relatively open (35-40 m). Some other dominant species are *Coelocaryon preussii* and *Uapaca* spp. Also the understorey (2-7 m) is quite open with species such as *Anthonotha macrophylla* and *Raphia* sp.

Fallow lands of five to ten years old and patches in logged-over forest are occupied by the *Xylopia-Musanga* community (IV). The tree layer is open and reaches 15-25 m. In this layer species as *Musanga cecropioides, Pycnanthus angolensis, Coelocaryon preussii, Funtumia elastica, Xylopia* sp., *Tabernaemontana crassa, Ricinodendron heudelotii* and *Rauvolfia macrophylla* are dominant. The understorey merges often into the tree layer. It contains rattan species like *Ancistrophyllum secundiflorum*, as well as small trees and shrubs such as *Alchornea cordifolia, Zanthoxyllum gilletti* and *Anthonotha macrophylla.*

Strongly related to recent agricultural activities is the *Macaranga-Chromolaena* community (V). The very open tree layer is dominated by *Musanga cecropioides, Albizia zygia, Pycnanthus angolensis, Anthocleista vogelii* and *Elaeis guineensis*. Most characteristic is the understorey which consists of a closed cover of *Chromolaena odorata*. The woody species in this layer correspond with those in the previous type.

The data provided by the surveys on land form, soil and vegetation were associated and analysed, using cross-reference tables. This resulted in the landscape ecological map presented in Appendix I. This map is based on aerial photographs of 1983-1984. The actual area disturbed by logging and agriculture is therefore underestimated.

I.3.3 Population

The population density in the study area is low. Foahom and Jonkers (1992) give an estimation of 5 habitants per km, but based on the number of villages (49) and the size of the villages, this number is likely to be an underestimation and might be more than twice this value. The population consists of a majority of Bantu people and a minority of Bakola or Bagyeli (pygmies).

Bagyeli were among the first inhabitants in the area. They live scattered in small settlements, mainly in the forest at some distance from the Bantu villages and roads. Nowadays, they form a small minority of about 5% of the total population in the study area. According to Dounias (1993), about 3,400 Bagyeli are living in a total area of 12,500 km^2, in about 170 settlements.

Most Bagyeli have strong ties to Bantu families (mainly Ngumba and Fang), with whom they exchange products of hunting, fishing and gathering for agricultural products. In these relationships, the Bantu are acting as patrons. The exchange of products can be based on barter, but lately commodisation gained importance. In many locations, fixed prices prevail (Nkoumbele, personal communication). Trade is not any longer confined to Bantu villagers, as traders enter Bagyeli settlements to buy their products (Foahom and Jonkers, 1992).

Most settlements are rather stable. However, individuals do shift from settlement to settlement and many Bagyeli spend a part of the year in separated hunting camps. Since

the 1930s, Bagyeli are also involved in swidden agriculture. Some Bagyeli also started cocoa plantations. In addition, Bagyeli often work as temporary labourers on the fields and in the cocoa plantations of Bantu (Dounias, 1993; Biesbrouck, 1996). In spite of some exceptions, however, agriculture remains a low priority activity, especially when compared to hunting (Biesbrouck, 1996).

The attitude of Bantu people towards Bagyeli is quite ambiguous. At the same time they are feared as people living in the forest which is the domain of spirits and ghosts, they are despised and regarded as sub-humans and they are admired for their knowledge of the forest and the forest resources (Dounias, 1993; van den Berg, 1994).

The Bantu population in the study area, generally called 'villagers', consists of different ethnic groups. The majority is formed by the Bulu, who are the inhabitants of 36 out of the 49 villages in the area. The other main ethnic groups are the Ngumba and Fang, who form a majority in respectively six and five villages. One village in the area is a Bassa community. The Fang and Bulu are strongly related ethnic groups, belonging to the same linguistic group of the Beti-Fang (Dounias, 1993). The Ngumba, accompanied by pygmy people, were the first group of Bantu settlers in the region. The Fang and Bulu arrived a couple of centuries later (Dounias, 1993; van den Berg, 1994).

In the past, Bantu people lived in small family communities in the forest under the authority of family elders. During the colonial period, the Bantu were forced to move to the newly constructed roads in order to increase the control over these societies. These new villages regrouped often several patrilineages and they were placed under the authority of a village chief (Foahom and Jonkers, 1992). However, the elders of the extended families ('ndabot'), remain very powerful as authorities, for example in land attribution or conflict resolution. A new phenomenon in these days is the growing independence of the nuclear family[2] in both a social and economic sense (van den Berg, 1996).

Such a nuclear family disposes of a house and a separate kitchen ('kisen', adopted from the Pigeon language). The kitchens are the nucleus for women's life. Each married woman has her own fire place. The social life of men is concentrated in their own house or in the communal men's house of the 'ndabot' (van den Berg, 1996).

The different Bantu groups are all sedentary farmers, practising shifting cultivation and cocoa cultivation. In general, the tasks are clearly divided between men and women. The selection, clearing and burning of new fields, as well as assuring the protection of fields is executed by men. Sowing, transplanting cuttings and other planting materials, weeding and harvesting is done by women. The main cash crop is cocoa. The

[2] The nuclear family is defined as an economically independent man with his wife(s), children and other dependent family members (van den Berg, 1993).

plantations are created and controlled by men, although all family members help with the harvest. However, the production decreased in the early 1990s due to low world market prices. The devaluation of the CFA F in 1994 caused a slight increase of the production.

I.3.4 Land use

I.3.4.1 Food crop and cocoa cultivation

The major food crops cultivated in the study area are starchy foods as plantain, cocoyam, cassava, maize and yam; oil containing condiments like ground nuts and various varieties of cucumber; a number of vegetables such as egg plants, tomatoes and many different green vegetables and flavourers as onions, garlic and pepper. Table I.4 gives an impression of the production and the destination of the most important food crops.

Clearing forests for food crop cultivation is done selectively. Important fruit bearing or otherwise useful trees are preserved, usually about 1-5 trees in a field. After cutting the undergrowth, the larger trees are felled, using chain saws or local techniques. The residues are burned. All crops are cultivated in mixture. Cassava, yams and plantains are planted shortly after and even during the process of clearing, other crops somewhat later. Dounias (1993) estimated the annual area which is cleared per family in the Campo Ma'an region at 0.4 ha for Bagyeli people and 0.8-1.1 ha for the Bantu populations. According to the same author, the total surface in production for the cultivation of food crops is about twice as high. The fields are abandoned after a period of 2-5 years, but still many crops are harvested in these fallow lands and oil palms will appear spontaneously.

Table I.4 The major food crops cultivated in the TCP study area

Product	Average production in no. of 50 l bags (s) or bunches (b)	Share of the total harvest sold in %
Cassava	67.0 s	44
Maize	5.9 s	30
Plantains	80.0 b	37
Cucumbers	3.3 s	41
Yams	4.0 s	22
Okra	4.0 s	41
Sweet potato	1.6 s	21
New cocoyam	6.0 s	13
Cocoyam	7.0 s	32

Source: Poulin Therault (1996)

Three agricultural cycles can be distinguished. Most fields ('afup') are created at the beginning of the long dry season ('esep'). The cultivation period extends till the end of

the rainy season. The second period of creating fields starts at the beginning of the small dry season ('oyon'). A third type of fields ('assan') makes use of depressions in the landscape and the production cycle is restricted to the long dry season. Although the production on these fields is lower, they are of importance as source of income as the prices of agricultural produce rise in this period due to limited supply (farmer in Ebimimbang, personal communication).

Fields are created in the 'virgin' forest, in old fallow lands of 15-20 years old, on medium aged fallow lands (approximately 10 years old) and on very young fallow lands (< 6 years old). The latter are mainly used for intensive groundnut cultivation.

The attribution of land is controlled at the level of the extended families ('ndabot'). The boundaries of the land of the different 'ndabots' are well defined, although frequently subject of conflicts. These lands do not always border to the ward of the family. Sometimes the property claims reflect the former settlement patterns of the pre-colonial period (van den Berg, 1996).

Nowadays, people tend to create their fields further from the villages than before and thus to clear patches of primary forests more frequently. Some farmers stated that the introduction of animal husbandry drive them to the forest to avoid damage to the crops. According to van den Berg (1996), this tendency is related to feelings of insecurity of land rights as a result of the modern notion of the state's ownership claim on land.

A kind of home garden or back yard garden exist in the villages. This 'falak' is bordering directly to the wards. Several introduced and wild fruit bearing trees are planted and many of them regenerate spontaneously. Examples are the mango tree, avocado pear, kasa manga and various citrus trees, as well as a number of medicinal plants as *Ocimum* spp. and *Rauvolfia vomitoria* ('nivaquine tree').

The cultivation of cocoa was introduced by the German colonial authorities and has been intensively stimulated. In 1958, the average number of cocoa trees planted by Bulu, was estimated at 1,500 per household (Alexandre and Binet in Dounias, 1993). In 1979, the average number of trees per household was estimated at 2,800 trees, covering an area of 2.2 ha (Waguela in Dounias, 1993). Since 1988, the prices of cocoa dropped seriously. Consequently, many farmers abandoned their plantations. In spite of the slight increase of the production since the devaluation of the CFA F, it was observed that more than 50% of the cocoa plantations remained abandoned. It is likely that also the production in well-maintained plantations has dropped. Farmers do no longer get free inputs (mainly pesticides) from the government and most of them refuse to invest in the cocoa cultivation. Recently, also small village plantations and some large(r) plantations of oil palms have appeared in the area. The latter are created by Bantu living and working in the cities, the so called 'elite'.

I.3.4.2 Hunting, fishing and gathering

Hunting, fishing and gathering is commonly practised by both Bantu and Bagyeli people. Excluding fuel (available in abundance and hardly commercialised) and fodder (hardly used), the products extracted from the forest can be classified as follows: (i) vegetal and animal food resources, (ii) medicinal plants, (iii) construction materials, (iv) products used for local equipment, (v) industrial products.

The consumption of bushmeat is extremely important to people, as it is the major source of protein. Most households keep domestic animals such as small ruminants, pigs and chickens. These are not meant for daily consumption, but only consumed at special occasions or kept as a complementary source of income. The review presented below is based on a literature review.

Food resources

Forest food includes bushmeat (mammals, reptiles, birds and snails), honey, mushrooms and the fruits, leaves, seeds, roots and tubers of numerous plants. The latter are used as spices, soup thickeners, staple food, vegetables or snacks, or for food wrapping and for the production of cooking oil and palm wine.

Bushmeat is very popular. The consumption is estimated at 200 g/day/capita for Bagyeli people in the Campo region (Froment, Koppert and Loung, 1993). In a Mvae village study in the same region, 17,000 kg of bushmeat was hunted in a small village of 60 people over a year's period which corresponds with almost 800 g/day/capita (Dounias in Thomas and Thomas, 1993).

Trade in bushmeat is a very important, especially for Bagyeli people. It is one of their main sources of cash income, although the law does not allow commercialisation. De Garine (1993) states that the income of selling bushmeat is comparable to that of cocoa planters.

In the region, many forest plants are used as food. Important quantities of the almonds of *Irvingia gabonensis* as well as the seeds of *Ricinodendron heudelotii* and *Coula edulis* are added to sauces. The seeds of the Moabi tree (*Baillonella toxisperma*) are used to produce cooking oil and a variety of species are used for flavouring (e.g. *Monodora* spp., *Aframomum* spp., *Afrostyrax kamerunensis*, *Scorodophloeus zenkeri*, *Tetrapleura tetraptera*). Various types of bark (e.g. *Sacoglottis gabonensis, Afrostyrax kamerunensis*) are used in the palm wine production for flavouring and the enhancement of fermentation. Stimulating seeds as *Cola* spp. and *Garcinia* spp. are consumed almost daily, like other seeds and fruits which are eaten as snacks. Many of these plant products are commonly available on the local markets. A lively trade and barter is concentrated around the consumption of palm wine, extracted from oil palms (*Elaeis guineensis*) but also from *Raphia* spp. In contrast with other Pygmy groups, the Bagyeli people do not

use of the tubers of wild yam species any longer. Their staple foods come from cultivated products (Koppert and de Garine, 1993).

Medicinal plants
Bagyeli people are reputed for their knowledge of medicinal plants, but many plants are used and extracted commonly by all ethnic groups, especially by women. Descriptive studies identify up to 200 different plant species (Coustix, 1961 in Falconer, 1990). Mostly the bark or the bark of roots is used, but also resins, leaves, fruits and seeds. Little is known to which extent they are used and traded or what the ecological impact of especially bark extraction is. Different types of medicinal plant products can be found on the markets (e.g. *Aframomum* spp., *Pterocarpus soyauxii, Garcinia* spp., *Guibourtia tessmannii*).

Construction materials
Houses are made of poles, palm leave petioles or bamboo stems and twines (e.g. *Raphia* spp.), or planks (*Pycnanthus angolensis*). Faure and Vivien (1980) assert that approximately 300 poles are used for the construction of one house, which corresponds to a consumption of 4,200 m of wood for 9 villages. The value of the forest materials of a poto-poto house, constructed of 35 poles and 600 palm petioles was estimated at 50,000 CFA F (Tanga, 1977 in Falconer, 1991).

For the manufacture of canoes different types of wood are used. *Pterocarpus soyauxii* is often used, but also the soft wood from *Musanga cecropioides* which is transformed into portable canoes.

Household and agricultural equipment
This category includes a wide range of products such as furniture, mattes, cooking utensils, pestles and mortars, baskets, brooms and tools for farming, hunting and fishing. An even wider range of species is used to make them. Only descriptive data are available on these NTFPs (e.g. Dounias, 1993). Probably a lot of them are still home produced.

Industrial inputs
Some plant species which occur in the region are or were exploited commercially in Cameroon (*Pausinystalia johimbe, Strophanthus* spp., *Voacanga africana, Rauvolfia* spp., *Funtumia elastica, Cola acuminata, Enantia chlorantha, Alstonia boonei*) by pharmaceutical industries (Falconer, 1990), but their importance is declining with the increasing availability of chemical substitutes.

The only product in the study area that is actually extracted for the pharmaceutical industry is *Strophanthus gratus.* The resources of Johimbe (*Pausinystalia johimbe*), seems to be depleted (Mbamba, personal communication).

Others
Many products cannot be classified in the categories mentioned above, such as toys, instruments, art products and insect repellents. Animal and plant species serving as protection against witchcraft (e.g. *Guibourtia tessmannii*) should also be mentioned. They can be placed in the house or transformed into ritual meals, drinks or ointments.

I.3.4.3 Commercial timber exploitation

The study area includes the actual and a former concession of a logging company, named Wijma-Douala SARL (GWZ). Most logging operations are carried out by subcontractors.

GWZ is especially interested in harvesting Azobé (*Lophira alata*), a timber particularly suitable for water-resistant constructions. About 60% of the harvested timber consists of Azobé. The Cameroonean regulations prescribe a minimum diameter at breast height (DBH) of 50-100 cm depending on the species. GWZ, however, only harvests trees of 80 cm DBH or more.

The logging is carried out selectively with machinery such as skidders, dozers and chain saws. The harvesting levels are on average 0.7 tree/ha, which corresponds with a volume of 10 m^3/ha. This harvesting level contrasts sharply with those in South America and Asia (respectively 15 m^3/ha and 75 m^3/ha (Jonkers, personal communication). Preliminary results of the TCP logging study show that on average 15% of the total area is affected by logging. The spatial distribution of affected areas is very uneven, however.

As elsewhere in Cameroon, the concessionaire pays several fees to the Government and has to fulfil a number of contractual obligations, recorded in a 'cahier de charge'. These 'cahiers de charge' specify the extraction rules, the required infrastructural developments (e.g. roads and bridges) and the compensations to be paid to the local communities involved (Ambrose, 1994).

Before GWZ, other logging companies have exploited the area. Most forests are logged-over at least twice (Foaham and Jonkers, 1992).

II. NTFPs IN RURAL HOUSEHOLDS

II.1 INTRODUCTION

This part of the book discusses the use of NTFPs in the Bipindi-Akom II region. The numerous NTFP species are inventoried and their major types of use are described.

To get insight into the uses and their relative importance, a number of surveys were carried out. The methodologies are discussed in Chapter II.2. In Chapter II.3, socio-cultural factors with regard to NTFP exploitation are discussed.

The results of the various surveys with regard to the uses of the NTFPs are presented in the Chapters II.4 to II.7. The different types of uses are described with respect to the use of plant food resources (Chapter II.4); animal food resources and the materials used for their acquisition (Chapter II.5), medicinal NTFP resources (Chapter II.6), materials used for construction and the manufacturing of equipment (Chapter II.7).

The perception of local people with regard to the importance, availability and the strategies for conservation of NTFP resources are presented in Chapter II.8.

In Chapter II.9 the perception of people towards the influence of logging operations on the availability of NTFP resources is outlined.

The commercialisation of NTFPs is discussed in Chapter II.10. The actual commercialisation within the study area is dealt with, as well as the marketing of NTFPs as far as it concerns regional markets for NTFPs. The sections concerning the marketing of NTFPs were written by M. Kempkes, who also conducted the survey.

A synthesis of the results and some preliminary conclusions are presented in Chapter II.11.

II.2 RESEARCH METHODOLOGY

II.2.1 General

Three separate surveys were carried out. The utilisation of NTFP species was determined in a general reconnaissance survey. Moreover, specific surveys were executed on the marketing of NTFPs in the region and on hunting. The latter were carried out by students.

Inventory of the names and uses of NTFP species
The objective of the inventory was to determine the names and uses of the NTFP species which are commonly used in the area, as well as to get insight into the relative importance of the different species.

Data were selected on basis of a two-level stratified sample. At the first level, a differentiation was made in ethnic groups.

Within the research area the Bulu are the major Bantu group. Thirty-six out of the 49 Bantu villages consist of Bulu communities. Other Bantu groups in the area are the Fang, Ngumba and Bassa, living in respectively five, six and one village(s) in the north of the study area. Bagyeli people live dispersed in small settlements.

Five communities were selected for the survey: two Bulu villages (Ebom and Mekalat), a Fang village (Ebimimbang) and two Bagyeli settlements (Nja-myong and Mefane). In total 29 interviews were conducted of which 18 in Bulu villages, nine in the Fang village and two in the Bagyeli settlements.

As the extraction of NTFPs is often ethnic, gender, and age class related, an attempt has been made to include the possible variation in the uses by a stratified selection of the respondents.

The interviews took place in turn with women and men. Although in general only one respondent was asked to participate in the interview, in reality many members of households assisted, especially in the Bagyeli settlements. Often, elderly people were asked by the respondents to join the interview because of their broader knowledge. Children were regularly asked to complete the answers of their parents as they, too, have their specific knowledge.

Also an attempt was made to include people from as many different clans as possible in each village, as well as people with a certain specialism regarding the use of NTFPs such as carpentry, ba/sketry and traditional medicine.

In data collection, standardised as well as a number of open-ended questions were used.

The informants were asked to list the names of the species in their own language, according to a fixed list of use categories (see Appendix II). The information given by the respondents was clarified and completed by observations in and near their houses.

The questionnaire also included a number of items to get insight in the relative importance of NTFP species. Questions were asked on:

- peoples' perception on the importance of the species;
- the commercialisation of NTFPs;
- the decrease or increase in the availability of NTFP resources;
- conservation practices for NTFP species;
- species needing special attention to control damage by logging practices.

The identification of the scientific names of plant species was initially based on literature study and later checked by botanists. At first with the help of available literature (e.g. Coustix, 1961; Vivien and Fauré, 1985; Bonnéhin, 1991; Samgba Ahanda, 1991; Vivien, 1991) a list was compiled of potential NTFP species, known to be used in central and west Africa, including their uses and their vernacular names in relevant languages.

During the fieldwork for the ecological inventory (see Chapter II.11), for a number of transects the species were identified simultaneously by a botanist and local tree spotters to enable a comparison of the scientific and vernacular names. The final identification of the scientific names was mainly based on the determination of species by other Tropenbos researchers.

Also, samples were collected of species which could not be identified with certainty or which did not appear in the results of other researchers. Their identification was confined to the TCP botanists or the National Herbarium in Yaoundé.

Although much attention was paid to compare and analyse the different sources of information, the identification, especially for pluri-specific genera, is not always fully reliable. The documents on NTFP studies in south Cameroon which were consulted, gave in several cases different names for the same 'local taxons'. There for, these results must be considered with some caution.

As far as animals are concerned, the identification was almost totally based on existing documentation. When ever possible, the identification was checked with the help of pictures or drawings, which were shown to the informants. This procedure did not cause problems in case of the mammals, as their number is restricted and they are nearly all well documented. However, for other animal species there is far less, or no information available. Some of the snails were identified by a snail expert (de Winter).

II.2.2 Market survey

A reconnaissance market survey was carried out to investigate to what extent NTFPs available in the study area have a commercial potential.

The objective of this survey was to get insight in the organisation and conduct of the markets for the most important plant NTFPs, with a special emphasis on the potential role of the study area as a source area for commercial NTFPs.

Due to time and logistical restrictions, it was decided to focus on traders active on markets which serve as major trade centres for the population of the study area, which are the regional markets of Ebolowa and Kribi. Wholesalers in Douala were interviewed to get insight in their role as assemblers and suppliers of retailers in the area.

A number of 49 people was interviewed on the different markets, nine of whom were wholesale traders and 40 were retailers. The information was gathered with the help of structured interviews. A number of parameters has been taken into account (Table II.1).

Table II.1 Parameters and type of information gathered for the market survey

Parameter	Information gathered on:
Marketing channels	- Location of assembly (retailers/wholesalers)
	- Factors influencing location of assembly
Efficiency	- Number of enterprises
	- Characteristics of enterprises (owners, size, diversity and quantities of products etc.)
	- Quality and stocking of NTFPs
	- Competition
	- Adoption of new practices
Products	- Consumers
	- Possible substitutes
	- Conservation
Yield	- Quantities bought and sold
	- Buying and selling prices
Price variation	- Seasonality of availability and price fluctuations
Transport	- Organisation of transport
	- Constraints of transport

Source: Kempkes (1995)

The fieldwork was conducted in the period April - July 1995. In this period, only few species that produce the commonly marketed NTFPs are productive, and the supply of NTFPs is limited as hardly any fresh products are available.

II.2.3 Survey on hunting

A small survey on hunting was conducted in the rainy season of 1994. The aim was to obtain insight into the species and quantities hunted. The relation between hunting technique (rifle, trapping) and the amount and composition of the catch was also investigated.

The survey was carried out among 28 hunters in the villages Ebom and Ebimimbang. With the help of diaries, data were collected on the type of species, the technique used and the destination of the bushmeat (e.g. consumption, selling).

A regular control took place several times a week among the respondents. In the village of Ebimimbang, 16 hunters were surveyed during six weeks. In Ebom, 12 hunters participated during eight weeks. All respondents practised trapping, five also used a rifle.

Other data such as the number of traps, the financial and labour investments and the identification of animals were collected with the help of interviews.

II.3 SOCIO-CULTURAL FACTORS IN NTFP COLLECTION

A detailed overview of the results of the inventory is presented in Appendices III to V. Appendix III on plant species consists of a database in which all the uses, the scientific and the different vernacular names, the kind of species (e.g. tree, liana, herb etc.) and the part of the species which is used are mentioned. Furthermore, the number of interviews as well as the concerning ethnic groups which indicated a certain use has been indicated (N=29). This provides some indication on the significance of a certain use of the species.

Before presenting these results in more detail, two important aspects influencing NTFP collection will be discussed first, i.e. different types of NTFP collection and role of social differentiation.

II.3.1 Vernacular names

The vernacular names of species were recorded in the languages of the three ethnic groups. The Fang and the Bulu languages are narrowly related. They both belong to the Beti-Fang language group (based on Guthrie in Dounias, 1993). The Bagyeli or Kola language belongs to another group: the Kwasio, to which the Ngumba language also belongs. For a preliminary identification of Fang and Bulu names, existing literature (e.g. Samgba Ahanda, 1991; Dounias, 1993) was of great help.

It appeared, however, that many vernacular names of plant species given by the Bagyeli informants did not correspond with names in existing literature, nor names given by others informants. It is likely that many Bagyeli people adopt partially the vernacular names of the related Bantu group. The names given in the ethnobotanical lexicon (Appendix IV), should be treated with care.

In this document mainly Bulu names are used. The vernacular names often give information on specific characteristics of the species or their habitat preference (Table II.2).

Table II.2 Meaning of frequently used Bantu words in species names

Description	Meaning	Example
Ndik	Rope or liana	Abominjang ndik (*Piper guineense*), 'pepper liana'.
Elok	Herb	Elok soupe (*Talinum fruticosum*), 'herb used in the soup'.
Ele	Tree	Ndondo ele (*Drypetes* sp.), 'pepper tree'.
Afan	Virgin forest or 'wild'	Abu afan (*Cola verticilatta*), 'wild kola nut'.
Ntangan	White man or introduced	Ando'o ntangan (*Mangifera indica*), 'white men's mango'.
Ngoé	Pig or Bagyeli	Menyom ngoe (*Glossocalyx brevipes*), 'bad smell of the Pygmies'.
Bikabala	of the Bassa	Folong bikabala (*Amaranthus spinosus*); 'Amaranth of the Bassa.'
Efoumele	White	Efoumele zo'o (a.o. *Pausinystalia macroceras*); 'White wooded Zo'o'
Evele	Red	Evele ekop (*Monopethalanthus* sp.), 'Ekop with red wood'.
Evindi	Black	Evindi nyo (*Naja nigricollis*), 'Black snake'.
Ekotok	Fallow	Elon bikotok (*Erythroxylum mannii*), the 'Elon of the fallow lands'.
Oswe	Swamp	Engang oswe (*Carapa* sp.); the 'Engang of the swamp'.

Source: fieldwork 1994-1996, NTFP reconnaissance and ecological survey

Many names of plant species appear in the names of the villages and pygmy settlements in the area. It often refers to a characteristic tree or group of trees which were found on the location at the moment of settlement. Examples are Adjap (*Baillonella toxisperma*; Moabi), Akom (*Terminalia superba*), Ebom (*Annona muricata* and *Anonidium* spp.), Minkan (*Sclerosperma mannii*), and Mefane (*Hexalobus crispiflorus*).

The local nomenclature not always distinguishes separate species. Some species are grouped together, even when they hardly resemble. This feature is often related to utilisation. When the use and the performance of the species correspond, no distinction is made, although people are aware that it concerns often 'different qualities'. An example is 'Evindi afan', which groups at least 8 species showing hardly any common botanical characteristics. Other examples are 'Mbazo'o' (*Strombosia* spp.) and 'Assam' (*Uapaca* spp.). In the case of some Rubiaceae which are grouped under the synonyms 'Atjek afan' and 'Tchangya' (a.o. *Corynanthe pachyceras* and *Pausinystalia johimbe*) it is quite remarkable that although it concerns different genera, the species contain the same medicinal active principles, for example yohimbine (Abbiw, 1990).

The opposite also occurs. Different names may be used for adult and young specimen. An example is the liana *Phyllanthus muellerianus*. The adult c.q. woody liana is used for the production of palm wine, and is called 'Awum'. Young specimen, called 'Njal kabat', are applied in medicinal treatments, especially for women.

Dacryodes edulis is known by many different names. The cultivated trees are distinguished as 'Assa'. Wild species are named 'Assa mingun': "the Assa which is eaten by the birds". Bagyeli people also separate the adult and young trees as respectively 'Mbamesa' and 'Mbanya'.

II.3.2 Cultivated species versus wild species

The distinction between wild species on one hand and cultivated or planted species on the other hand is not always evident. Species, which are mostly exploited in natural forest, may be protected when a shifting field or cocoa plantation is established, or even planted. An example is *Baillonella toxisperma* (Adjap; Moabi) which is a highly appreciated multiple purpose tree. Other examples are the small trees *Garcinia kola* (Onyai; bita kola) and *Garcinia lucida* (Esok), the liana *Strophanthus gratus* (Enay) and the herb *Ocimum canum* (Mecep).

Somewhat more domesticated are for example *Cola acuminata* (Abu) and *Cola nitida* (Abu-goro). These kola nut trees occur in the forest, where they are also exploited. However, the majority of people have planted some trees in their cocoa plantations.

Of *Dacryodes edulis* (Assa; African prune), of which the cooked fruits are commonly eaten as a kind of vegetable, only the planted trees are used. In the forest, the species is rather common but these wild populations produce very small fruits.

Other species are considered fully domesticated although they also regenerate spontaneously. The oil palm, *Elaeis guineensis*, is a representative of this category but also vegetables as *Basella alba* ('Épinard') and *Solanum aethiopicum* (Zom(pl)/Nzong(fr)).

A number of introduced species are now commonly accepted and used by the local population. Examples are fruit trees such as the papaya *Carica papaya* (Fofo), the avocado pear *Persea americana* (Fio) and the mango tree *Mangifera indica* (Ando'o ntangan), the medicinal plants *Cassia alata* (Ndowolo ntangan) and *Digitalis purpurea* (Abindja). These species also regenerate spontaneously. Many of them are intensively used and not only for the purpose for which they were introduced. Even species which have been introduced only recently such as *Chromalaena odorata* (Kodengui or Ngum ngum) are adopted in the current medicinal uses. This underlines the fact that the use of NTFPs is not at all 'traditional' nor static.

In the peoples' perception the difference between wild and cultivated is not always clear. All the informants considered the species *Aframomum melegueta* (Ndong) as a NTFP. However, it appeared later that the species is only cultivated in cocoa plantations and nobody could indicate wild populations. Another example is that during the inventory of medicinal NTFPs, cultivated species were often mentioned. However, starchy crops like *Xanthosoma sagittifolium* (Ekaba) or *Manihot esculenta*

(Mbon) were not mentioned, but they appeared regularly as medicinal treatments. It is likely that people make a distinction between crop harvesting as the result of agriculture on the one hand, and collection of some parts of plants as NTFP extraction on the other hand.

II.3.3 Gender, age class and ethnic aspects of NTFP exploitation

Although it was beyond the scope of the inventory to distinguish the gender, age class and ethnic aspects of NTFP exploitation, some general trends could be identified.

NTFP exploitation is closely related to the tasks and activities executed by the different household members. Women collect many vegetal food products women as they are responsible for preparing the meals. For example the collection of vegetables is uniquely confined to women. A number of mainly herbaceous plant species are cultivated, protected or tended in the direct surroundings of the houses in a kind of herb garden. Examples are *Ocimum* spp., which are planted for both food and medicinal purposes.

The situation changes when products gain a commercial interest such as bush mango, *Irvingia gabonensis*. Both women and men nowadays collect the fruits and often the revenues end up in the hands of men.

Women are also to a great extent responsible for the cultivation of food crops. On their daily trips to the fields they collect NTFPs for different purposes. They collect many NTFPs growing in the fields and fallow lands, but women rarely enter deep into forest which is regarded as being too dangerous. Men, however, make journeys into the 'virgin forest', especially for hunting. On these trips they also collect NTFPs such as the bark of the undisturbed forest species *Garcinia lucida* (Esok) which is added to palm wine. In general, the knowledge of useful herbaceous plant species is better developed among women than among men, but men are more aware of the uses of primary forest species.

Not only the exploitation of NTFPs is gender related. Also the consumption can be specifically related to gender or age classes. The consumption of bushmeat is governed by several taboos. For young people in the Fang community of Ebimimbang, eating certain species as the tortoise, gaboon viper, African civet and the nile monitor lizard is prohibited, as they are believed to be an obstacle for a happy future (Dkamela, 1996). The same author states that some animals cannot be eaten by women as they are said to influence fecundity or childbirth. For example the bates' dwarf antelope is believed to transmit epilepsy, as these animals easily drop down after a long period of running. In the Bulu village Ebom the consumption of the gaboon viper, is reserved to (older) men.

Children are often collectors of 'snacks' such as fruits, nuts and insects. Many adults consider the harvest of the nuts of *Coula edulis* (Komen) as too time consuming. In addition, the shells are very hard and the distance to producing trees is often large. To enter the forest 'just to eat something' is not done by adult people.

With regard to the variation in knowledge and uses of the three ethnic groups included in the survey, only slight differences were observed. The limited number of interviews in general and especially amongst Bagyeli people, hardly permits a comparison. However, based on the interviews, observations in the field and some personal communications, it can be stated that the knowledge of trees and their uses is more detailed within the Bagyeli communities. An example is the distinction of a number of different species within a *Cola* spp. group named 'Mvoi' by the Bulu (see Appendix IV). Within the food category 'edible fruits and nuts', Bagyeli people mentioned an additional number of species of which Bantus appear to be unaware.

Bantu people perceive the Bagyeli as 'people of the forest'. Although their life stile is often classified as inferior, they are admired for their knowledge of hunting and medicinal plants, especially medicinal trees. It is a common practice for Bantu people to consult a Bagyeli in case of severe illness.

According to the Bagyeli informants they never collect vegetables. Eating vegetables is seen as a Bantu habit.

Between the Fang and Bulu only slight differences were observed. As for edible NTFPs, hardly any differences were found. The only exception is the use of *Raphia vinifera* (Ako) for the production of palm wine mentioned by the Fang. However, the information gathered is based on the awareness of certain uses and not the current use. According to several people this *Raphia* sp. is only commonly used by the Bassa, the neighbours of the Fang informants.

With respect to medicinal uses slight differences occur. For example *Picralima nitida* (Ebam), *Rhigiocarya racemifera* (Okometele) and *Enantia chlorantha* (Mfo) were often mentioned by the Bulu informants as effective for malaria and as febrifugal in general. None of the Fang informants mentioned these species. On the other hand, the species *Barteria fistulosa* (Mekbenga) appears to be well known by the Fang as a medicine to treat anaemia, but it was not mentioned by one of the Bulu informants.

II.4 FOREST FOOD PLANTS

II.4.1 Introduction

A wide variety of wild food products and ingredients for beverages are gathered from the plant species in forests, fields and bush fallow lands. They can be divided

in condiments and spices, oil producing seeds, vegetables, food wrapping leaves, edible fruits and nuts, starchy foods, and the ingredients of beverages. Table II.3 summarises the number of different species within each food category recorded during the reconnaissance survey. Detailed information is given in Appendix II.

Table II.3 The number of species producing vegetal food products recorded per use category

Use category	Number of species
Condiments and spices	32
Oil producers	6
Vegetables	33[1]
Food wrapping leaves	14
Fruits	33[1]
Nuts	16
Tubers	9
Beverages	31
Mushrooms	29[2]

Notes: [1] Among the category of vegetables are many cultivated or sub-spontaneous species.
[2] The number is based on the number of different names recorded among the Bulu respondents. For the time being, the scientific names nor the correspondence between the vernacular names in the various languages are not identified yet.
Source: fieldwork 1994, NTFP reconnaissance survey.

In Figures II.1 to II.7 the relative importance of the different species mentioned within the various use categories is specified. The calculated frequencies are based on the number of respondents who mentioned the specific species as a percentage of the total number of respondents (29). The results are an indicator for the frequency of use, although the figures are based on the awareness of a certain utilisation that does not guarantee the actual use.

II.4.2 Condiments and spices

Condiments are added in sauces and soups that accompany starches as cocoyam, cassava or plantains. The category contains oil- and protein-rich seeds and fruits which are often applied as soup thickeners, as well as leaves, barks and seeds that are uniquely applied as flavourers. Figure II.1 presents the most frequently mentioned species as recorded among the 29 respondents.

Oil-containing fruits and seeds are very popular. They are used directly or transformed in edible oils. Groundnut can be regarded as the cultivated equivalent. However, these NTFPs can hardly be considered as substitutes for groundnut as their tastes are different and very specific.

Among the species used, the fruits of the oil palm *Elaeis guineensis* (Alen) are the most frequently consumed. The tree is widely cultivated, but regenerates also

spontaneously in fallow lands. Other important species which produce oil containing and protein rich seeds are the bush mango or *Irvingia gabonensis* (Ando'o), *Ricinodendron heudelotii* (Ezezang/Njansang), *Baillonella toxisperma* (Adjap/Moabi), *Coula edulis* (Ewomen/Komen), *Panda oleosa* (Afane) and *Poga oleosa* (Angale).

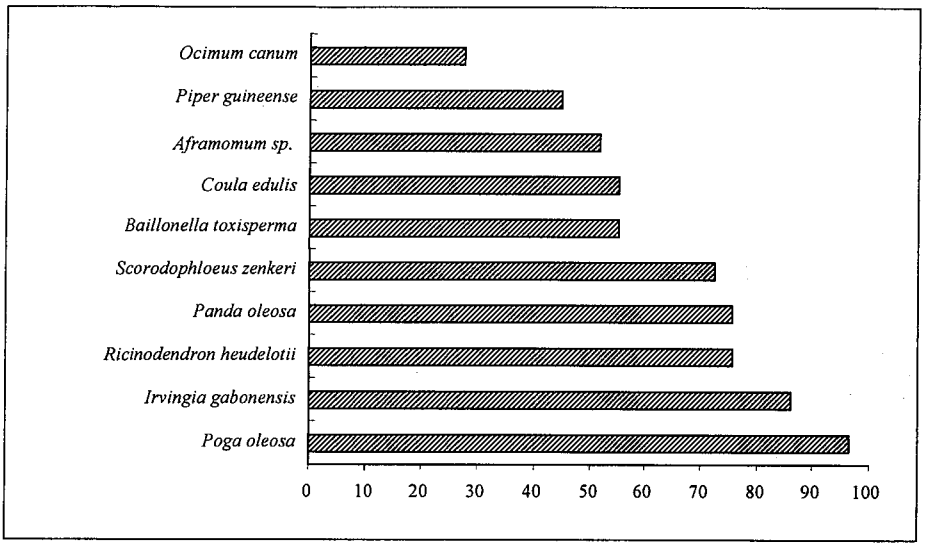

Figure II.1 Popularity of species used as condiments and spices (in % of total number of respondents)

The almonds of *Irvingia gabonensis* are widely used in the study area and known in large parts of western and central Africa. They are rich in oil (54-67%) (Irvine, 1961). It is one of the most frequently commercialised NTFPs and often sold to wholesale buyers coming from the cities and even from abroad. The collection is seasonal and the fruits are very perishable.

The use and commercialisation of *Ricinodendron heudelotii* seeds as a condiment have been introduced only recently. Until about twenty years ago, only the medicinal properties of the species were known. Although it is now a well known condiment, it remains unclear to which extent the seeds are actually used. The kernels have a peppery taste and thickening properties. The processing of the fruits into consumable kernels is a time consuming and tedious practice.

Although the nuts of the African walnut, *Coula edulis* are better known and more frequently used as a snack, they also can be added to sauces and soups.

The seeds of *Baillonella toxisperma* are highly valued. The cooking oil produced from the seeds is very popular and has a high market value. In 1992, before the

devaluation, the selling price at village level was estimated at 740 CFA F/litre (Schneemann, 1992). However, the species is very rare (see Chapter III.1), which restricts the availability and thus the use considerably.

A commonly used species for the extraction of oil is *Poga oleosa* (Angale), which is somewhat less rare than the Moabi tree. Highly appreciated is also *Panda oleosa.* The processing of the fruits is mainly confined to Bagyeli people, as the shells are very hard and difficult to crack. The nuts are bartered or sold to Bantu villagers.

Some condiment producing trees occurring in the area are not used in the TCP. For example the use of black kernels of the quite common tree *Canarium schweinfurthii* (Otu) is not known, although they are highly appreciated by neighbouring ethnic groups as the Eton and Ewondo.

Flavourers are added in small quantities to sauces and soups. Two types of 'garlic trees' can be distinguished in the region: *Afrostyrax kamerunensis* and *Scorodophloeus zenkeri* (Olon). Of the two species both the seeds and the bark can be used. In the study area, the use of 'garlic trees' is restricted to the bark of *Scorodophloeus zenkeri*, although the other products are also available in the markets of Kribi and Ebolowa.

Various species of the genus *Aframomum* are commonly used as peppery flavourers. Although many people consider *Aframomum melegueta* (Ndong, Guinee pepper) as a wild product, it was only found as a cultivated crop in cocoa plantations. It is indigenous in West Africa, where the species is occasionally found in forest reserves but also in Ghana the plant is better known as a crop (Abbiw, 1990). In the study area it is very frequently used in medicine mixtures, but it is also applied as a spice. Between 1865 and 1920 the product was exported as a spice to Europe (Abbiw, 1990).

Highly appreciated are the fruits of *Aframomum* sp. (Mvolong, Mbongolo). They are used to make 'black sauce'. Although the species can be found in disturbed forest areas as bush fallow lands or along roads, it is not very common. *Aframomum citratum* can be found in the same environment but is far more common but less appreciated.

Two 'wild Basil' species, *Ocimum gratissimum* (Osim) and *O. canum* (Mecep), are commonly added to meals. They are often grown in the direct surroundings of houses.

The climber *Piper guineense* (Abominjang ndik) produces peppery fruits which are added to soups and sauces. Many people have planted the species in their cocoa plantations.

Some spices are commonly available in markets elsewhere in Cameroon, but are not or hardly used in the study area, in spite of their occurrence. The fermented fruits of *Tetrapleura tetraptera* (Kpwa'sa; 'quatre coté') are rarely used. False nutmeg, *Monodora* spp. (Fio) probably is not used as a spice. According to the older men, the nuts can be grinded and added to chewing tobacco. The use of the fruits of different *Xylopia* spp., which also are fermented, appears not to be common.

II.4.3 Vegetables and food wrapping leaves

Vegetables, of which the leaves, fruits or both are eaten, are used mainly by Bantu people. According to the Bagyeli, it is not their habit to eat leaves. For an overview of major species used as vegetable and their popularity, see Figure II.2.

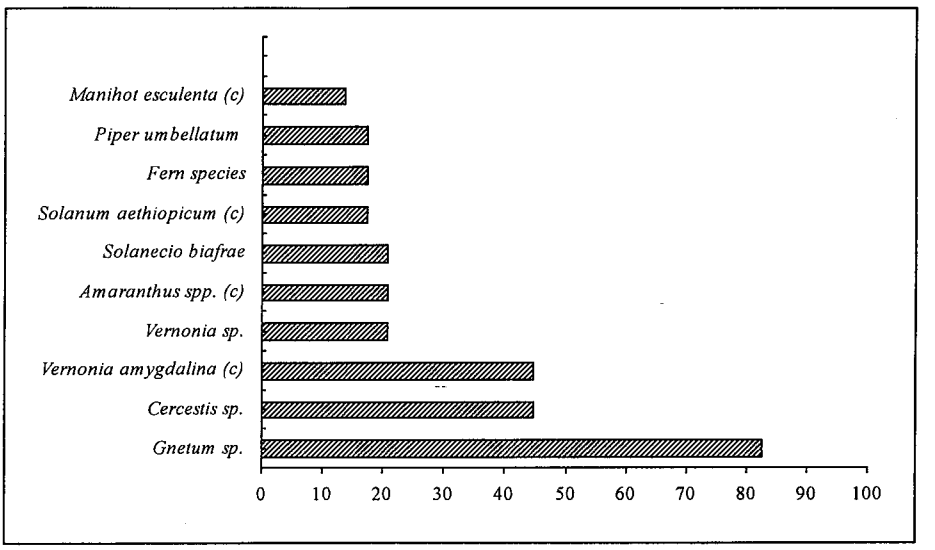

Figure II.2 The popularity of species used as green vegetables (in % of total number of respondents). (c) refers to cultivated

The most popular green vegetables come from cultivated starchy food plants. The most appreciated are the leaves of cassava (*Manihot esculenta*), which is known as Kpwem. Many other cultivated green vegetables belong to the Amaranthaceae, commonly named Folong. Bitterleaf, *Vernonia amygdalina* (Ayolo, Bita ka, Ndole), is also commonly cultivated. One *Vernonia* species, referred to as Bita ka mesak, is said to occur spontaneously in swampy areas.

Only a few vegetables are not from cultivated plants: *Cercestis* sp. and *Nephtytis poissonii* (Nlom ndes), *Solanecio* biafrae (Nlot melen), *Talinum fruticosum* (Elok soupe), a fern species (Zeng; Mbakou) and *Gnetum* spp. (Ocok). The latter has a high economic value. Important quantities are commercialised in and around the big

cities and exported to Nigeria (Henkemans, 1995; Malleson, 1994). The main exploitation regions appear to be the Southwest Province and the surroundings of Yaoundé. The market of Obala is an important trade centre.

Some vegetables grow sub-spontaneously in the fields and young fallow lands. They are sown when the species does not occur spontaneously in new fields (Dounias, 1993). Examples are the bitter tomato *Solanum aethiopicum* (Zom) and *Basella alba* (Épinard).

The tree species *Dacryodes edulis* (Assa) produces very appreciated fruits which are eaten as a vegetable after cooking. The tree is fully domesticated and often planted in cocoa plantations and home gardens.

The leaves of various Marantaceae species are used as wrapping materials, especially for cassava sticks ('batton de manioc'). In the Bulu language, they are referred to as 'mekai' which means leaves. Cassava sticks, one of the most popular types of starchy foods, are prepared in these leaves. In the study area, the leaves are collected from wild stands. Mostly used are *Sarcophrynium prionogonium* (Angwafan), *Megaphrynium macrostachyum* (Okakon) and *Halopegia azurea* (Nken). In the coastal areas the latter is cultivated.

II.4.4 Fruits and nuts as snack foods

As many as 39 species which produce edible fruits and/or nuts have been distinguished. The most important are the bush mango *Irvingia gabonensis* (Ando'o), two *Trichoscypha* spp.: *T. acuminata* (Mvut) and *T. arborea* (Engong), *Antrocaryon klaineanum* (Ozakong), *Dacryodes macrophylla* (Tom), *Pseudospondias* spp. (Ofo), *Myrianthus arboreus* (Angokom) and *Hexalobus crispiflorus* (Owe) are the most important. These trees are carefully protected in the fields and cocoa plantations. Also several *Cola* spp. are highly appreciated. In the Bulu language the species groups 'Akomngoé' and 'Mvoi' are distinguished. The first species was in this study identified as *Cola ricinifolia*, but Dounias (1993) refers to it as *C. crispiflora*. Within the 'Mvoi' group *C. ficifolia, C. pachycarpa* and *C. lepidota* were identified. In Dounias (1993) also *C. semecarpophylla* and *C. argentea* are regrouped under the name Mvoi, but *C. ficifolia* does not appear.

Some other *Cola* spp. produce nuts which are appreciated for their stimulating properties. *C. nitida* (Abu) and *C. acuminata* (Abu-goro) both occur in the forest and they are also planted in cocoa plantations. They are frequently eaten and commercialised.

The only type of kola nut never planted is *C. verticillata* (Abu afan) and its nuts are less appreciated.

'Bita kola' or 'monkey kola' (*Garcinia kola)*, as well as *Garcinia lucida* (Esok) have the same properties as the true kola nuts. Especially 'bita kola' is widely consumed, commercialised and often sold in the small bars in the cities. This small tree is rare in the forest and often planted in cocoa plantations.

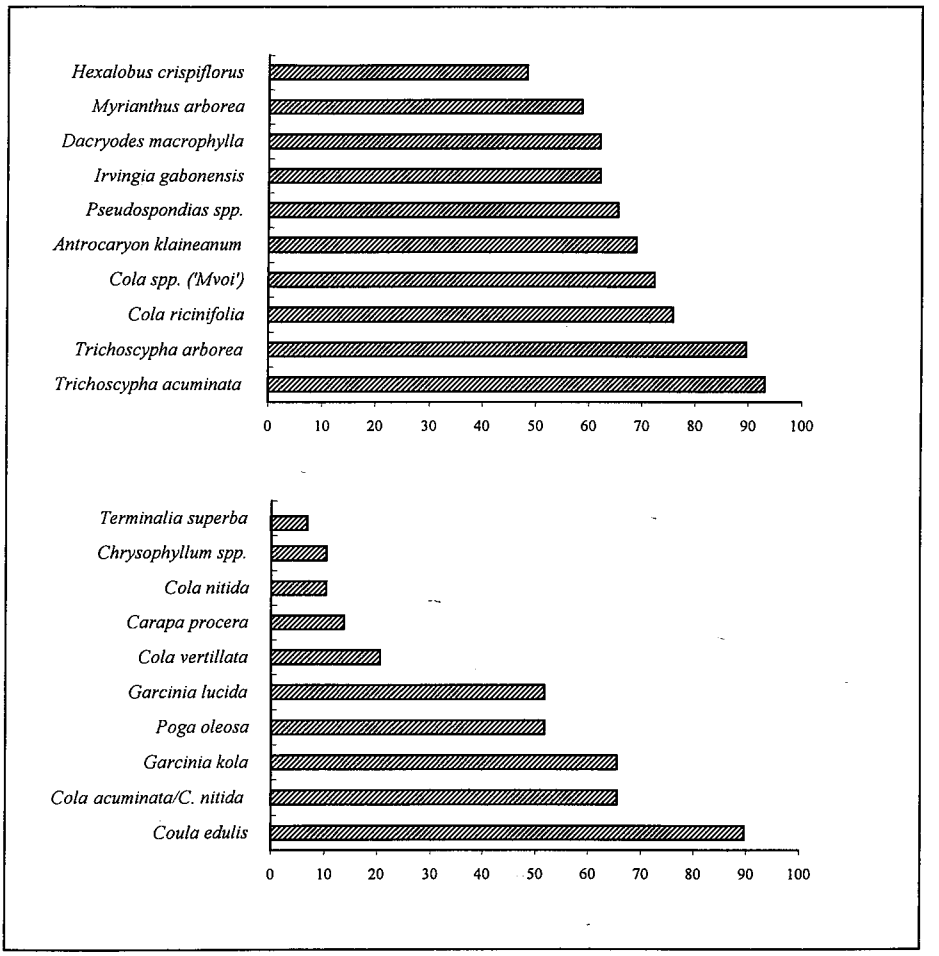

Figure II.3 The popularity of fruit (above) and nut (below) bearing trees (in % of total number of respondents)

The oil-rich nuts of *Coula edulis* (Komen) can be eaten fresh or roasted. It is one of the most frequently eaten snacks and especially popular among children. Other appreciated nuts with a high fat content are *Poga oleosa* (Angale) and *Carapa procera* (Engang).

II.4.5 Edible tubers and other starchy foods

A number of wild yams (*Dioscorea* spp.) is known to be edible but is is not known to which extent they are still used. Bagyeli people distinguish many more yam species than the Bantu villagers, but as the number of Bagyeli respondents was small, the number of species mentioned was few (see Figure II.4). *Dioscorea mangenotiana* (Essang (adult); Afel (young)) is the species most frequently mentioned. Also *Dioscorea burkiliana* (Okumen) appears to be well known. The only fruit species which was mentioned to be used is breadfruit *Artocarpus altilis* (Abok ntangan), an introduced species.

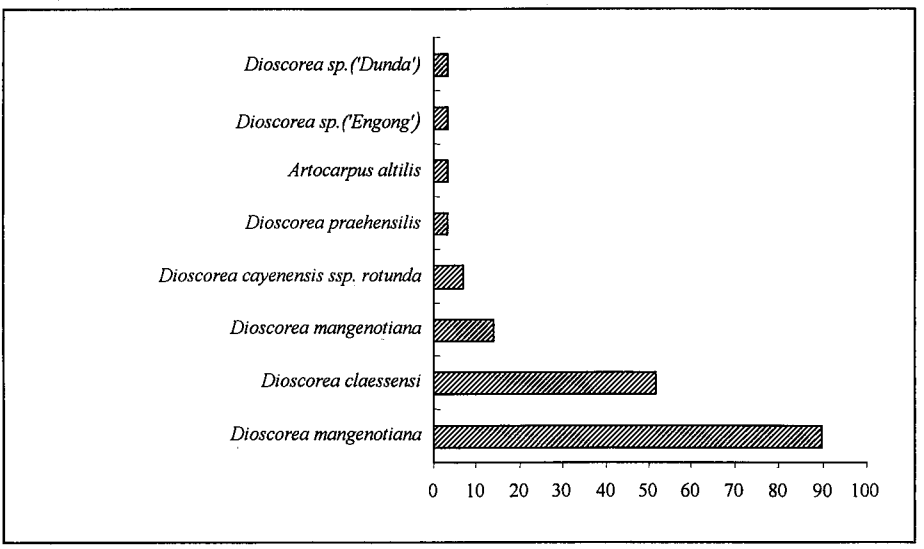

Figure II.4 The popularity of wild species used as starchy foods (in % of total number of respondents)[1]

II.4.6 Alcoholic and non-alcoholic beverages

Producing (and drinking) palm wine is common practice in the study area. The most used species are the oil palm *Elaeis guineensis* (Alen) and *Raphia montbuttorum* (Zam). *Raphia vinifera* (Ako) was also recorded among the Fang respondents to be well known but hardly used as a wine producing palm tree. The tree is said to be especially exploited by the neighbouring Bassa people.

The oil palm was introduced from West Africa, but now appears spontaneously in the fallow lands. The Raphia palms are a characteristic species of swampy areas.

[1] The scientific names are based on the species list of Dounias (1993)

In the study area, the palm trees are always cut down for tapping. Using this technique, the trees can be tapped for one to three months, depending on the age and vitality of the tree.

Palm wine tapping is of great importance. For many people, especially men, it is a major source of cash income.

Tapping oil palms for wine competes with the collection of fruits and nuts, which is of a greater interest for women. People complain about the scarcity of the resource, in spite of the fact that improved varieties of oil palm trees are often planted. These improved varieties are said to be growing and producing less well than spontaneously by appearing palms.

Claims on raffia stands can be established by creating fields in swampy areas which are then colonised by the palms. In spite of a lower production, these fields are important because they can be harvested in lean periods when prices for food crops are comparatively high. For many people, the clearing of fields is an important means of appropriating the right to exploit the palm trees, and the exploitation of palm trees often is a source of conflicts.

It is common practice to add pieces of bark or nuts to palm wine (see Figure II.5). These barks are said to stimulate the fermentation process. Equally important are the medicinal properties of the added types of bark. *Garcinia lucida* (Esok) which is the most frequently used type of bark in the study area, is also applied to prevent food poisoning. Both the nuts and the bark have strong antidotal properties. Bita kola or *Garcinia kola* (Oniay) has the same properties. However, this species is rare in comparison to *G. lucida*, and thus less applied.

Garcinia lucida only occurs in the hills. In the coastal areas where this species does not occur, the bark of *Sacoglottis gabonensis* (Bidu), which is also appreciated for its backache healing properties, is often applied for palm wine preparation. Another species providing bark used in the production of palm wine is the liana *Phyllanthus muellerianus* (Awum) (see Figure II.5).

The different types of bark add a specific flavour to the palm wine. Adding the bark of *Garcinia* spp. makes the palm wine bitter, while the bark of *Sacoglottis gabonensis*, gives the palm wine a rather sweet taste.

Palm wine is frequently used as a basic ingredient for a liquor which is named 'Ha'a' or 'l'eau dontol'. Other base ingredients are derived from cultivated species such as maize sprouts ('Arki') and sugar cane. Both palm wine and liquor are important sources of income. Many people own distillation systems.

Non-alcoholic beverages seem to be rather impopular. The only fruit juice recorded is derived from the pericarp of cocoa fruits.

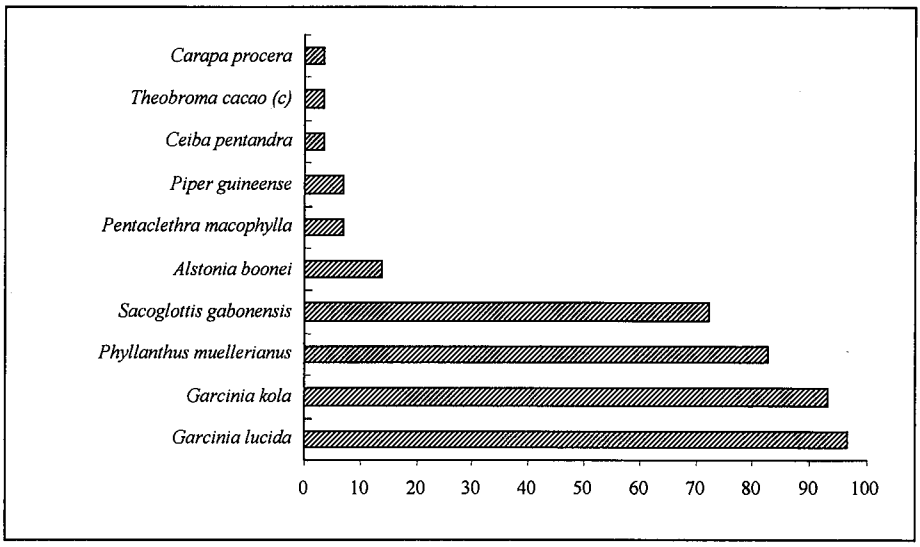

Figure II.5 Types of bark used in the production of palm wine (in % of total number of respondents)

Of some species, the exudate is consumed as drinking water in case clear water of streams or wells is lacking. The most frequently used species are the liana *Cissus* sp. (Fazo'o) and the umbrella tree *Musanga cecropioides* (Asseng). Other exudates, such as *Guibourtia tessmannii* (Oveng or Bubinga) for example, are consumed as medicinal tonics.

II.4.7 Mushroom collection

The collection of mushrooms ('Vio') is important in the area and is done by all family members. Mushrooms are frequently added to soups and sauces in which they are regarded as a substitute for meat or fish. The best periods for collection are the rainy seasons. However, many species and especially those growing on rotten trunks of trees, can be collected throughout the year (Onguene, 1997).

Numerous different species are collected. At least 29 different species were recorded. This figure is based on the number of different names used by the Bulu respondents. As there was no documentation available on mushrooms and as the species names often did not correspond in the three languages, it was not possible to identify the scientific names, nor to determine the most frequently collected species. In Table II.4 the most frequently mentioned vernacular names of the various mushroom species are listed.

As shown in Table II.4, certain names of species were uniquely or mainly recorded among Bulu, Fang or Bagyeli/Ngumba respondents. 'Etok', 'Babé', 'Otjetja', 'Nlom', 'Akok' and 'Mfumu' were frequently recorded among Bulu respondents. 'Eboleteng', 'Avam', 'Akwa' and 'Nia mvem' were mainly recorded among Fang respondents. Only for a few species, synonyms could be identified with a reasonable certainty.

Table II.4 Frequently collected mushroom species

Bulu name	**# of times recorded (N=18)**	**Fang name**	**# of times Recorded) (N=9)**	**Bagyeli/Ngumba Name**	**# of times recorded (N=3)**	**Total (N=29)**
Bikoko	15	Bikoko	9	Bikoko	2	26
Osie	11	Oswi	8	Si	1	20
Etok	15	Eboleteng	10	Bisugu	2	28
Biyaé	10	Biye	4	Mandjere?		14
Kondo	6	Kono	3	Anguende	3	12
Abone	11	?		?		11
Avam?	2	Avam	7	Aban?		9
Babé	9	Nlom/Ze/Babe?	3	Ze/Babé	2	14
Otua	3	Nia mvem otua	6	Nbimi?		9
Otjetja	6	Otjé	1	Madenmangale?		7
Akok	6	Akwoé	5	Akok vio	1	12
Mfumu	9	?		?		9

Source: fieldwork 1994, NTFP reconnaissance survey and fieldwork 1996, N. Onguene (pers.comm.)

In some cases, the same name was given to different species. For example, people distinguish 'Etok si' (the 'ground Etok') and 'Etok melen' (a species growing on the rotten trunks of oil palms). However, in recording the names of the various mushroom species, most respondents only mentioned 'Etok' and in consequence it is not clear whether there are two species involved or only one.

Table II.5 The number of animal species recorded as being hunted or caught

Animal resource	**# of different species**
Hunted animals:	98
- Mammals	48
- Birds	32
- Reptiles	18
Fishes/crustaceans	61
Snails/other molluscs	10
Insects	16

Source: fieldwork 1994, NTFP reconnaissance survey

II.5 ANIMAL RESOURCES

II.5.1 Introduction

Bushmeat and other animal products for human consumption can be obtained by hunting, trapping, fishing or collection (snails, insects and honey). The use of animal resources is described in the following sections according to these various acquisition techniques. The number of species per (sub-)category recorded as being hunted or caught is summarised in Table II.5.

II.5.2 Hunting

In Bantu communities, hunting is exclusively executed by men. The commercialisation of the bushmeat is, however, done by both women and men. Women prepare the meat and sell it in small portions called 'Ovianga'. Trapping and hunting by rifle are the most frequently applied techniques.

Bagyeli people apply many more techniques, such as the use of crossbows, nets and spears. Within their communities, also women and children participate in hunting.

Hunting takes place all around the year, but the best period is said to be the long rainy season (from August till November). According to the respondents the game is then easier to capture as their tracks are concentrated due to the appearance of numerous streams.

II.5.2.1 Species hunted

In Appendix V, the scientific and vernacular names of the species recorded as being hunted are listed. The list also contains a few species that no longer occur in the area. According to the respondents, the elephant (*Loxodontha africana*), the hippopotamus (*Hippopotamus amphibious*), the leopard (*Panthera pardus*) and the African long-nosed crocodile (*Crocodilus cataphractus*) have disappeared from the area.

Figure II.6 ranks the most frequently hunted animals, according to the respondents. Except for the Gaboon viper, all animals listed are mammals, especially rodents, Undulates and primates. Rodents such as the giant gambian rat (*Cricetomys gambianus*), the brush-tailed porcupine (*Atherurus africanus*) and the blue duiker (*Cephalophus monticola*) were mentioned most frequently.

Table II.6 summarises the numbers per species hunted within a two-month period. The data are based on a hunting survey (August-October 1994) among 28 village hunters which kept a daily diary. Hunting was by trapping (28 people) as well as by using of a rifle (6 people). The numbers reported correspond well with the ranking in Figure II.6.

The most frequently hunted animals appear to be:
- rodents such as the giant Gambian rat (*Cricetomys gambianus*), the brush-tailed Porcupine (*Atherurus africanus*) and the cane rat (*Protoxerus stangeri*);
- pangolins (*Manis* spp.);
- the blue duiker (*Cephalophus monticola*);
- the cusimanse (*Crossarchus obscura*); and
- venomous snakes as the Gaboon viper (*Viper gabonica*) and the cobra (*Naja nigricollis*).

Although the number of animals hunted in the village of Ebimimbang is lower than in Ebom, the ranking of the frequency of the various animals captured is comparable for both villages. In comparison with a study on hunting in a village in the Campo Ma'an region over a longer period (13 months), but including only 14 participants (Dounias, 1993), the share of snakes and the cusimance of the total number of captures in the study area is remarkable. Species which were recorded to be frequently captured in the Campo Ma'an region, but which were hardly or not recorded in the present survey, are the water chevrotain (*Hyemoschus aquaticus*), the grey-cheeked mangabey (*Cercocebus albigena*) and the dwarf crocodile (*Osteolaemus tetrapis*).

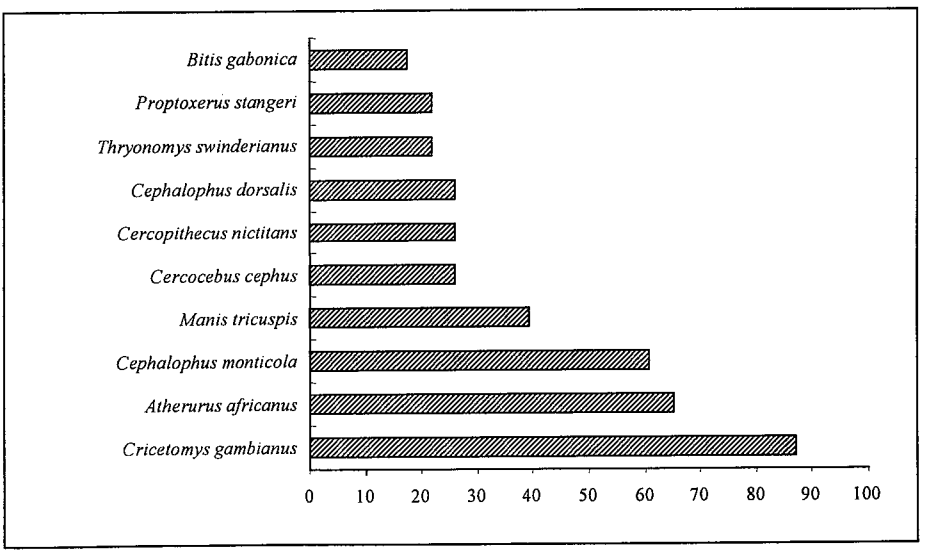

Figure II.6 The most frequently hunted animals according to the respondents

The number of species captured in the survey period, seems to differ significantly in the two villages, amounting to 40 in Ebom and 18 in Ebimimbang. The difference between the survey periods (8 and 5.5 weeks respectively) cannot explain this variation completely, as the number of participants in Ebom was lower than in

Ebimimbang (12 and 16 respectively) which results in 96 and 88 man-weeks for the two villages.

Figure II.7 reflects the differences in captures between the two villages with regard to the numbers and biomass per species groups. The estimation of the biomass was based on the average weight of the animals as determined by Dounias (1993).

Table II.6 Names and numbers of animals hunted in two villages in the study area during eight weeks in the rainy season

Scientific name	Bulu	Ebom	Ebimimbang	Total
RODENTS				
Cricetomys gambianus	Kossi	57	30	87
Atherurus africanus	Ngom	15	25	40
Protoxerus stangeri	Mvok	17	2	19
Trhyonomys swinderianus	Mvep	7	4	11
Lemniscomys striatus?	Fo	7		7
Helioscurius rubrobrachium	Edoun	6		6
Funisciuris isabella	Osen	5	1	6
Total		**114**	**62**	**176**
SCALY ANTEATERS				
Manis tricuspis	Ka	21	4	25
Total		**21**	**4**	**25**
PRIMATES				
Cercopithecus nictitans	Avembe	14	4	18
Cercocebus cephus	Osok	6	4	10
Pterodicticus potto	Awoum	5	3	8
Cercopithecus pogonias	Esouma	4		4
Papio sphinx	Suek	1		1
Total		**30**	**11**	**41**
CARNIVORES				
Crossarchus obscurus	Yameso'o	15	6	21
Nandinia binonata	Mvae	11	1	12
Genetta servalina	Nsim	5		5
Atilax paludinosus	Mvak	5		5
Viverra civetta	Zoe	2		2
Total		**38**	**7**	**45**
UNDULATES				
Cephalophus monticola	Okpweng	11	16	27
Cephalophus dorsalis	So	4		4
Potomocherus porcus	Ngou	1		1
Cephalophus callypigus	Mvim	2		2
Neotragus batesi	Odjoi	1		1
Tragelaphus spekei	Mvou	1		1
Total		**20**	**16**	**36**
HYRAXES				
Dendrophyrax arboreus	Niok	4		4
Total		**4**	**0**	**4**

Table II.6 Names and numbers of animals hunted in two villages in the study area during eight weeks in the rainy season (cont'd)

Scientific name	Bulu	Ebom	Ebimimbang	Total
REPTILES				
Bitis gabonica	Akpwe	16	4	20
Kinixys sp	Kou	8	6	14
Naja nigricollis	Evindi nyon	14	1	15
Varanus niloticus	Nka'a	8	2	10
Python sabae	Mvom	2		2
Dendroaspis jamesoni	Ayam	1		1
Total		**49**	**13**	**62**
BIRDS				
Guttera sp.?	Obem	10		10
'Koubakok'	Koubakok	3		3
Bycanistes subcylindricus	Miam	2	1	3
Ceratogymma atrat	Ongoun	3		3
Bycanistes cylindricus	Zanga	1	1	2
Himantornis haematopus	Nkoulengwe	1		1
Total		**20**	**2**	**22**

Source: Marrel, fieldwork 1994

In both villages the share of rodents in the total number of animals hunted is the largest, with 39% in Ebom and 54% in Ebimimbang. With regard to the biomass, the share of Undulates, mainly the blue duiker (*Cephalophus monticola*), is the highest in both villages with 33% and 31% respectively. In Ebom, however, the high biomass of the Undulates can be attributed largely to only one animal, a bush pig (*Potomochoerus porcus*).

There seems to be a difference between the two villages. In Ebom a hunter captured on average 3.1 animals with a total weight of 11.1 kg per week. In Ebimimbang the average number was 1.3 animals with a total weight of 4.3 kg. These figures are low in comparison with the results in the Campo Ma'an region, where Dounias (1993) recorded an average of 3.5 animals per week with a weight of 30 kg. The variation between the two villages can be explained by differences in hunting intensity. The number of traps per household (121 versus 71) and the number of hunters owning a shotgun (5 versus 1) was higher in Ebom. This might be caused by logging operations which took place in Ebom during the survey. Many labourers settled temporarily in this village, creating an increase in the demand for food products.

II.5.2.2 Hunting techniques

Trapping and shotgun hunting are the main techniques used by villagers. In the study area, only few people possess a shotgun. But it is common practise to 'borrow' or to rent a shotgun, which often is provided by people from outside the village or settlement. In return, a share of the game is given to the rifle owner. Bantu people

often provide shotguns to Bagyeli, as they are considered to be the most effective hunters.

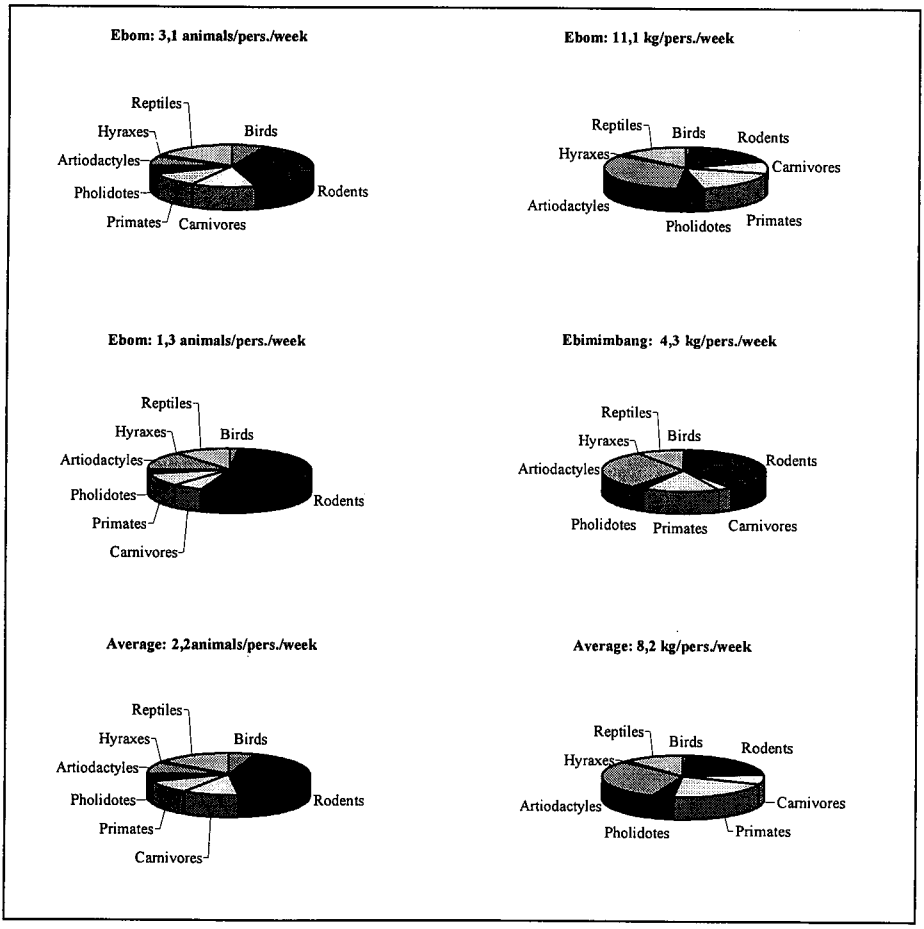

Figure II.7 Numbers and biomass of the species groups hunted in the villages Ebimimbang and Ebom and the average over both villages in percentage of the total captures

The use of a shotgun is rather expensive. Cartridges cost 300-500 CFA F a piece, is high in comparison to the prices paid for game at the village level, considering the risk of missing a shot. A blue duiker (*Cephalophus monticola*), which is one of the most commonly captured animals, is sold at 1,500-2,000 CFA F.

Trapping is more common. The traps are set out in the forest or on cultivated lands exploited by the (extended) family. They can be constructed exclusively using

materials from the forest. Nowadays, however, people use metal cables. In spite of higher costs these are preferred for being more durable and effective.

The number of traps per household varies a lot, from 15 to 305 traps with an average of 95.

Table II.7 The distribution of captures with regard to the use of various acquisition techniques

	Shotgun		Forest traps		Field traps	
Species group	**Campo[1]**	**TCP[2]**	**Campo[1]**	**TCP[2]**	**Campo[1]**	**TCP[2]**
Undulates	65%	2%	58%	17%	10%	2%
Pangolins	3%	0%	3%	9%	5%	5%
Carnivores	1%	9%	3%	12%	7%	11%
Primates	22%	78%	2%	2%	0%	0%
Rodents	7%	2%	20%	37%	48%	61%
Birds	1%	6%	6%	2%	23%	2%
Reptiles	1%	0%	9%	19%	7%	16%
Hyraxes	-	2%	-	1%	-	0%

Source: [1] Dounias 1993, fieldwork May 1990-June 1991, Campo Ma'an hunting survey.
[2] Marrel, fieldwork Aug. 1994-Oct. 1994, hunting survey. TCP= study area.

Table II.7 reflects the differences in captures expressed in numbers resulting from the use of different acquisition techniques. The figures show a clear difference in captures between the use of a shotgun and trapping. In the study area, the nearly-totality of all primates are hunted with a shotgun. In the Campo Ma'an area the share of Undulates in captures with a shotgun also is very high. In both areas, especially larger animals are hunted by shotgun.

Rodents are captured by trapping and often in fields and fallow lands. The traps in the fields are often set as barriers that also serve as a means to protect the crops.

To analyse the effectiveness of both acquisition techniques, the numbers and weight of the captures per week and per person were compared. The results are shown in Tables II.8 and II.9.

Table II.8 Effectiveness of hunting by trapping

	Ebom	**Ebimimbang**	**Average**
# traps /household	121	71	95
# animals/pers./week	2.7	1.3	2.0
Weight of game/pers./week in kg	7.2	3.8	5.4
Weight of game/capture in kg	2.7	2.9	2.8

Source: Marrel, fieldwork Aug. 1994-Oct. 1994, hunting survey

The weight of an average capture by shotgun hunting is twice as high as for trapping, which confirms the statement that shotgun hunting focuses on larger animals (5.8 versus 2.8 kg). This is probably due to the high costs of cartridges. It appears, however, that the two techniques provide on average a similar biomass of game in a week: 5.4 and 5.8 kg per household by trapping and shotgun hunting, respectively.

Table II.9 Effectiveness of hunting with a shotgun

	Ebom	Ebimimbang	Average
# hunters with a shotgun	5	1	
# of animals/pers./week	1	0.9	1
weight of game/pers./week in kg	7.2	4.2	5.7
weight of game/capture in kg	7.4	4.6	5.8

Source: Marrel, fieldwork Aug. 1994-Oct. 1994, hunting survey

Exact data on the labour input for both acquisition techniques are not available. People stated that the traps were visited twice a week. A visit takes the whole day. The average number of hunting trips by the participating hunters with a shotgun was 0.8 times per week. In general, these trips are somewhat more time consuming, as people often leave for a couple of days.

It can be concluded that the use of a shotgun results in captures of bigger animals, especially primates. However, the weight of the game captured per time unit is about the same for both hunting techniques. There are indications that the effectiveness of both techniques is similar. However, more data are needed to take the labour input for both techniques fully into account.

II.5.2.3 Hunting equipment

As stated earlier, the most common techniques for hunting are trapping and the use of shotguns. Only the Bagyeli use a wider range of techniques such as crossbows, spears and nets which are often applied in drives with dogs. The small number of Bagyeli respondents, however, does not allow a complete ethnobotanical description of the materials they use for these techniques.

There are many different trapping systems. Dounias (1993) counted 33 different types actually used by the Mvae. The main difference between the various systems concerns the part of the animal captured: the paws or the throat. Traps which focus on the paws are mainly applied in the forest. In and around the fields throat traps are often aligned in a barrier of raffia mats (*Raphia montbuttorum*, 'Zam') which serve at the same time as protection for the crops.

In the past, canes and hides were used to manufacture snares. But nowadays they are replaced by metal cable which costs about 100 CFA F/m. In order to tighten the

snare, small shrubs are used such as *Lasianthera africana* (Nditip), *Costus* spp. (Mian), *Alchornea floribunda* (Elobe), or *Leea guineense* (Otebisson).

Table II.10 Lures for hunting

Scientific name	Bulu name	Part of the species used
Ongokea gore	Anjek	Fruit
Elaeis guineensis	Alen	Nut/fruit
Musa sapientum (c)	Adyoi	Fruit
Hexalobus crispiflorus	Owe	Fruit
Coula edulis	Ewomen (Komen)	Nut
Persea africana (c)	Fio	Fruit
Allanblackia floribunda	Anyoi	Nut
Anthonotha macrophylla	Enak	Fruit
Carapa procera	Engang	Fruit
Alchornea cordifolia	Aboe	Fruit

Notes: (c): cultivated or introduced species
Source: fieldwork 1994, NTFP reconnaissance survey

Especially in and around the fields and fallow lands, lures are used. The most frequently recorded species are mentioned in Table II.10.

The use of lures focuses on specific animals or groups of animals. For example, *Ongokea gore* (Anjek) is mainly used to capture rodents and *Alchornea cordifolia* (Aboe) is specifically used for trapping birds.

II.5.3 Fishing

Both women and men practise fishing. However, the techniques applied by the two sexes are different. In the villages surveyed, only a few techniques were mentioned. Although fishing takes place throughout the year, the best period appears to be the long dry season.

II.5.3.1 Species captured

Many species (51) of fishes and crustaceans were recorded. Of only a few species, the scientific name could be identified, in spite of the fact that some documentation exists (Vivien, 1991).

The different species of crustaceans were hardly specified. Most respondents referred to them as 'Kata' and 'Mingos', which are the generic terms for respectively crabs and shrimps.

In Figure II.8, data on the most frequently recorded species are summarised. Most of these species are catfish-like species (Clariidae) such as *Clarias* spp. and *Gymnallabes typus* or carps (Cyprinidae) as for example *Barbus* spp. and *Labeo annectans*. The number of species mentioned by the respondents of Ebimimbang largely exceeded the number mentioned by the respondents of Ebom and Mekalat.

Contrary to Ebom and Mekalat where only small streams occur in the direct surroundings, Ebimimbang is located on the bank of a river, the Lokoundje. Fishery is of a greater importance in this village.

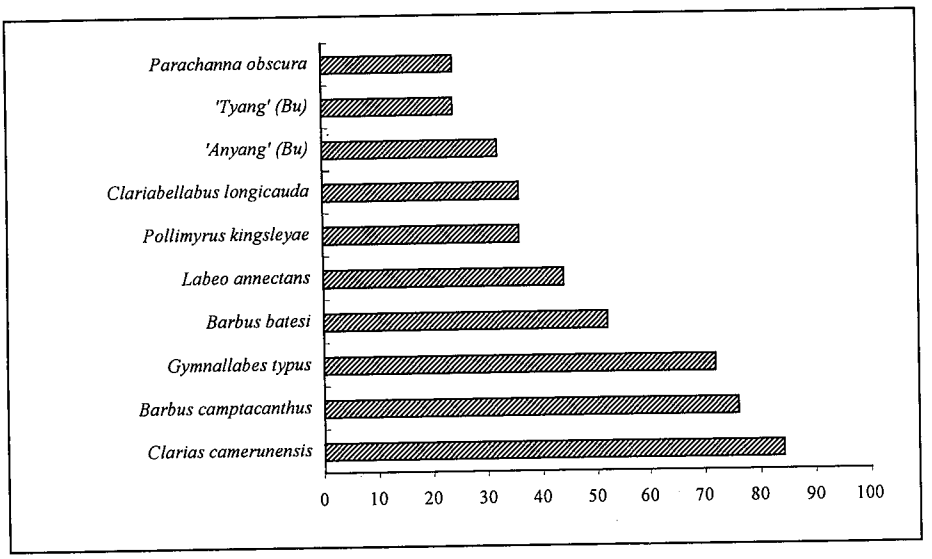

Figure II.8 Commonly consumed fishes (in % of the total number of respondents)

II.5.3.2 Fishery techniques and equipment

Only the main fishing techniques and materials applied for the manufacturing of equipment were studied. Other materials such as baskets and cords for tying are discussed in Chapter II.7.

The following fishing techniques were recorded:

Shrimp traps: 'Aya'

Only women make use of shrimp traps, although men are frequently involved in producing these traps. With these traps crabs ('Kata'), shrimps ('Mingos' and 'Sin') and small fishes are captured. In the study area *Haumania danckelmaniana* (Se) is mainly used for constructing the traps. Towards the coast, cane species (Nlong) are more commonly used, especially 'Aka' (*Calamus* sp.?).

The stems of the lianas are sliced in small strips and are then tied to one another by using ropes made of the bark of *Cola lateritia* (Ebe abu). The fruits of oil palms, pieces of cassava or cocoyam and several (larvae of) insects are applied as bait.

Fishing with baskets and plate: 'Alok'
Another technique that is frequently and uniquely applied by women is called 'Alok'. Dams are built in small streams in order to create a water basin. The water is removed with the help of a wooden plate ('Ekunda') which is made of the wood of *Ricinodendron heudelotii* (Ezezang) or *Alstonia boonei* (Ekuk). Closely aligned the women progress using small baskets ('tan') to prevent that the fishes escape. The fishes are killed with machetes. The 'tan' are made of a ring of cane (Nlong) or *Strychnos asterantha* (Mfas) with a woven net of 'Okong' (e.g. *Clappertonia polyandra*).

Fishing lines and rods
New techniques such as the use of fishing rods made of the petioles of *Raphia montbuttorum* (Zam) or simple nylon lines with hooks are nowadays the main fishing techniques applied by men. For fishing in deeper waters, canoes are applied. Small and light canoes are used by only one person ('piroque moustique') are mostly made of the umbrella tree *Musanga cecropioides* (Asseng). For heavier canoes, timber from species such as *Pentaclethra macrophylla* (Ebay) and *Pterocarpus soyauxii* (Mbe or 'Paduk') is used.

Various types of bait are applied, e.g. termites or 'Ty'ale', worms or 'Sa', the larvae of *Rhynchophorus phoenicis* or 'Fos' and snails 'Koi'.

The use of ichthyo-toxins
The knowledge of poisons which can be applied for killing fish is widespread. It is, however, not clear to what extent they are actually applied in the area. According to Dounias (1993), the use of ichthyo-toxins is still common practice among Bagyeli people. In Table II.11 the most frequently mentioned poisons which are derived from plant species are listed.

Table II.11 The most frequently recorded ichthyo-toxic plants

Scientific name	Bulu name	Habit
Tetracera alnifolia	Angongi	Liana
Strychnos aculeata	Asso	Liana
Strychnos sp.	Awom	liana
Blighia welwitschii	Awonog	tree
Sacoglottis gabonensis	Bidu	tree
Zanthoxylum spp.	Olon/Bongo/Elelongo	tree
Strophathus gratus	Enay	liana
Ganophyllum giganteum	Engak	tree
Pachyelasma tessmannii	Eyek	tree
Cassia alata	Ndowolo ntangan	shrub
Justicia extensa	Ofya	herb
Unknown	Zek mevele	herb

Source: fieldwork 1994, NTFP reconnaissance survey

In addition, also the poison derived from the stomach of the toad *Bufo superciliaris* (Nkong) can be applied. This poison was however, more frequently mentioned as being applied in hunting.

II.5.4 Collection of animal resources

A number of insects and mollusca are collected for consumption (see Appendix V).

The larvae of *Rhynchophorus phoenicis* (Fos) live on the rotten trunks of palm trees, where they can easily be collected. Also a number of edible caterpillars (Nkong), crickets (Asileng) and grasshoppers (Mba'a asang) were reported to be edible.

Mollusca are appreciated and frequently collected and eaten, especially by children (Dounias, 1993). The species listed in Appendix V include a number of giant snails (*Achatinidae*), but also small water snails (*Potodoma* spp.) and clams (*Aestheria* sp.).

Honey is much appreciated. The collection is, however, a dangerous and hard job and mainly done by Bagyeli. Nevertheless, many villagers stated that they also collect it themselves. The respondents distinguished three types of honey bees. Mostly appreciated is the honey produced by *Apis mellifera* (Wi), which is collected in the forest. Another type of honey that is also collected in the forest, is called 'Abai'. 'Oboi' is said to be collected in the direct surroundings of houses. The latter types of honey are probably produced by *Trigona* spp.

II.6 FOREST MEDICINES

II.6.1 Introduction

The large majority of medicinal uses of NTFPs recorded during the survey concern plant species. Most people did not feel any reticence in providing information. Only with few of the health problems people had difficulties to reply or they obviously felt restrictions to provide the information. Some respondents avoided to mention problems such as venereal diseases and snake bites, or the use of aphrodisiacs. They were said to be treated in hospital only, not to occur or to be treated by healers uniquely.

The direct use of animal produce is limited to the treatment of wounds and injuries, for which, for example, the shells of a giant snail (Ngom), the eggs of turtles (Ku), and the hide of *Genetta servalina* (Nsim) are used. Only a few respondents mentioned these treatments. Honey, however, appears to be one of the most commonly applied medicines to treat burns and blisters. Rather than using animal produce for healing, it is more common to stimulate or forbid the consumption of certain animals to specific age and gender groups, such as young boys or pregnant women. This can be considered as a type of profylaxis to prevent certain diseases.

Almost all the useful plant species recorded during the survey were reported to have medicinal properties. As such, about 510 different plant species could be identified which cure a wide range of diseases.

In all households it was stated that the use of plant medicines plays an important role in daily health care. Although many 'modern medicines' are easily available in all villages from travelling traders who pass by regularly, many people prefer 'traditional medicines'. They are of course less expensive but they are often also regarded as being more effective. The remark "Obaton' (*Rauvolfia vomitoria*) is at least twice as strong as nivaquine", was made more than once.

Although in most households 'modern' health care is adopted, it is always applied in interaction with traditional treatments. Health problems often are treated in the first place by self-aid, using local plant medicines. In case the treatment fails, modern health care facilities will be consulted. However, the more severe and difficult cases are often treated by local healers, which have specific specialisms. among the Bagyeli people, but also within the Bantu communities, there are many such healers.

II.6.2 Plant medicines

Traditional medicine is associated with many spiritual beliefs and operations. The tree *Guibourtia tessmannii* (Oveng) plays a central role in the cultural and religious aspects of healing. The tree protects people against evil spirits. Both Bantu and Bagyeli attach pieces of bark at the doorway or they carry a piece of bark in their pocket. In case an illness is said to be caused by witchcraft, the treatment will be related to the use of the tree. The bark or the exudate can be added to the medicine, or the medicines have to be taken in the neighbourhood of the tree.

Some treatments do not have any physical or chemical effect. These are the numerous talisman-like applications. They are not applied as curatives, but as a kind of prophylactics. Pregnant women and young children, for example, often carry a string of a liana (e.g. *Stephania* sp. or 'Edjibili') around their belly to protect themselves or the foetus.

Other examples of such 'treatments' are the use of the ash of a tree which was hit by the lightning to treat headaches or the use of sticks which had been used by young chimpanzees to help them to climb a tree, which is said to stimulate children to start walking.

Most species used contain active chemical elements however. Many of them have been analysed and are commonly applied in the pharmaceutical industry.

Although it is often said that NTFPs are subject to substitution, Abbiw (1990) states that only 10% of the initially from plant species derived medicines are nowadays commercially produced synthetically. Some well-known examples of species in

Cameroon applied in the pharmaceutical industry can also be found in the study area. They are listed in Table II.12.

Table II.12 Some medicinal plant species of the study area applied in the pharmaceutical industry

Species	Active principles	Application
Pausinystalia yohimbe (Atjek afan)	Yohimbine Yohimbinine	enlarges blood vessels
Alstonia boonei (Ekuk)	Echitine	malaria remedy
Rauvolfia spp. (Obaton; Esombo)	Reserpine Deserpidine Rescinamine	Antihypertensives
Strophanthus gratus (Enay)	Strophantine	Cardiotonic
Picralima nitida (Ebam)	Akuamine	Sympathicosthenic

Source: Abbiw (1990); Mbenkum and Thomas (1991)

According to the respondents, the only medicinal plant species actually extracted for commercial purposes, is strophanthus (*Strophanthus gratus*; 'Enay'). Especially for Bagyeli people this is an important source of income. Bantu people are also involved in this trade, but only by engaging Bagyeli people for the extraction and processing. The extraction of the fruits requires tree climbing and the peeling of the fruits causes a lot of dust.

In the past the liana was planted in cocoa plantations or in the backyard garden (falak). But as prices on the world market dropped, most Bantu people abandoned the extraction of strophanthus. The Bagyeli could continue the commercial extraction because bottom prices were ensured by an NGO. As was the case for cocoa, the devaluation of the CFA F caused a raise in prices and therefore the Bantu in the study area, especially the Ngumba, have taken up the extraction recently. In the period from 1985/1986 to 1990/1991, 6.7 ton strophanthus was processed by the company Plantecam, which is the largest pharmaceutical industry in Cameroon (Cunningham and Mbenkum, 1993).

II.6.3 Medicinal plant species

The objective of the reconnaissance survey was to inventory the names and uses of commonly used NTFP species. In consequence, it was not attempted to record the exact treatments of the various medicinal applications of NTFPs, to evaluate the effectiveness of remedies nor to include the information of specialists as local healers.

Different categories of diseases were used as an approach to facilitate people to recall the names of the species. In Table II.13, the most frequently mentioned medicinal plant species are listed for each category of illness. Although an attempt

was made to include all possible diseases, the listing is not complete. Several diseases or health problems were added during the period of interviews. Anaemia, for example, was not included from the beginning, but it appeared to be a very common health problem which is mostly treated locally. Also, a number of less obvious health problems appeared to be treated. Examples are the stimulation of the articulation of young children and the limitation and regulation of women's periods. Not all these new categories are listed in Table II.13, as the small number of respondents made it difficult to distinguish significant uses.

Table II.13 The most important medicinal plant species per category of diseases and the number of times the specific use was indicated

Anaemia[1]		**Headaches**	
Hibiscus acetosella	7	*Mitragyna stipulosa*	16
Barteria fistulosa	6	*Discoglypremna caloneura*	14
Alchornea cordifolia	6	*Clerodendrum splendens*	10
Aphrodisiacs		**Jaundice**	
Aframomum meleguata[2]	17	*Harungana madagascariensis*	17
Carpolobia lutea	9	*Cassia alata*[2]	13
Zanthoxylum heitzii	7	*Enantia chlorantha*	13
Cola acuminata/C. nitida[2]	7	*Emilia* sp.	9
Backache		**Measles**	
Carica papaya[2]	11	*Thitonia diversifolia*	12
Sacoglottis gabonensis	11	*Elaeis guineense*[2]	9
Bailonella toxisperma	10	*Erythrophloeum ivorense*	8
Rauvolfia macrophylla	6	*Manihot esculenta*[2]	8
Colds		**Skin infections/Scabies/Lice**	
Musanga cecropioides	16	*Pachypodanthium staudtii*	21
Alstonia boonei	11	*Erythrophloeum ivorense*	10
Pentaclethra macrophylla	10	*Vernonia amygdalina*[2]	7
Ocimum canum[2]	10	*Cassia alata*[2]	6
Diarrhoea		**Treatment of snake bites**	
Psidium guyava[2]	19	*Garcinia lucida*	6
Terminalia superba	13	*Alstonia boonei*	6
Mangifera indica[2]	10	*Rauvolfia vomitoria*	6
Coula edulis	7		
Elaeis guineense[2]			
Eye infections/Filaria		**Toothache**	
Phyllanthus muellerianus	8	*Alchornea cordifolia*	20
Enantia chlorantha	6	*Lophira alata*	14
Ageratum conyzoides	6	*Coula edulis*	7
Pachypodanthium staudtii	6	*Mangifera indica*[2]	6
Fever/Malaria		**Cleaning teeth**	
Alstonia boonei	28	*Raphia* sp.	14
Rauvolfia vomitoria	23	*Rattan* spp.	10
Picralima nitida	13	*Sida acuta*	7
Enantia chlorantha	7	*Alchornea floribunda*	6
Rhigiocarya racemifera	7		
Food poisoning		**Lactating women**[1]	
Garcinia lucida	18	*Musanga cecropioides*	5
Elaeis guineense[2]	6	*Alstonia boonei*	4
		Milicia excelsa	4

Table II.13 The most important medicinal plant species per category of diseases and the number of times the specific use was indicated (cont'd)

Intestinal worms		**Regulation menstruation period**[1]	
Vernonia amygdalina[2]	14	*Musa paradisiaca*[2]	4
Alstonia boonei	12	*Anchomanes difformis*	2
Morinda lucida	9	*Cassia* sp.	2
Carica papaya[2]	7	*Piptadeniastrum africana*	2
Wounds/Injuries		**Pregnancy problems**[1]	
Tabernaemontana crassa	21	*Anonidium floribunda*	5
Coula edulis	16	*Ricinodendron heudelotii*	3
Musanga cecropioides	16	*Cleistopholis patens*	2
Vernonia conferta	13		
Manihot esculenta[2]	13		

Source: fieldwork 1994, NTFP reconnaissance survey

Notes : [1] The category of diseases or health problems was added in a later stage in the interviews. As a result not all the respondents were included.

[2] Introduced, cultivated or planted species.

The number of different species which were mentioned for the various diseases was in some cases very high, especially for those categories which include different kind of disorders. Up to 45 different species were mentioned to treat wounds and injuries. For others, the number of different species is far more restricted, such as for example febrifugals (18) and plant medicines that treat hepatitis (20).

Most of the species in Table II.13 are tree species. But also other types of species are frequently applied such as the shrubs *Clerodendrum splendens* (Bejeme elok), *Cassia alata* (Ndowolo ntangan) and *Manihot esculenta* (Mbon); herbaceous species as *Aframomum melegueta* (Ndong), *Ageratum conyzoides* (Okpwate), *Thitonia diversifolia* (Ndowolo), *Sida acuta* (Nsisim) and *Ocimum canum* (Mecep); the vine *Rhigiocarya racemifera* (Okometele) and the woody liana *Phyllanthus muellerianus* (Awum/Njal kabat). Remarkable are the number of species which are cultivated, planted or which were introduced in the past. They are marked with an asterisk in Table II.13. Some species appear to be important for more than one purpose. *Alstonia boonei* (Ekuk) is applied for many diseases, and also *Coula edulis* (Ewomen), *Mangifera indica* (Ando'o ntangan), *Rauvolfia vomitoria* (Obaton), *Alchornea cordifolia* (Aboe), *Musanga cecropioides* (Asseng) and *Erythrophloeum ivorense* (Elon). In some cases it is likely that the same type of effect is used to cure different medical problems, such as febrifugal properties (*Rauvolfia macrophylla*) or toxic properties (*Erythrophloeum ivorense*).

Some species do not appear prominently in Table II.13, although they are often applied. Different products of *Elaeis guineensis* like palm wine, oil from the fruits or kernels are frequently used as a basic solution or to facilitate ingestion. *Aframomum melegueta* (Ndong) is often added to medicinal mixtures to increase their power and also the utilisation of *Guibourtia tessmannii* (Oveng) is important in this respect.

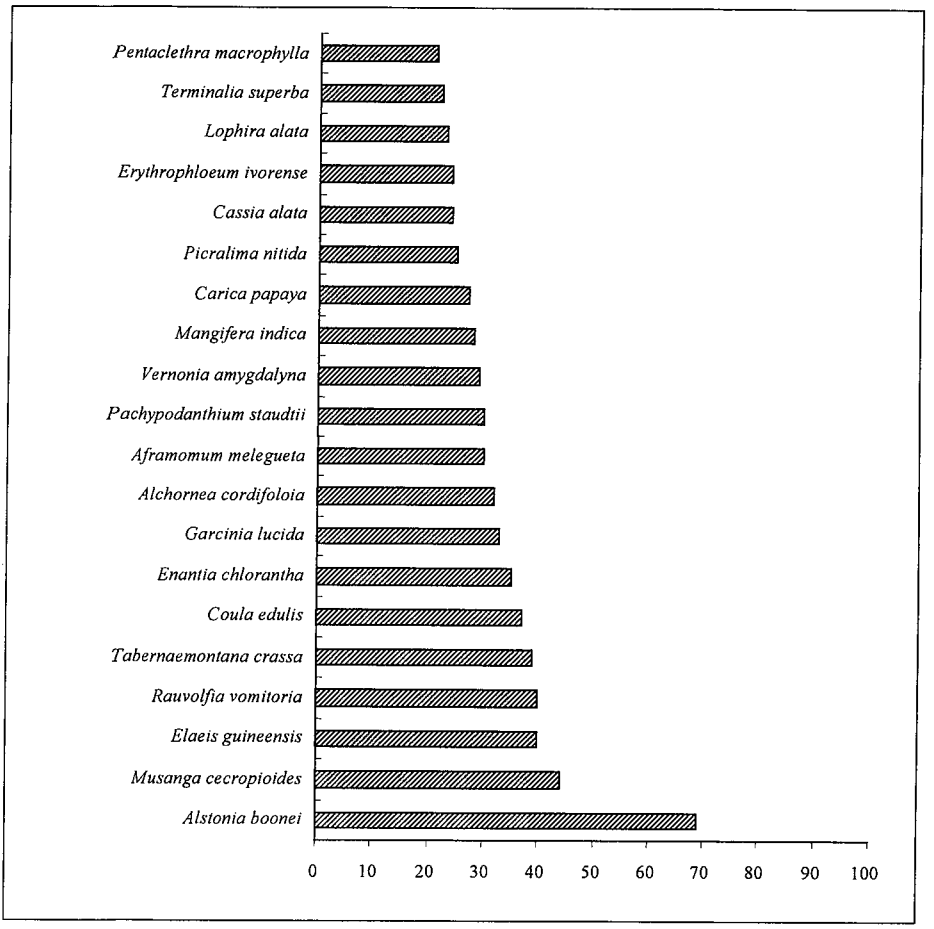

Figure II.9 The most frequently recorded medicinal plant species (in the number of times a medicinal use was indicated)

In order to get some insight into the frequency of the use of the various species, the number of times a certain species was mentioned a medicinal treatment was used as indicator. Figure II.9 reflects the results. *Alstonia boonei* (Ekuk) is the most frequently recorded species. All other species follow at a distance. Noticeable is the rather high number (6) of cultivated or introduced species. These are *Elaeis guineensis, Aframomum melegueta, Vernonia amygdalina, Mangifera indica, Carica papaya* and *Cassia alata.*

II.7 CONSTRUCTION MATERIALS AND HOUSEHOLD EQUIPMENT

For the construction of houses and the manufacturing of furniture and equipment, leaf petioles and leafs of *Raphia montbuttorum* (Zam) and rattan species (Nlong) as well as other fibres are used as cords for tying (e.g. *Clappertonia polyandra* or 'Okong'). Rattan species are hardly specified and mostly referred to as 'Nlong', but commonly used species are *Ancistrophyllum secundiflorum* (Nkan), *Calamus* sp. (Mfop), and *Calamus deerratus* (Obok nlong).

Table II.14 Number of wood species per use category

Type of use	Number of species
House construction	34
Furniture	23
Equipment	25

Source: fieldwork 1994, NTFP reconnaissance survey

The use of wood was classified in three categories (see Table II.14). Their application is considered in Chapters II.7.2 to II.7.4.

II.7.1 Construction of houses

Most houses of both Bantu and Bagyeli in the area are in the 'Poto-Poto'-style. This style was introduced in the colonial period. Before people started to apply this type of construction, the walls were made of leaves or bark (e.g. *Cordia platythyrsa*).

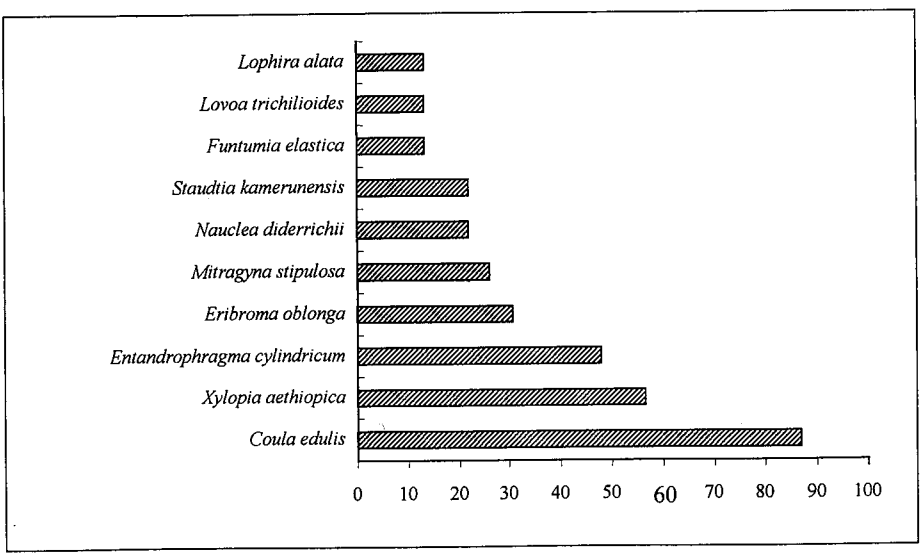

Figure II.10 The most frequently used woods for house construction

Poto-poto-houses are constructed of poles and cross-slats of the petioles of *Raphia* spp., mostly *Raphia montbuttorum* (Zam) or Bamboo (*Bambusa vulgaris*). They are tied with rattan cords (Nlong). The walls are filled in with mud. Often the walls are cemented and the roofs of most houses are nowadays covered with galvanised metal sheets. Only the kitchens remain uncemented and they are sometimes covered by the woven mats of the leafs of *Raphia montbuttorum* (Zam).

In Figure II.10, the species most frequently used for the construction of houses are given. The wood used for poles must be resistant to water and termites. The most frequently used wood for poles is *Coula edulis* (Ewomen), which is referred to as 'iron wood'. Also *Nauclea diderichii* (Akondok) and *Lophira alata* (Okwa) were mentioned as being highly suitable for this purpose.

For the rafters and planks of roofs, *Xylopia aethiopica* (Nkala), *Eribroma oblonga* (Eyong) and *Mitragyna stipulosa* (Afobezam) are mostly used. Doors, windows and their frames are preferably made of *Entandrophragma cylindricum* (Asie) or *Lovoa trichilioides* ('Bibolo'). Except for *Coula edulis* and *Xylopia aethiopica*, all these species are also commercially exploited in the area for their timber.

II.7.2 Furniture

In most houses, furniture can be found made by carpenters and mostly bought in the urban centres. However, the more or less standardised interior of the kitchens is manufactured locally, using materials from the forest. The standard furniture consists of a mezzanine, beds and often a special table for grinding. The most frequently used materials are given in Figure II.11.

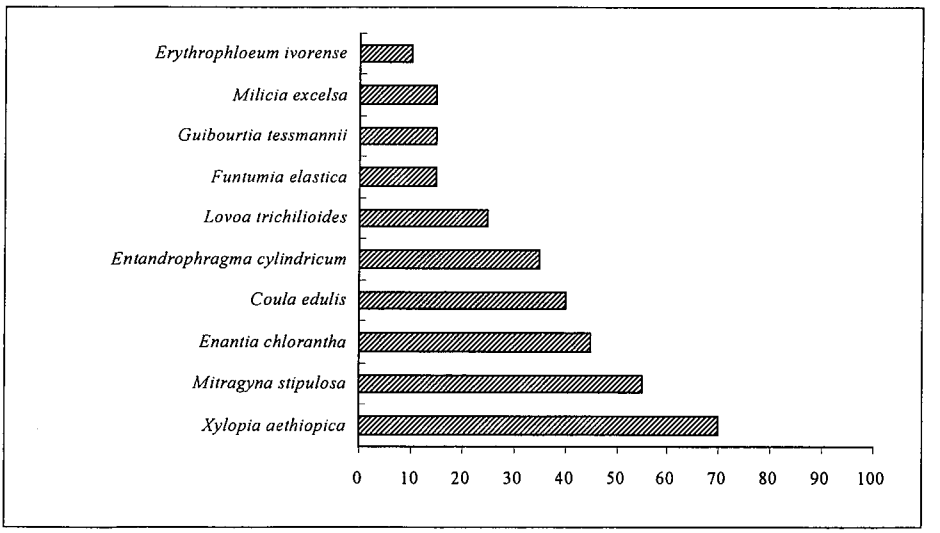

Figure II.11 Frequently used woods for furniture making

All along the length of the house and above the fire place, there is a mezzanine on which the harvest is stocked. The materials used are the petioles of *Raphia montbuttorum* (Zam), cords of canes (Nlong) and poles, for which mainly *Xylopia aethiopica* (Nkala), *Mitragyna stipulosa* (Afobezam) and *Coula edulis* (Ewomen) are used.

For beds, the same materials are used, although *Enantia chlorantha* (Mfo) appears to be the most appreciated wood. For the grinding tables, durable timbers like *Entandrophragma cylindricum* (Asie), *Lovoa trichilioides* ('Bibolo') and *Erythrophloeum ivorense* (Elon) are used.

II.7.3 Household and agricultural equipment

Many materials used in making household and agricultural equipment come from the forest.

Household equipment includes mortars, pestles, other grinding equipment, different kinds of baskets, mats and small utensils. The equipment is homemade. However, their production is often specialised labour, practised especially by older men. Selling such equipment can generate an important income.

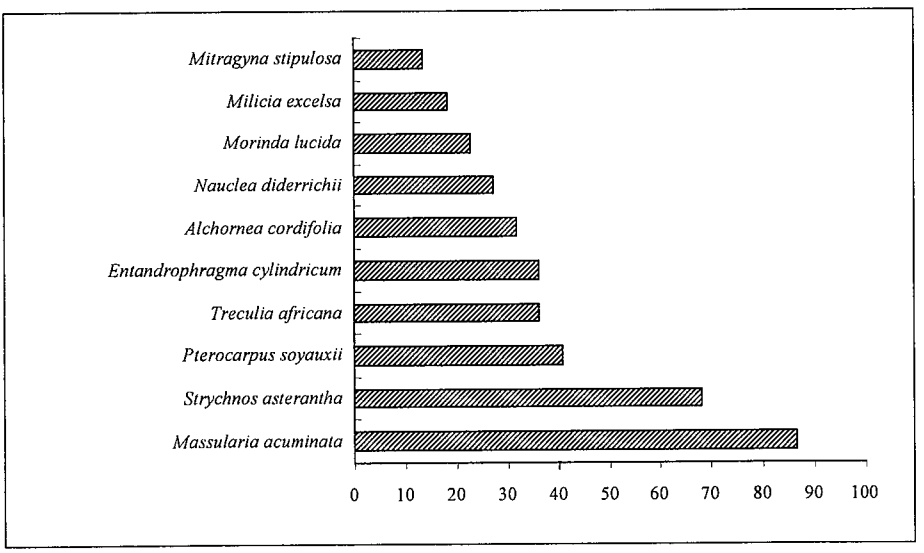

Figure II.12 The most frequently used materials for equipment

In Figure II.12, the woods used for making mortars, pestles and hafts of tools are given. The small tree *Massularia acuminata* (Zo'o) appears to be most frequently used. It is used both for the hafts of tools and as pestles. Frequently used species for tools are also the liana *Strychnos asterantha* (Mfas) and the small trees *Alchornea*

cordifolia (Aboe) and *Trema guineensis* (Etui/Etoup). The choice of the wood depends on the kind of tool. For tools with short hafts, such as machetes, flexible timber with a low density is used (e.g. *Musanga cecropioides* or 'Asseng'). High density timber is used for agricultural equipment such as the hoe (Dounias, 1993).

For mortars and pestles, different kinds of wood are used. *Pterocarpus soyauxii* (Mbe or Padouk) and to a lesser extent *Entandrophragma cylindricum* ('Asié' or Sapelli) and *Morinda lucida* (Atjek) are most frequently used for mortars. *Massularia acuminata* (Zo'o) is mostly used as pestles. Mortars and pestles are mainly used for the grinding of starchy foods.

For the grinding of vegetables, spices and oil containing seeds, the hard fruits of *Strychnos* spp. (Asso) are commonly used.

For large baskets, which are used to carry the harvest to the village, rattan species are used. Most people referred to the rattans as 'Nlong' which is a generic name. The names of individual species could not be identified.

For smaller baskets, used for stocking produce and utensils, *Megaphrynium macrostachyum* (Nden) is frequently used.

II.8 PEOPLE'S PERCEPTION OF NTFP USE

II.8.1 Introduction

In order to get some insight into the local people's perception on the need to include a number of specific species in forest management practices, several indicators were applied. They include the hierarchy of importance, the species conserved or tended by the people themselves and the desirability of conservation with regard to future management.

II.8.2 People's perception on the relative importance of NTFP species

For the major use categories, the respondents were asked to mention the six most important species. These categories were spices and condiments, fruit and nut bearing species, medicinal plants and timber species. In Table II.15, the results are summarised for each of these categories, as well as the number of times the species was mentioned.

Within the category of condiments and spices only a small number of species was mentioned. Especially the oil-containing nuts and almonds were frequently considered as being very important. These include also the species *Poga oleosa* and *Panda oleosa*, in spite of the fact that it are mainly Bagyeli people who extract and unshell the fruits. Although hardly consumed in the study area, *Ricinodendron heudelotii* (Ezzezang /Njansang) was also frequently mentioned. Apparently its

commercial value is well known. *Baillonella toxisperma* (Adjap; Moabi) was not as often mentioned as might be expected, although people highly appreciate the oil made from its seeds. This is probably due to the rareness of the tree, which restricts the use of the nuts.

Also, with regard to the fruit and nut bearing species, only a few species were mentioned. Cola nuts (*Cola acuminata* and *C. nitida*) do not figure in the listing. This is probably because most people only exploit planted trees. Only one nut bearing species is included, *Coula edulis* (Ewomen/Komen). All other species mentioned are fruit species.

In the list of construction materials only wood species are listed. Cane species, mostly used as ropes, were mentioned but not frequently. The two most important, *Coula edulis* (Ewomen) and *Xylopia aethiopica* (Nkala) species are not commercially exploited. All other species mentioned are also commercially exploited for their timber, although they are not the most frequently exploited or valuable species, except for *Entandrophragma cylindricum* (Asié/Sapelli).

The high number of species mentioned as important medicinal plants reflects the wide array of diseases and the numerous treatments. *Alstonia boonei* (Ekuk) was the most frequently mentioned species, which is not surprising given the numerous treatments in which the species is applied (see Chapter II.6.3). More than 75% of the informants mentioned this species.

Table II.15 The most important NTFP species for four major use category groups according to the local people (in percentage of the total number of respondents)

Scientific name (# species recorded)	**Bulu name**	**Frequency in % of total number of respondents**
Condiments and spices (14):		
Irvingia gabonensis	Ando'o	
Poga oleosa	Angale	77
Ricinodendron heudelotii	Ezzezang	62
Panda oleosa	Afane	50
Baillonella toxisperma	Adjap	35
Elaeis guineensis	Alen	27
Scorodophloeus zenkeri	Olon	15
Coula edulis	Ewomen	15
Xylopia spp.	Mvolong	8
Piper guineense	Nkala	4
Unknown	Abominjang ndik	4
Fruit and nut bearing species (18):		
Trichoscypha acuminata	Mvut/Abut	73
Trichoscypha arborea	Engong	58
Coula edulis	Ewomen/Komen	58
Cola spp.	Mvoi	38
Irvingia gabonensis	Ando'o	35

Table II.15 The most important NTFP species for four major use category groups according to the local people (in percentage of the total number of respondents) (cont'd)

Scientific name (# species recorded)	Bulu name	Frequency in % of total number of respondents
Cola ricinifolia	Akomengwoé	31
Dacryodes macrophylla	Tom	27
Hexalobus crispiflorus	Owé	19
Garcinia kola	Oniay	15
Antrocaryon klaineanum	Ozakong	15
Construction materials (26):		
Coula edulis	Ewomen	73
Xylopia aethiopica	Nkala	54
Mitragyna stipulosa	Afobezam	54
Entandrophragma cylindricum	Asié	38
Pterocarpus soyauxii	Mbe	23
Nauclea diderichii	Akondok	23
Staudtia kamerunensis	Mbonda	19
Milicia excelsa	Abang	15
Eribroma oblonga	Eyong	15
Lovoa trichilioides	Bibolo	15
Medicinal plants (62):		
Alstonia boonei	Ekuk	77
Rauvolfia vomitoria	Obaton	35
Coula edulis	Ewomen	27
Pentaclethra macrophylla	Ebay	23
Musanga cecropioides	Asseng	23
Guibourtia tessmannii	Oveng	23
Piptadeniastrum africanum	Atui	23
Picralima nitida	Ebam	19
Tabernaemontana crassa	Etoan	19
Mitragyna stipulosa	Afobezam	19

Source: fieldwork 1994, NTFP reconnaissance survey

II.8.3 Conservation of NTFP species

Two questions were asked concerning the conservation of NTFP species. The first question referred to the local practise of preserving trees in cocoa plantations and at the moment of land clearing. Secondly, the opinion of the respondents was asked on the species which they considered to be in need for protection in future management schemes.

Figure II.13 shows that farmers feel that the species preserved by them also need to be protected in managed forest. The most important are *Irvingia gabonensis, Baillonella toxisperma, Coula edulis, Entandrophragma cylindricum, Terminalia superba, Guibourtia tessmannii, Trichoscypha acuminata* and *Ricinodendron heudelotii.* These are medium-sized to very large trees. Most are fruit and nut producing species, and/or used for their timber.

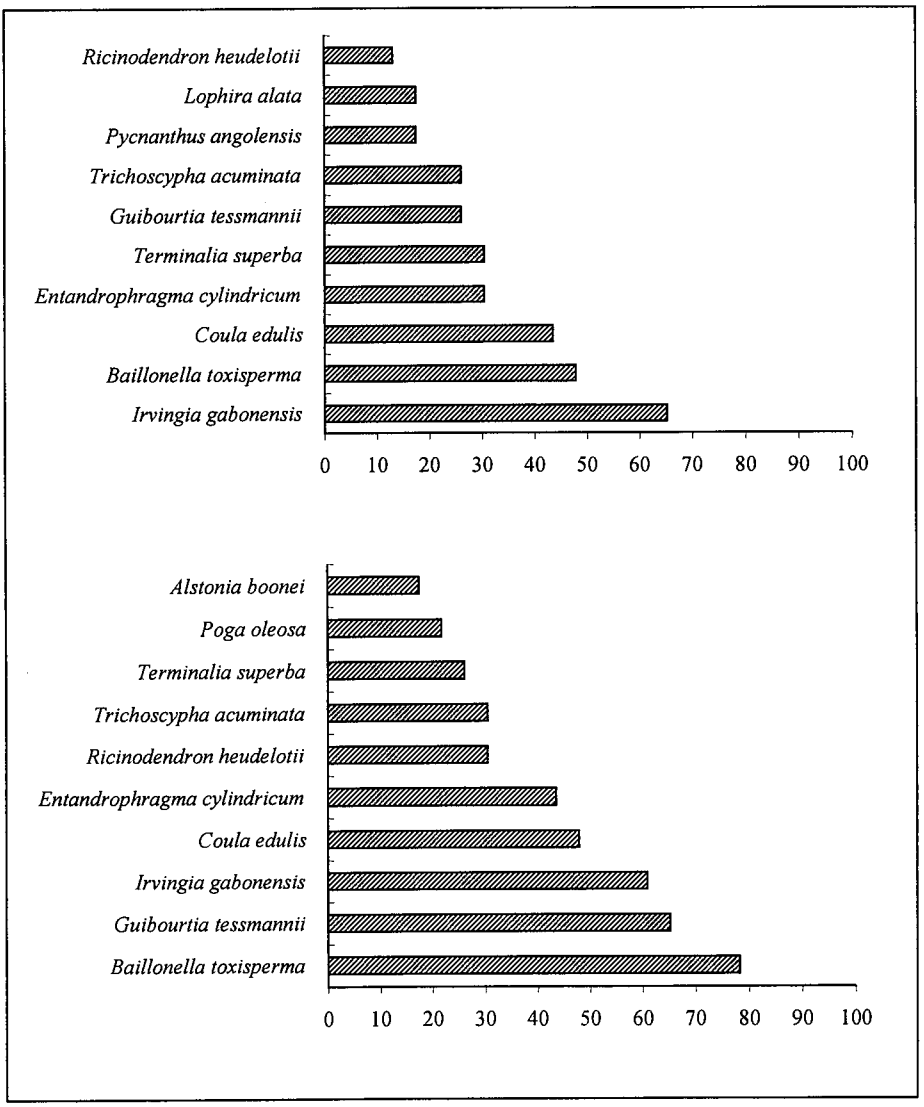

Figure II.13 NTFP species which are actually protected by farmers (above) and which should be taken into account in future forest management schemes (below)

Although *Lophira alata* ('Azobé') is the most important commercial timber species, and in spite of its importance for medicinal and construction purposes, the species, surprisingly enough, does not figure in the ranking of species which would deserve special attention for conservation in forest management.

II.9 LOGGING OPERATIONS: PEOPLE'S PERCEPTION

II.9.1 General

Until recently, timber exploitation was entirely based on arrangements between the national government and the logging companies. The local perceptions, norms and the use of NTFPs were not or hardly taken into account (Foahom and Jonkers, 1992). In the new forestry law and in initiatives for forest management such as the timber certification, local people's interests and their role in forest management receive more attention, although the practical applicability of ideas and concepts needs to be further developed.

Officially, the local population only benefits from logging activities by the transfer of taxes into a national development fund by the concessionaires. In reality, the former practice of establishing direct arrangements between a village and concessionaire is still more or less applied. In negotiations, concessionaires can offer presents (food and beverages) and indirect compensations such as contributions to road building, schools, dispensaries or football fields, as well as direct compensations for the damage caused to crops.

The presence of logging companies also may provide some other benefits to the local population. Some people are engaged as labourers and the settlement of employees from outside the village increases the market potential for agricultural and non-agricultural produce. Both advantages have, however, a temporary character.

Compensation arrangements and temporary benefits hardly seem to satisfy the people in the study area. Most complaints concern the direct and indirect damage caused by logging operations, such as:

- the damage caused to forests in general by the construction of roads and landings, as well as skid trails. People complain for instance that they get lost in the forest;
- the negative impact on NTFP resources, which includes the felled NTFP-producing trees and the damage caused to neighbouring trees;
- the disturbance of watercourses and drinking water sources by the machinery used;
- the drive-off of (mainly larger) game which does not return after the logging operations have stopped.
- the abusive use of other resources such as game or fruits and nuts by employees of the logging company. In this respect, the felling of NTFPs bearing trees to have easy access to a certain product was reported several times.

II.9.2 Changes in the availability of NTFP resources: the role of logging

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), which are both species who prefer disturbed habitats.

The majority of people declare however, that logging causes the decrease in availability of certain NTFP resources.

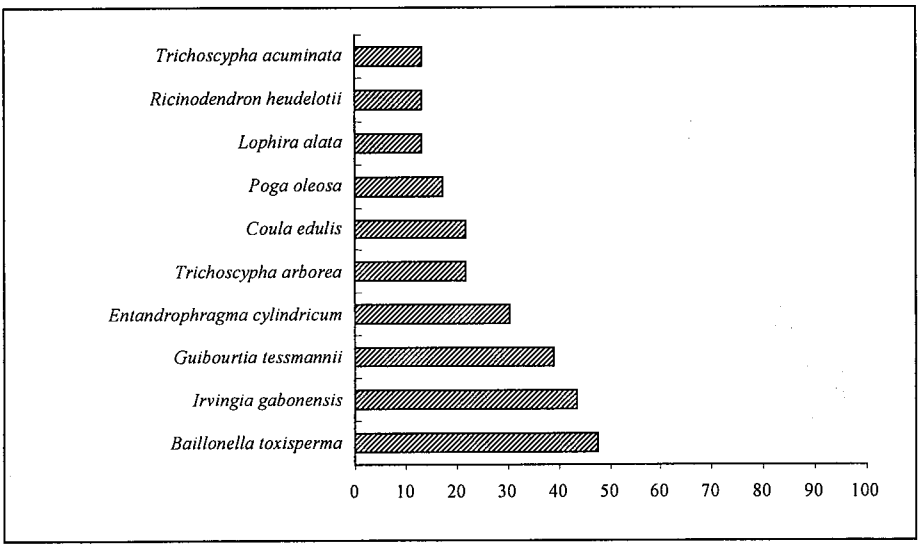

Figure II.14 NTFP resources which are affected by logging, according to the respondents' perception

Tree species which, according to the respondents, are seriously affected by logging (see Figure II.14) are the Moabi or *Baillonella toxisperma* (60%), Bubinga or *Guibourtia tessmannii* (40%) and Sapelli or *Entandrophragma cylindricum* (30%). These are all highly valued but also rare commercial timber trees. A number of trees frequently mentioned as being affected by logging are not commercially harvested. These are the bush mango *Irvingia gabonensis* (40%), Njansang or *Ricinodendron heudelotii* (20%), *Trichoscypha* spp. (15%), *Poga oleosa* (30%) and *Coula edulis* (25%). In addition, a few (< 15%) respondents mentioned a number of commercial timber species, which are also used by the local people for construction and in some cases for medicinal purposes, such as Fraké (*Terminalia superba*), Iroko (*Milicia excelsa*), Azobé (*Lophira alata*) and Bibolo (*Lovoa trichilioides*).

II.9.3 Commercial timbers and their importance for the local people

In order to obtain a further insight into the possible effect of logging on NFTP availability a comparison was made between the importance of individual timber species for the local population and for the concessionaire GWZ (Table II.16).

Table II.16 The importance of tree species for commercial timber and NTFP extraction

Scientific name	Pilot name	% of total vol. Timber exploit.[1]	Use frequency[2]	Importance[3]	Wish for protect.[4]
Antrocaryon klaineanum	Angongui	<0.01	24	3	1
Baillonella toxisperma	Moabi	0.4	74	17	18
Canarium schweinfurthii	Aiele	1.4	10	-	-
Distemonanthus benthamianus	Movingui	2.3	6	-	1
Entandrophragma cylindricum	Sapelli	0.2	24	9	12
Eribroma oblonga	Eyong	0.5	10	3	3
Erythrophloeum ivorense	Tali	4.4	26	-	3
Zanthoxyllum heitzii	Olon	0.6	12	3	1
Guibourtia tessmannii	Bubinga	0.02	44	8	15
Khaya ivorensis	Ngollon	1.2	3	-	-
Lophira alata	Azobe	60.1	26	-	2
Lovoa trichilioides	Bibolo/Dibetou	3.3	7	-	3
Milicia excelsa	Iroko	0.2	14	3	3
Mitragyna stipulosa	Bahia	<0.01	39	-	4
Nauclea diderichii	Bilinga	3.1	13	-	-
Piptadeniastrum africanum	Dabema	0.02	11	9	4
Pterocarpus soyauxii	Padouk	1.8	22	6	1
Staudtia kamerunensis	Niove	2.2	9	6	3
Terminalia superba	Frake	3.5	25	5	6

Notes: [1] GWZ figures based on the quantities of logs which entered the Bidou sawmill and which were shipped directly from the Kribi port.
[2] The number of times the use of a species was indicated.
[3] The number of times a species was mentioned by local people as being important.
[4] The number of times a species was indicated as important to be taken into account for the control of damage of logging.

Source: fieldwork 1994, NTFP reconnaissance survey.

Of the 31 commercial timber species actually exploited in the study area, 19 are also used by the local population. In total about 86% of the total volume exploited by the concessionaire concerns species of importance to the local people.

The volume harvested per species as percentage of the total volume of timber exploited was used as an indicator for the importance of the individual timber species for GWZ. The data used include the total volume of timber processed at the Bidou sawmill and the logs exported from the Kribi port in a one year period (1993-1994).

The relative importance for local people is expressed by the number of times:
- the use of a species was indicated;
- a tree species was mentioned as being important for food, medicinal or construction purposes;
- people expressed the wish that a tree deserves special attention for conservation during logging activities.

The trees which appear to be most vulnerable to conflict situations are Moabi (*Baillonella toxisperma*), Bubinga (*Guibourtia tessmanni*) and Sapelli (*Entandrophragma cylindricum*). These three species were most frequently mentioned as species which should be better conserved in the future.

Guibourtia tessmannii (Bubinga) is mainly of magic-religious value. 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 seeds is very valuable and the tree has many medicinal functions. *Entandrophragma cylindricum* (Sapelli) is mainly appreciated for its timber. It is frequently used for furniture, doors and windows.

In terms of quantities harvested, the three species do not contribute much to the total volume harvested by GWZ. However, they are the highest priced timbers in the area. The mercurial alues of these species are than more as four times those for example Azobé (*Lophira alata*).

Azobé is the most important timber species for GWZ (60% of the total volume). Although local people use the tree for construction also to treat toothaches and backaches, they do not attribute a special importance to the tree. This could indicate that the harvesting of timber as such does not cause a big problem. It becomes a problem in case of religious values or when people perceive that logging affacts seriously the availability of NTFPs.

II.10 COMMERCIALISATION OF NTFPS

II.10.1 Introduction

Four categories of actors involved in the NTFP trade can be distinguished. The first one consists of the *gatherers* who collect the NTFPs in the forest. They can sell their products themselves in the surrounding markets, but mostly they sell to *assemblers* or to *retailers ('Buyam sellam')*. Assemblers act only as middlemen by selling the produce to *wholesalers* or to *retailers*. *Retailers* assure mostly the link to the consumers in the urban areas. They sell the merchandise in small quantities (a piece, in glasses or piles).

Most retailers are grouped in urban markets. They offer a wide range of NTFPs, especially condiments. In addition, they sell other household and agricultural products (e.g. soap, groundnuts and tomatoes). This situation is an advantage for the consumers, who thus have a large choice (Abbott and Makeham, 1990).

Some NTFPs are sold by specialised retailers who only offer one or two NTFPs. The reason for this is that these NTFPs require a special treatment. The 'Ocok' leaves (*Gnetum* spp.) for example, require the slicing of the leaves which takes time and needs expertise. This is difficult to combine with the selling of other products.

The marketing process does not follow a fixed pattern. An actor is free to bypass other types of actors. A forest villager might, for example, travel himself to an urban market and sell his merchandise directly to retailers or consumers. Traders may also have different roles at the same time or change their activities from one year to another (Ndoye, 1995). They can simultaneously act as assemblers, middlemen and retailers. The motivation for changing activities can be the immediate need for cash or an expected price behavior.

There are many people involved in the marketing of NTFPs: 71 retailers were counted at the market of Kribi and 36 in Ebolowa. In Africa, women play an important role in the trade of food (Okafor, 1991). Falconer (1990) explains that this is because women do not own capital and land, which makes trade one of the rare opportunities to earn a cash income.

A study on NTFP trade in the humid forest zone of Cameroon (Ndoye, 1995) showed that 94% of all traders were women, including retailers as well as wholesalers. In the present survey, 40 retailers and 9 wholesalers were interviewed. The dominance of women appeared to be stronger in the retail sector than in the wholesale sector. From the nine male respondents, only five were retailers. Two men were temporarily replacing their wives.

Men mainly do transport. For women, transport over long distances is said to be too heavy and time consuming (Henkemans, 1995). Women are less mobile than men are, as they have their household obligations.

II.10.2 NTFPs commercialised in the study area

Figure II.15 presents the results of the inquiries among the local population concerning the commercialisation of NTFPs. The top bars ('Commercialised NFTP') present the frequency with which a product has been indicated as an important source of income. The bottom bars ('NTFPs sold last year') reflect the percentage of respondents who sold a certain product in the preceding year.

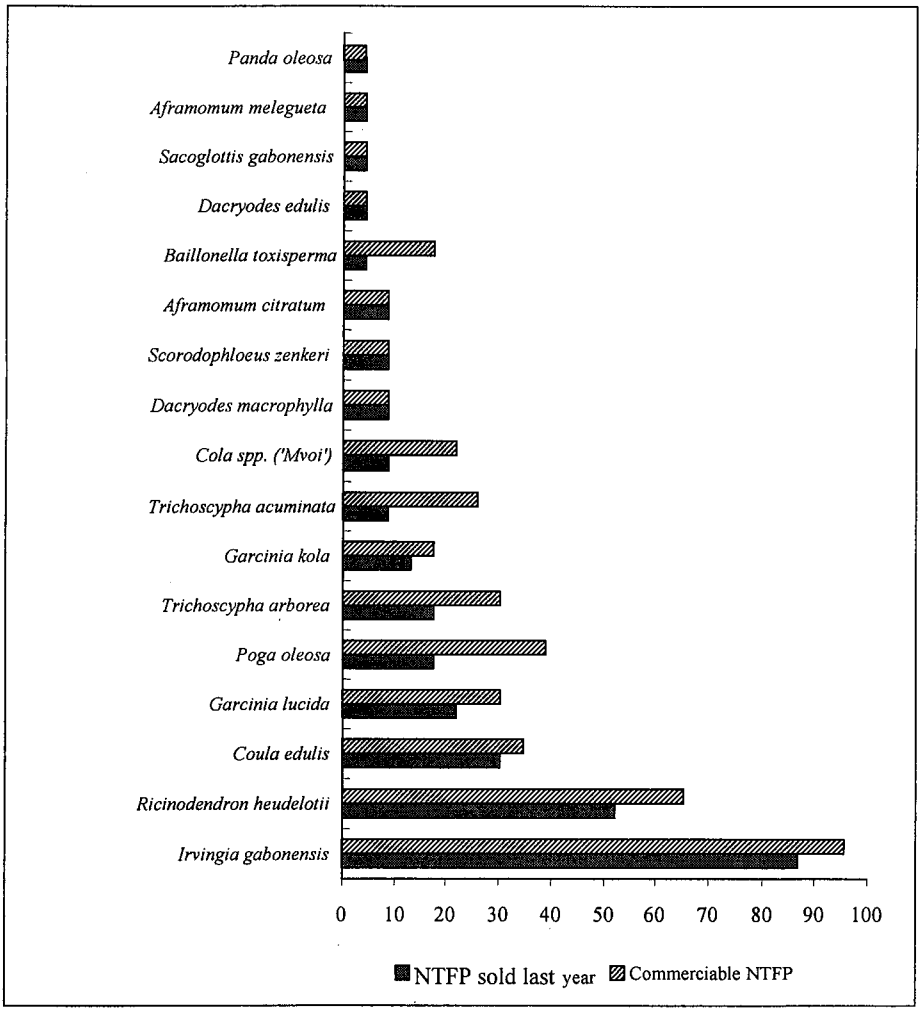

Figure II.15 Frequently commercialised NTFPs in the study area

Bush mango (*Irvingia gabonensis*) and 'Njansang' (*Ricinodendron heudelotii*) are the most frequently sold NTFPs in the study area.

A number of products traded in other areas, apparently are not commercialised in the study area. None of the respondents said to sell rattans, although there is an important demand, at least around urban centres. Also a number of widely traded condiments which are also available in the surrounding markets are not sold in the study area. Their use is not or hardly known. Examples are 'Quatre cotés' from

Tetrapleura tetraptera (Kpwa'sa), 'Akui' from *Xylopia* spp. (e.g. Nkala, Mvomba), 'Pévé' from the wild nutmeg *Monodora* spp. (Fio) and the seeds from *Canarium schweinfurthii* (Otou).

Twelve NTFPs were specifically observed in a marketing survey involving the markets of Kribi and Ebalowa. An overview of these NTFPs is given in Table 22.

Some products included in other NTFP surveys (Ndoye 1995; BEDI-SNV, 1992) were not taken into account in this study because they are fully domesticated (*Dacryodes edulis, Cola* spp.) or because they may come from plantations (e.g. oil palm fruits (*Elaeis guineensis*)).

Except for the ocok leaves which are consumed fresh, the NTFPs listed in Table II.17 are sold in a dried form and therefore can be easily stored. A long conservation period of the NTFPs ensures the availability of these products throughout the year in spite of their seasonal production. All these NTFPs are used as a condiment or spice in cooking and some (e.g. Ndong or *Aframomum melegueta*) also have medicinal applications. The quantities in which they are sold are small, but the prices are rather high which implies a high commercial value (Ros-Tonen *et al.,* 1995).

Table II.17 NTFPs considered in the marketing survey: names, consumers purchase unit and price indication

Scientific name	Local name	Consumers purchase unit	Price indication (in CFA F)
Ricinodendron heudelotii	Njansanga pile	(40 seeds)	25-50 / pile
Irvingia gabonensis	Bush mango	a pile (25 almonds)	50-100 / pile
Xylopia spp.	Akwi	3 fruits	10-15/3 fruits
Aframomum spp.	Mbongolo	1 fruit	5-50 / fruit
Aframomum melegueta	Ndong	1 fruit	10-100 / fruit
Monodora spp.	Pévé	3 seeds	5-30 / 3 seeds
Garcinia lucida	Eson bark	1 piece	50-100 / piece
Scorodophleus zenkeri	Olon bark	1 piece	10-75 / piece
Scorodophleus zenkeri	Olon fruit	3 fruits	30-75 / 3 fruits
Tetrapleura tetraptera	Quatre côtés	slice of 1 fruit	10-25 / slice
Gnetum spp.	Ocok	small plate	00-125 / plate
Piper guineense	Poivre sauvage	bags of 160 seeds	25 / bag

Note: 1 US$ was 500 CFA F at the time of the survey
Source: fieldwork market survey, Apr.-May 1995, M. Kempkes

Difficulties of processing are often mentioned as a major constraint to NTFP trade (Padoch, 1988; Henkemans, 1995). Processing is basic. To enable storage,, NTFPs are dried above the household fire place or in the sun. Processing can also be needed to extract the edible parts, as in the case of the almonds of Bush mango and Njansang. The extraction of the almonds is done at the gathering site, under the producing tree, or in the village. After splitting the fresh fruits, the almonds can be

taken out. The kernels can also be squeezed out ounce the fruits are rotten. The kernel then needs to be split or cracked to take out the almonds. The removal of the almonds after rotting is practised in the South-West Province (Henkemans, 1995). The whole kernels can also be stored, which necessitates cracking afterwards, but may allow a longer storage period (Malleson, 1994). Henkemans (1995) states that because of the tedious character of extraction, cleaning and cracking, Njansang collection is unpopular in the South-West Province of Cameroon.

In Nigeria, bush mango is industrially processed (Henkemans, 1995), but in Cameroon they are only processed manually. Further processing at village level could provide higher returns to the gatherers (Malleson, 1994). The bush mango can, for example, be turned into paste which, provided it is kept dry, can be stored for a longer period than the kernels while requiring a smaller volume.

II.10.3 Markets of NTFPs

Urban centres are meeting points for assembly and distribution in trade (Abbott and Makeham, 1990). For some NTFPs, like bush mango (*Irvingia gabonensis*) and cola nuts (*Cola* spp.), neighbouring countries are also important markets. The towns of Kribi and Ebolowa are the two nearest to the study area, respectively situated to the east and to the west. The two largest cities of Cameroon, Douala and Yaoundé, can be reached from Kribi and Ebolowa in a few hours. Most wholesalers can be found in Douala and Yaoundé. During the present study (April and May 1995), only few wholesalers were active in Ebolowa. In Kribi only retailers were active.

The survey showed that traders from Kribi, Ebolowa and Douala purchase most of their merchandise in their own town (see Table II.18). Only few of the interviewed traders (7-12%) buy their NTFPs in forest villages.

Table II.18 Location of NTFP purchase of traders in Kribi, Ebolowa and Douala

	Location of purchase		
Market	*Same town*	*Other town*	*Village*
Kribi	51%	37%	12%
Ebolowa	76%	13%	11%
Douala	93%	0%	7%

Source: fieldwork market survey, Apr.-May 1995, M. Kempkes

The purchase behaviour is subject to seasonal change. During the production season, the products appear in large amounts on the different markets. The rest of the year, retailers depend on the stocks of assemblers and/or wholesalers.

Compared to other urban markets, the retailers from Kribi seem to rely largely on supplies from another town, which is Douala (see Table II.18).

II.10.4 Variation in supply and prices

The kinds and quantities of NTFPs offered on the markets vary throughout the year. During and shortly after the production season large quantities are offered. Consequently, the prices of the NTFPs drop. Although the seasonal character is limited for the humid forest zone of Cameroon as a whole, because of the interregional differences in the production seasons, the local influence of seasonality on the production can be considerable (Ndoye, 1995).

During the production season, forest villagers store NTFPs designated for household consumption. Henkemans (1995) noticed that 10 to 20% of the bush mango harvest is preserved for domestic use. The rest of the gathered NTFPs is sold. Assemblers and wholesalers buy large quantities that are partly resold immediately and partly stocked. Retailers regularly purchase small quantities and do not have stocks due to lack of capital.

At the end of the production season, the quantities of NTFPs for sale decrease, while the prices rise. Ndoye (1995) found for 'Njansang' (*Ricinodendron heudelotii*), for example, that the purchase price varied from 36,000 to 92,000 CFA F per bag of 84 kg.

Most retailers get their supplies from wholesalers during the off-season. Therefore, the latter largely determine the prices for a whole region (Abbott and Makeham, 1990).

Also in the Tropenbos-Cameroon study area, prices were said to vary considerably for nine (of the twelve) NTFPs studied. These nine NTFPs are said to have maximum prices that are 1.5 to 2 times as high as the prices during the production season. For some other NTFPs, respondents said there is hardly any price variation. These products can be gathered all the year round, for example olon bark (*Scorodophloeus zenkeri*), esok bark (*Garcinia lucida*) and ocok leaves (*Gnetum* spp.). Henkemans (1995) also mentions the ocok leaves as a NTFP with a fairly stable price throughout the year.

Farmers tend to sell their produce during or immediately after the production season, when the prices are low. According to Ndoye (1995), farmers are not or hardly informed about the prices. Only 20% of the extractors seem to be aware of the prices that prevail in the urban centres. The income provided by the NTFPs could be raised and spread more equally throughout the year if villagers would stock their produce. More people would then be stimulated to exploit NTFPs (Nkwatoh, 1994).

II.10.5 Value of marketed NTFPs and benefits

The marketing survey by Ndoye (1995) in the humid forest zone provides an indication of the value of marketed NTFPs. The total value of NTFPs marketed during half a year for 31 markets was estimated at 643.6 million CFA F (1.3 million US $) (Ndoye, 1995).

Some NTFPs are sold to traders from neighbouring countries. For some products the crossborder trade is quite considerable. The estimated volume of bush mango exported to Gabon or Equatorial Guinea, for example, amounts to 41.9 millions CFA F per year (Ndoye, 1995), which represents 27% of the total volume traded. According to the same author, the value of *Garcinia kola* traded to Gabon is 6.9 millions CFA F.

The value of NTFPs marketed in Kribi and Ebolowa is estimated at 3.5 millions CFA F on a yearly base, based on the figures provided by retailers on the quantities purchased and the average selling prices. This amount is probably underestimated, as for most NTFPs it is based on the marketed volumes during a non-productive period of the year. Based on the estimated value of marketed NTFPs in Kribi and Ebolowa, the average yearly income for the retailers comes to 26,000 CFA F. However, the gross margins recorded from retailers in Kribi and Ebolowa appear to be quite high. For the two NTFPs sold in the largest quantities (Njansang and bush mango) the margins are the lowest, namely 86 and 93%, respectively. For the other NTFPs, margins found are higher, up to a maximum of 359% for akwi (*Tetrapleura tetraptera*).

Table II.19 The trade in bush mango: percentage of the sales price received by marketing participants

Percentage of sale price	*Border trade*	*Internal trade*
Farmers	24.0 - 46.0	59.3 - 56.2
Traders	68.4 - 49.7	38.0 - 37.3
Transporters	7.5 - 2.4	1.6 - 2.0
Municipalities	0.0 - 1.3	0.0 - 0.0
Others (storage, losses)	0.1 - 0.6	0.0 - 1.1

Source: Ndoye (1995)

Table II.19 gives an example of the distribution of the benefits from trade among the different participants expressed as a percentage of consumer prices. Depending on the destination of the NTFPs (crossborder or internal trade), the farmers receive 25 to 60% of the selling price for bush mango. For other products, this percentage is somewhat higher. The high percentage received by the traders for crossborder trade can be explained by the risky character of this trade. This is due to unstable markets and price levels, lack of market information and fluctuating exchange rates (Henkemans, 1995; Ndoye, 1995).

II.10.6 Marketing costs

Marketing costs consist of storage costs, losses, opportunity costs of capital, taxes paid at the markets and transportation costs. The lack of transport facilities and the high transportation costs are often pointed out as main constraints to the further development of NTFP trade (Padoch, 1988; Anderson, 1990). Ndoye (1995) found that the transportation costs range from 31 to 99.6% of the total marketing costs, depending on the type of NTFP and the distance to the market.

In the Tropenbos study area, roads connecting the gathering sites to the nearest urban markets are unpaved. During the rainy season, these roads get muddy. Transport then takes more time, is more risky and transporters are therefore less willing to drive in this area.

According to Ndoye (1995), the average price per kilometre for transporting a 80 liter bag of NTFPs in the Cameroonian humid forest zone is 25 CFA F. In the South Province, where the Tropenbos study area is located, the average transport cost is about 35 CFA F/km. The bad condition of the roads and the scarcity of transport facilities might explain why the provincial average is higher than that for the humid forest zone as a whole. In the East Province where hardly any paved roads exist, transportation costs are as high as five times the average.

The transport between the larger towns in the South Province (Douala-Kribi and Ebolowa-Yaoundé) is not hindered by the lack of facilities nor by high costs. However, retailers complain about bad service, frequent delay and damage to or losses of the cargo. For transport, people depend on cars owned by private companies which, according to western standards, are in poor condition and overloaded.

II.10.7 Income from NTFPs

Most people sell NTFPs in small quantities ("I sold half a bucket of.."; "I sold for 4,000 CFA F", etc.) during or just after the production season. Because of the number of products the income can still be quite significant. In case of the bush mango, the quantities can be considerable - up to 400-450 kilo - which represents an annual income of 200,000 CFA F, comparable to what cocoa farmers earn with the sale of cocoa.

Henkemans (1995) estimated the earnings from the collection and selling of bush mango in the South-West Province of Cameroon at 750 CFA F/person/day, and that a similar daily income can be obtained from the collection and selling of 'Ocok' leaves (*Gnetum* spp.).

An important part of the traded NTFPs stays in the village. The commercialisation of products such as bush meat and palm wine is restricted to the village or

neighbouring villages. Nevertheless, they can provide a significant source of income for individual households.

II.11 SUMMARY AND CONCLUSIONS

Importance of different types of NTFPs
The reconnaissance survey of two months provided much information on the functions of NTFPs and the numerous species from which they are derived. The results demonstrate the importance of NTFPs for the local population. NTFPs are used in every household, they are part of almost every aspect of rural life and they offer a range of possibilities to earn an income. People are collecting many forest species for a wide range of uses. During the survey 280 animal species were recorded to be consumed and more than 500 plant species were found to be used for 1,100 different purposes.

Among the most important categories of NTFPs are wild animal resources such as bushmeat, fish, crustaceans and molluscs, which serve as a major source of protein. The recorded average weight of 8.2 kg of bushmeat weekly captured per household provides an indication of the level of exploitation. This quantity, however, was registered in a peak period for hunting. During other periods of the year, fishing and the collection of small animals may be of more importance. Hunting is probably still a subsistence activity for which trade is merely to respond to the local demand, except for the (temporal) rise in demand caused by the presence of logging companies.

The most important group of vegetable NTFPs are food products such as seeds, fruits, exudates and mushrooms that are used as ingredients of meals, snacks and beverages. They are highly appreciated for their taste and they are part of the daily consumption. These products are not only used for household consumption, but also for trade. They are by far the most important group of traded NTFPs and they are marketed in urban markets inside and outside the country.

Compared to other food providing NTFP plants, the use of starchy food and vegetables is less varied and amounts consumed are small. These products are not primarily collected from the forest, but mainly derived from cultivated species.

A large variety of species (300) are used for medicinal applications. The use of such medicinal products is common in all households, and the knowledge of medicinal plants is very well developed among all groups within the communities.

The forests also provide the bulk of the material for house construction as well as for household, agricultural, hunting and fishing equipment. For each of these applications, clear preferences exist with regard to the species from which the raw

materials are derived. In some cases, this leads to high exploitation levels which may have a considerable impact on the available resources. An example is the use of the highly valued timber from *Coula edulis* (Ewomen) as poles for the construction of houses.

Prospects for management and the development of sustainable extraction
The survey also provided information on the dynamics and sustainability of NTFP use. Notably the extraction of NTFPs for commercial purposes is rather dynamic. Over time, important changes occur in types and quantities of NTFPs exploited for trade, as well as the people involved in such commercial extraction. Products extracted for international markets, such as *Strophanthus gratus*, appear to be subject to changes in price and demand. Such fluctuations limit the options for developing methods for their sustainable management.

Products sold mainly on local markets are more stable in price and are subject to a growing demand. For instance, in a period of twenty years, the extraction of the condiment Njansang (*Ricinodendron heudelotii*) developed from non-existing to a second position in the commercialised NTFPs. These locally marketed products seem to hold more promise for sustainable management.

Two types of local markets can be distinguished, i.e. urban markets and village markets. The sale of NTFPs on urban markets is restricted to products yielding relatively high prices per unit of volume, such as condiments, spices and flavourers and, to a lesser extent, fresh fruits. Except for bush mango (*Irvingia gabonensis)* and Njansang (*Ricinodendron heudelotii*), these products are consumed and sold in very small quantities which probably restricts the opportunities to develop commercial extraction.

In the studied villages the marketing of these products seems to be limited and unstable. This is probably mainly due to the poor infrastructure in the area, resulting in high transport costs.

Other products sold at the village markets such as palm wine, liquor derived from palm wine, bushmeat and fish are sold in larger quantities. The sale of these products forms an essential part of the income of the local people.

During the survey some threats to the sustainability of NTFP extraction were noted. Shotgun hunting is a matter of concern with respect to the conservation of animal resources and their sustainable exploitation. This type of hunting especially affects larger and mostly scarce game species. Especially primates are vulnerable to shotgun hunting; they form 78% of all the animals shot. In contrast, hunting by trapping primates form only 2% of the total numbers captured.

Local people indicated that commercial timber exploitation is another factor affecting the availability of certain NTFPs. Some commercial timber species also produce NTFPs. Two of such species, which are very important for local people, are very rare and deserve special attention, i.e. Moabi (*Baillonella toxisperma*) and Bubinga (*Guibourtia tessmannii*).

Further research on NTFPs

As the number of species used as NTFP is very large, it will not be feasible to take them all into account in designing sustainable forest management. Therefore a selection was made of the most important plant species to be included in the next phases of research. The list of selected species includes:

- all species which were indicated by the respondents as being the most important;
- species with the highest frequency of use within a specific use category and species which are used frequently for various purposes;
- all species with a market value and which therefore could serve as a source of revenue. These include NTFP resources actually commercialised in the region, as well as resources which are not yet exploited for commercial purposes, but which have a known market value;
- all NTFP species which are also commercially exploited for their timber.

In total 85 species and species groups were selected. Their names and major characteristics such as habit, parts of the plant extracted, types of uses and the total number of times a certain use was indicated, are summarised in Table II.20. The ecology of these species will be further elaborated in the following chapters of this book.

Fam.[1]	Scientific name	Bulu/'Pilot name'	Habit	Parts used[2]	Types of uses	# of times recorded
ANAC	*Antrocaryon klaineanum*	Ozakong/'Angongui'	m/l-sized tree	fr,ba,se	snack, medicines	24
ANAC	*Trichoscypha arborea*	Engong	m-sized tree	fr,ba	snack, medicines, equipment, revenue (fr)	28
ANAC	*Trichoscypha acuminata*	Mvut/Abut	s/m-sized tree	fr,ba,wo	snack, medicines, revenue (fr)	30
ANNO	*Anonidium floribundum*	Ebom afan	m-sized tree	ba,fr	medicines, snack	6
ANNO	*Enantia chlorantha*	Mfo	s/m-sized tree	ba,wo,le	medicines, furniture, equipment	41
ANNO	*Hexalobus crispiflorus*	Owe	m-sized tree	fr,wo	snack, condiment, lure, equipment, revenue (fr)	23
ANNO	*Monodora myristica*	Fio	m-sized tree	se	condiment, revenue (fr)	2
ANNO	*Pachypodanthium staudtii*	Ntom	m/l-sized tree	ba	medicines	44
ANNO	*Xylopia aethiopica*	Nkala	s-sized tree	wo,ba,fr	construction, furniture, medicines, commerciable condiment (fr)	37
ANNO	*Xylopia quintasii*	Mvomba	s/m-sized tree	ba,fr	condiment, medicines, construction, commerciable condiment (fr)	2
APOC	*Alstonia boonei*	Ekuk	l-sized tree	ba,ex	medicines, additive palm wine	79
APOC	*Funtumia elastica*	Etendamba	m-sized tree	ba,wo,ex	furniture, construction, medicines	13
APOC	*Picralima nitida*	Ebam	s-sized tree	ba,ro,st	medicines, equipment	29
APOC	*Rauvolfia caffra*	Esombo	m-sized tree	le,ba	medicines, equipment	6
APOC	*Rauvolfia vomitoria*	Obaton	s-sized tree	fr,ro,ba,le	medicines	42
APOC	*Strophanthus gratus*	Enay	liana	se	hunting/fishing poison, revenue	2
APOC	*Tabernaemontana crassa*	Etoan	s/m-sized tree	ex,le,ba	medicines	38
BIGN	*Spathodea campanulata*	Esusuk	m-sized tree	ba,ex	medicines	11
BOMB	*Ceiba pentandra*	Dum	l-sized tree	ba	medicines	5
BURS	*Canarium schweinfurthii*	Otu/'Aiele'	l-sized tree	ex,se,ba,fr	fuel, witchcraft, medicines, commerciable (se)	10
BURS	*Dacryodes edulis*	Assa mingung	m-sized tree	fr	snack	2
BURS	*Dacryodes edulis*	Assa	m-sized tree	fr,ba	vegetable, medicines, revenue	2
BURS	*Dacryodes klaineana*	Tom afan	m-sized tree	fr	snack	2
BURS	*Dacryodes macrophylla*	Tom	m-sized tree	fr	snack, revenue (fr)	18
BURS	*Santiria trimera*	Ebaptom	m-sized tree	fr	snack, commerciable (fr)	3
CAES	*Distemonanthus benthamianus*	Eyen/'Movingui'	m/l-sized tree	wo,ba,fr	construction, medicines	6
CAES	*Erythrophloeum ivorense*	Elon/'Tali'	l-sized tree	ba,wo	medicines, furniture, construction	26
CAES	*Guibourtia tessmannii*	Oveng/'Bubinga'	l-sized tree	ba,tr,ex,wo	witchcraft, medicines, equipment	44
CAES	*Scorodophloeus zenkeri*	Olon	m-sized tree	ba,se	condiment, revenue (ba, se)	27
CECR	*Myrianthus arboreus*	Angokom	m-sized tree	fr,ba,le,wos	snack, medicines, construction, vegetable	28
COMB	*Terminalia superba*	Akom/'Frake'	l-sized tree	ba,wo	medicines, equipment, construction	25
COMP	*Vernonia conferta*	Abangak	s-sized tree	ba,le	medicines	20

[1] See list abbreviations scientific names of families

[2] ba: bark; ex: exudate; fr: fruit; le: leaves; ro: roots; se: seeds; sp: sprouts; st: stem; th: thorns; wo: wood

Table II.20 Selected species: names, functions and habitat (cont'd)

Fam.[1]	Scientific name	Bulu/'Pilot name'	Habit	Parts used[2]	Types of uses	# of times recorded
EUPH	*Alchornea cordifolia*	Aboe	s-sized tree	le,wo,fr	medicines, equipment, lure	39
EUPH	*Discoglypremma caloneura*	Ata'a	m-sized tree	ba	medicines	16
EUPH	*Phyllanthus muellerianus*	Awum	liana	ba,ex	additive palm wine, medicines	33
EUPH	*Ricinodendron heudelotii*	Ezezang	m/l-sized tree	se,ba	condiment, medicines, revenue (se)	26
EUPH	*Tetrorchidium didymostemon*	Dilik	s/m-sized tree	ba,wo	medicines, construction	12
GNET	*Gnetum* sp.	Ocok	vine	le	vegetable, commerciable (le)	24
GUTT	*Garcinia kola*	Onyai	m-sized tree	se,ba	snack/aphrodisiac, additive palm wine, medicines, revenue (se)	56
GUTT	*Garcinia lucida*	Esok	s/m-sized tree	ba,se	additive palm wine, snack/aphrodisiac, medicines, revenue(ba/se)	83
HUMI	*Sacoglottis gabonensis*	Bidu	m/l-sized tree	ba	additive palm wine, medicines	47
HYPE	*Harungana madagascariensis*	Atondo	s/m-sized tree	ba,wo	medicines, construction, furniture	26
IRVI	*Irvingia gabonensis*	Ando'o	l-sized tree	se,fr,ba	condiment, snack, medicines, revenue (se/fr)	64
LOGA	*Strychnos asterantha*	Mfas	liana	wo,ex	equipment, drinking water	15
MARA	*Halopegia azurea*	Nken	herb	ro,st,ex	medicines, basketry	25
MARA	*Megaphrynium macrostachyum*	Okadon/Nden	herb	le,st	food wrapping, basketry, equipment, revenue (le)	36
MARA	*Sarcophrynium prionogonium*	Angwafan	herb	le,fr	food wrapping, snack, revenue (le)	28
MELI	*Entandrophragma cylindricum*	Asié/'Sapelli'	l-sized tree	wo,ba	furniture, carpentry	23
MELI	*Khaya ivorensis*	Ngollon/'Acaju'	l-sized tree	wo,ba	furniture, medicines	3
MELI	*Lovoa trichilioides*	Bibolo/'Bibolo'	l-sized tree	wo,ba	construction, furniture	7
MIMO	*Pentaclethra macophylla*	Ebay	m/l-sized	ba,se,wo	medicines, witchcraft, furniture	25
MIMO	*Piptadeniastrum africanum*	Atui/'Dabema'	l-sized tree	ba	medicines	11
MIMO	*Tetrapleura tetraptera*	Kpwa'sa	m-sized tree	fr	condiment, medicines, commerciable (fr)	4
MORA	*Milicia excelsa*	Abang/'Iroko'	l-sized tree	wo,ba	medicines, equipment, furniture	14
MORA	*Musanga cecropioides*	Asseng	s/m-sized tree	ex,ba,le	medicines, equipment, drinking water	70
MORA	*Treculia africana*	Etui	m-sized tree	wo,se	equipment, condiment, medicines	12
MYRI	*Pycnanthus angolensis*	Eteng	l-sized tree	ba,wo	medicines, equipment	17
MYRI	*Staudtia kamerunensis*	Mbonda/'Niove'	m?-sized tree	wo,ba	construction, medicines	9
OCHN	*Lophira alata*	Okwa/'Azobe'	l-sized tree	ba,le,wo	medicines, construction	25
OLAC	*Coula edulis*	Ewomen	m-sized tree	wo,se,ba	construction, snack, condiment, medicines, revenue (se)	92
OLAC	*Ongokea gore*	Anguek	m/l-sized tree	fr,ba	lure, medicines	21

[1] See list abbreviations scientific names of families

[2] ba: bark; ex: exudate; fr: fruit; le: leaves; ro: roots; se: seeds; sp: sprouts; st: stem; th: thorns; wo: wood

Table II.20 Selected species: names, functions and habitat (cont'd)

Fam.[1]	Scientific name	Bulu/'Pilot name'	Habit	Parts used[2]	Types of uses	# of times recorded
PALM	*Ancistrophyllum secundiflorum*	Nkan/Minkam	liana	st, sp	construction, equipment, condiment, medicines, conmerciable (st)	4 (85)
PALM	*Calamus deerratus*	Mfop	liana	st	construction, equipment, medicines, conmerciable (st)	0 (85)
PALM	*Elaeis guineensis*	Alen	m-sized tree	ex,fr,se,le, st	palm wine, cooking oil, medicines, equipment, revenue (fr,ex)	88
[1]PALM	*Indeterminata*	Ongam	liana	st	medicines, food wrapping	14 (85)
PALM	*Raphia montbuttorum*	Zam	s-sized tree	le,ex,fr	palm wine, construction, furniture, equipment, revenue (ex)	93
PALM	*Rattan species*	Nlong	liana	st	construction, equipment, medicines, conmerciable (st)	67 (85)
PAND	*Panda oleosa*	Afane	m-sized tree	se,ba	condiment, medicines, revenue (se)	24
PAPI	*Pterocarpus soyauxii*	Mbe/'Paduk'	l-sized tree	wo,ex,ba,le	equipment, medicines, construction	22
PASS	*Barteria fistulosa*	Mekbenga	m-sized tree	ba	medicines	18
PIPE	*Piper guineensis*	Abominjang ndik	liana	fr,ba,le	condiment, additive palm wine, vegetable, medicines, commerciable (fr)	17
POLY	*Carpolobia lutea*	Onong	s-sized tree	ro,fr,wo,le	aphrodisiac, snack, equipment	25
RHIZ	*Poga oleosa*	Angale	m-sized tree	se,wo	condiment, cooking oil, snack, revenue (se)	59
RUBI	*Mitragyna stipulosa*	Afobezam/'Bahia'	m-sized tree	wo,ba	medicines, construction, furniture, equipment	39
RUBI	*Morinda lucida*	Atjek	m-sized tree	ba,wo,le	medicines, equipment, construction	28
RUBI	*Nauclea diderrichii*	Akondok/'Bilinga'	m/l-sized tree	wo,se	equipment, construction, snack	13
RUTA	*Zanthoxylum gilleti*	Bongo/'Olon'	l-sized tree	wo,ba	equipment, medicines	4
RUTA	*Zanthoxylum heitzii*	Elelongo/Ngues/ 'Olon'	l-sized tree	st,ba,th	aphrodisiac, poison, medicines, equipment	12
SAPO	*Baillonella toxisperma*	Adjap/'Moabi'	l-sized tree	se,ba,fr,wo	cooking oil, condiment, snack, medicines, carpentry, revenue (se)	74
STER	*Cola acuminata/C. nitida*	Abu	m-sized tree	se,ba	snack/aphrodisiac, medicines, revenue (se)	31
STER	*Cola ricinifolia*	Akomngwoé	s?-sized tree	fr	snack, revenue (fr)	22
STER	*Cola* spp.	Mvoi	s?-sized tree	fr	snack, revenue (fr)	21
STER	*Eribroma oblonga*	Eyong/'Eyong'	l-sized tree	wo,ba	construction, medicines, furniture	10
VITA	*Cissus* sp.	Fazo'o	liana	ex	drinking water	27
ZING	*Aframomum citratum*	Mvolong	herb	fr	condiment, revenue (fr)	15
ZING	*Aframomum melegueta*	Ndong	herb	fr	aphrodisiac, medicines, revenue (fr)	38
ZING	*Aframomum* sp.	Adjom	herb	fr,le,ex	snack, medicines, condiment	19

1 See list abbreviations scientific names of families

2 ba: bark; ex: exudate; fr: fruit; le: leaves; ro: roots; se: seeds; sp: sprouts; st: stem; th: thorns; wo: wood

In cocoa plantations the situation is different. The woody vegetation is only partly destroyed and the elimination of trees will take into account the conservation of useful species. In maintaining the plantation by regular clearing, the same selective elimination of the vegetation will be practised.

D. The influence of commercial timber exploitation on the availability of NTFP resources

Various types of damage caused to NTFP resources by logging can be distinguished:

- the harvesting of timber species which are also of importance as a source of certain NTFPs;
- the damage caused to NTFP species during the logging operations. The felling of tree damages neighbouring trees, and also for the construction of roads and landings numerous trees are felled or damaged.

The logging operations cause a change in the physical environment, which affects the growth conditions. Examples are changes in light and moisture conditions by the creation of gaps and compaction heavy machinery.

To get insight into the impact of logging not only the changes in the abundance and distribution of productive species in the logged-over forests should be considered, but also the changes in population structure. To enable the incorporation of the above mentioned aspects, the inventory took into account the variation in forest types and land uses in the area, as well as the population structure by recording diameter classes and counting saplings and seedlings.

Table III.1 Species selected for the determination of the impact of exploitation

Scientific name	Appreciation By local Population	Frequency of use	Commercial potential of NTFPs	Directly affected by logging	Risk of over-harvesting
Aframomum spp.	+	+	++	-	+/-
Alstonia boonei	++	++	-	-	+
Antrocaryon klaieanum	+	+	-	+	+/-
Baillonella toxisperma	++	++	+	++	++
Coula edulis	++	++	+	-	++
Garcinia kola	+	++	++	-	++
Garcinia lucida	++	++	++	-	++
Gnetum spp.	-	+	++	-	+
Irvingia gabonensis	++	++	++	-	+/-
Poga oleosa	++	++	++	-	+/-
Ricinodendron heudelotii	++	++	++	-	+/-
Scorodophloeus zenkeri	+	+	++	-	++
Terminalia superba	+	+/-	-	+	+
Tetrapleura tetraptera	-	-	++	-	-
Trichoscypha spp.	++	+	+	-	+/-

Source: fieldwork 1994, NTFP reconnaissance survey

For all species, selected on the basis of the reconnaissance and marketing surveys (see Table II.20), the results of the inventory are presented with regard to their distribution and abundance in the study area.

For the assessment of the impact of exploitation (B, C and D) a smaller number of species was taken into consideration, that is those species for which one could expect an impact of logging. The species and the reasons for their selection are summarised in Table III.1 (see also Section II.9.3).

III.1.2 Field survey

The selection of the sample plots was based on an aerial photo interpretation map prepared for a vegetation and soil survey, carried out within the framework of another Tropenbos research project (Touber, 1993). The preliminary results of this soil and vegetation survey were used to analyse the growth conditions of NTFP species.

Due to time constraints, the number of sample plots to be surveyed had to be limited to 34. As far as possible, the selection of sample plots took into account the environmental variation with regard to ecological transition from the western to the eastern part of the study area.

As one of the main objectives was to determine the influence of extraction of NTFPs on the abundance and distribution of species, a higher sampling intensity has been adopted in the vicinity of villages and settlements included in the reconnaissance survey at an earlier stage of the study.

To allow a comparison with data from the soil and vegetation survey, the distance to the starting point of the transect was measured.

The sample plot design was adopted from Hall and Bawa (1993). The sample plots covered an area of 1 ha, in the form of transects with a length of 1 km and 10 m wide.

In case of tree species, only those specimen with a diameter larger than 10 cm were included and their diameter at breast height (DBH) were recorded. For woody lianas such as *Strophanthus gratus* and *Strychnos asterantha,* a minimum DBH of 5 cm was used. In addition the vegetation was classified according to the type and degree of disturbance, and the physiographic position (see Table III.2).

Saplings, as well as shrubs, small lianas and vines, were enumerated in subplots of 10 m by 10 m on the same transect at distances of 100 m (see Appendix VI). This category included all individuals with a height of more than 1 m and a diameter of less than 10 cm. Within this category, a division into 3 classes was made: DBH smaller than 1 cm DBH, between 1 and 5 cm, and between 5 and 10 cm.

Seedlings were defined as individuals with a height of less than 1 m. They were enumerated in subplots of 2 m by 2 m, placed in the sapling subplots.

Table III.2 Overview of the vegetation, land use and physiographic units distinguished for the determination of habitats

Vegetation structure	
- Fie:	Fields;
- Com:	Well maintained cocoa plantations;
- Coa:	Abandoned cocoa plantations;
- Fay:	Young fallow lands;
- Bya:	Home garden-like backyard vegetation;
- Sag:	Secondary forest: older fallow lands and secondary forest;
- Slo:	Secondary forest: damaged by logging;
- Fun:	Undisturbed forests.
Physiography	
- Val:	Humid and frequently inundated valley bottoms;
- Pla:	Plains
- Slo:	Slopes
- Slr:	Slopes with rock outcrops
- Hsu:	Summit areas/plateaux
- Hsr:	Summit areas/plateaux with rock outcrops

Source: fieldwork 1994-1995, NTFP ecological inventory

All the species recognised by the field assistants were recorded. Therefore, also a number of species were included for which no functions were specified during the village studies. For a number of these species the use was specified during the ecological survey and they were included in Appendix III.

The identification of species was based on the vernacular names in Bulu. The translation of the Bulu names to their scientific equivalents was mainly based on data of fellow researchers. Moreover, some checks took also place in the field by a joint identification by the field assistants and a Tropenbos botanist. Species which could not be identified were sampled in the field and identified by the botanist. Some samples were sent to the National Herbarium of Yaoundé.

Of those species of which the impact of exploitation should be determined, the diameter at breast height (DBH) was measured. For all other species the diameter was estimated.

Small lianas, vines and herbaceous species were only inventoried as far as they were of special importance to the local population. They were enumerated by counting the number of clumps.

Whenever possible, the inventory team was divided into 2 sub-teams, splitting up the work in the inventory of adult species and the enumeration of seedlings and saplings.

Before entering the forest, the inventory team visited local authorities to explain the purpose of the research and to ask permission to work in the forest. In most villages the permission was given easily, but in some cases a village meeting had to be organised.

The 34 transects, covered an area of 31.9 hectares. Some of the transects did not reach the total length of 1 km due to obstacles such as rivers. Other transects were extended up to 2 km, as the degree of disturbance often was very high in the first part of transects and it appeared to be difficult to find patches of undisturbed forest. In Appendix VII the characteristics of the different transects are listed.

III.1.3 Detailed survey

A number of important NTFP species were not found during the general ecological survey, although they had been indicated by the informants participating in the reconnaissance survey as being frequently used.

It was decided to inventory these species in collection sites to be indicated by the population. With the help of interviews among Bantu villagers and Bagyeli people a number of collection sites were detected.

The species concerned were the *Garcinia lucida* (Esok) and the herbaceous species as *Aframomum citratum* (Mvolong) and *A. melegueta* (Ndong). The latter was sampled in cocoa plantations. Although some people said that wild stands occur in the forest, it appeared that all respondents collected the fruits from planted stands.

For *Garcinia lucida,* the same method of inventorying transects was used as described in the previous Section III.1.2. As it concerns a small tree which hardly reaches a DBH of more than 20 cm, all specimen with a DBH of > 5 cm were enumerated in the 1 ha plots. In addition, information on the condition of the trees was recorded in order to get an indication of the influence of decortication on population dynamics. Dead trees, decorticated trees and untouched trees were distinguished.

For the herbaceous *Aframomum* spp. the area were the species occurred was measured. In randomised sample plots the number of clumps were enumerated. As both *Aframomum* spp. appeared to be fruit-bearing at the moment of the inventory, also the number of fruits per clump was recorded to get some insight in the productivity.

III.1.4 Data analyses

Data analyses was carried out by post-stratification using size class distributions and taking into account the ecological factors which might influence the growth of the species.

The data analysis was rather complicated. The potential number of different habitats considered is high in view of the variation of ecological conditions and the various human impacts, and most species appeared to be quite rare (only 1-5 adult specimen per hectare). Comparing abundance of species and identifying the differences in population structures under various conditions was not possible at a detailed level. Some generalisation by pooling the data for a number of categories of habitats or size classes had to be applied.

At forest community level, the data were analysed for the different transects, as well as the various habitat types. The species composition, the species richness and diversity were determined.

For the individual species, the data were analysed for the influence of physiography and vegetation structure at one hand, and the influence of the west-east gradient in altitude and climate at the other hand. Based on the results, the major habitats were determined. The abundance was considered in relation to these habitat types.

An indication of the impact of NTFP harvesting on the resources was determined by comparing the population structures under various intensities of exploitation. For *Garcinia lucida* data were available for both exploited and non-exploited populations. For other species the analyses was based on a post-stratification of the data with regard to the distance to villages or roads. The data were stored and analysed in QUATTRO.PRO/EXCEL.

III.2 DISTRIBUTION AND ABUNDANCE OF NTFP SPECIES

III.2.1 Introduction

The distribution of NTFP species in study area is determined by the variation in natural conditions and in human interventions.

The impact of conversion of forest into fields and cocoa plantations is obvious. Pioneer species will appear in the fields after they are abandoned and gradually the fallow lands will be transformed in forest-like vegetation types. However, a number of NTFP species are conserved and sometimes planted in the fields or cocoa plantations which also influences their distribution patterns.

Logging also affects the abundance and distribution of species. Van Leersum (personal communication, 1996) estimated that on average 15% of the total area

damaged by logging operations. The impact is likely to differ from that of shifting cultivation, as small patches are affected and there is no burning.

Natural factors influencing the distribution and abundance of the species include the physical environment. Especially the swamps at the valley bottoms lead to specific growth conditions. Less obvious is the effect of the west-east gradient in altitude, climate and floristic composition in the area (see Section I.3.2). If, and to what extent this variation influences the distribution of important NTFP species has been investigated.

III.2.2 Species richness and diversity

The diversity and the richness of NTFP species was determined, taken into account all NTFP specimen with a DBH of > 10 cm and large lianas. The species diversity is defined as the total number of species per hectare. The species richness refers to the total number of NTFP producing individuals per hectare.

All the species recognised by their vernacular name by the field assistants are considered to be a NTFP species. About 90-95% of all the tree species in the various transects was recognised by the field assistants. Not al these species were indicated as being useful during the reconnaissance survey, but their functions were indicated during the ecological inventory. For few species no function was reported (see Appendix III).

A number of 310 species or species groups were distinguished by the field assistants in the 32 ha. Most of these are tree and shrub species. Only a small number of lianas, vines and herbs were recorded. Taking into account the various species in the species groups as distinguished by the field assistants, the number of different species raises to at least 350 different species from 71 families and 225 different genera. The taxonomy of 20 species could not identified.

Table III.3 Average of the species diversity and the total number of NTFP specimen in the various transects for the different altitude classes

Altitude class	Number of NTFP species/ha	Number of NTFP specimen/ha
< 180 m	92.6	493.0
180-340 m	90.2	457.8
340-540 m	85.0	523.8
> 540 m	91.6	566.0
Average	89.3	521.7

Notes: figures based on the trees with a DBH of > 10 cm and the large lianas
Source: fieldwork 1994 -1995, NTFP ecological inventory

The number of species in a transect ranges from 62 (Ebom II) to 123 (Doumsi) with a mean of 89.3. The averages for the altitude classes, however, differ hardly with values of 85.0 to 91.8 (see Table III.3). The variation in species diversity seems to be largely determined by the degree of disturbance, especially the impact of agriculture. The higher the percentage of undisturbed forest within a transect, the higher the diversity in species composition (see Appendix VII).

The NTFP species richness varies from 299 (Mekalat 1) to 888 (Meka'a II 2b) individuals per hectare with a mean of 521.7.

Although the species diversity (see Table III.3) in the lowland vegetation types is slightly higher than in the high altitude forest types, the total number of NTFP species in the latter is higher (566.0 versus 493.0). The difference can be explained by the fact that the higher altitude forests often have a more shrub-like character with high numbers of small trees.

The same parameters were evaluated for the various major habitats. The distinction of these major habitats was based on the results of this study as well as those of the soil and vegetation survey (van Gemerden and Hazeu, 1997). In this study it was concluded that the main factors which influence the floristic composition and structure of the vegetation types are the altitude and the impact of agriculture. The soil and vegetation survey resulted in the distinction of three main ecological zones (see Section I.3.2), related to the altitude classes of < 350m, 350-540m and > 540m. The main difference with the initial classification is the fact that the two lowest altitude classes were combined.

Table III.4 The species diversity and richness within the main habitat types

Habitat type	#ha[1]	Total number of different species/ha[2]	Total number of NTFP specimen/ha[3]	Total number of different NTFP species[4]
Forest > 540 m	7	102.7	637.1	166
Forest 350-540 m	3	100.7	551.4	153
Forest < 350 m	2	112.0	569.6	158
Swamp forest	1	109.0	734.4	125
Sec. Forest: logged	3	100.3	543.0	157
Sec. Forest: agriculture	4	82.3	470.1	139
Cocoa plantations: abandoned	1	85.0	371.1	105
Cocoa plantations	1	81.0	270.5	96
Young fallow lands	2	50.5	150.9	87

Notes: [1] The parts of the various transects covered by the habitat type were added to one hectare
[2] Average of the number of species in these 'artificial' hectare plots
[3] Figures based on the trees with a DBH of > 10cm and large lianas
[4] Total number of species recorded for the total area inventoried of each habitat type
Source: fieldwork 1994-1995, NTFP ecological inventory

In Table III.4, the species diversity and richness per habitat type are listed. The surveyed area per habitat type varies. This makes a comparison somewhat difficult especially for those habitat types which are poorly represented. For this reason, the number of different NTFP species per hectare was calculated. The parts of different transects covered by a certain habitat type were added up to one hectare in total. The species diversity was based on the average number of different species in these 'artificial' one hectare plots. Both species diversity and species richness appear to be the lowest for those habitats influenced by agriculture. However, given that many trees are eliminated in cocoa plantations, the diversity in NTFP species is still surprisingly high and comparable to late secondary forests. An explanation might be found in the fact that the elimination of trees is selective and the planting of useful species, including exotic species but also NTFP species.

As stated above, the forests of the highest altitude class (above 540 m) have the highest number of NTFP specimen per hectare. From the large differences between the maximum and minimum densities recorded in a transect within undisturbed forests (see Appendix VI), it can be concluded that the vegetation changes rapidly with an increasing altitude and a further division of the forests types within this altitude class is to be recommended.

Differences between the two lowest altitude classes (< 350 m and 350-540 m) are not very evident. The fact that both the species diversity and the species richness are slightly higher in the forests of the lowest altitude class might be caused by the higher degree of human impact in the western part of the study area, causing a larger share of pioneer species in the vegetation.

Swamp forests tend to be rather diverse. The number of different species is much higher than found during the inventory in the Cross River State forest in Nigeria (Dunn *et al.*, 1994). The high species diversity can be explained by the fact that one can expect differences in the species composition of swamp forests within the various parts of the area. The total sample area of 1.4 ha of swamp forest does nor permit a more detailed analysis. The species richness also is high, probably because in general trees are smaller than in many other habitat types and emergents are absent (see Section I.3.2.3).

Logging hardly affects the species diversity nor the total number of NTFP specimen. The figure on the species diversity is comparable with those of the undisturbed forest types and the species richness is only slightly lower.

III.2.3 The distribution and abundance of tree species

II.2.3.1 Habitat preference: physiography and vegetation

The data on the distribution of the NTFP species were post-stratified in 15 habitat classes, combining four vegetation classes (undisturbed or very old secondary forest,

logged-over forest, late secondary forest and young secondary vegetation types) with the four major physiographic classes (valley bottoms, plains, slopes and slopes with rock outcrops). The combination of young secondary vegetation and valley bottoms was not found during the survey. Agriculture and to a lesser extent logging, appear to have a far greater impact on the distribution of the NTFP species than the physiography. About 25% of the selected species appear to be strongly favoured by disturbance (Table III.5). These are, for example, *Alchornea cordifolia* (Aboe), *Ricinodendron heudelotii* (Ezzezang), *Myrianthus arborea* (Angokom), *Rauvolfia* spp. (Esombo; Obaton), *Terminalia superba* (Akom or 'Frake') and *Tetrapleura tetraptera* (Kpwa'sa). Most of these species are characterised also by other authors as typical pioneer species. The exceptions are *Funtumia elastica* (Etendamba) and *Myrianthus arboreus* (Angokom). The first species is characterised by Hawthorne (1995) as a non-pioneer light demander and Keay (1989) confines the species to a forest habitat. In the study area, however, the distribution pattern reflects the one of a typical pioneer.

A possible explanation could be the human influence. The species has been commercially exploited in the past for its rubber. The second species, described by Hawthorne (1995) as a shade-bearer and thus depending on shade for regeneration, is expected to occur mainly in undisturbed forests. Keay (1989), however, characterises the species also as belonging to secondary forests.

Typical shade-bearers are, for example, the small understorey trees *Anonidium mannii* (Ebom afan) and *Garcinia lucida* (Esok), as well as *Xylopia quintasii* (Mvomba), *Scorodophloeus zenkeri* (Olon) and *Santiria trimera* (Ebaptom). Other species showing a less distinct preference for undisturbed forest types, probably belong to this category too. However, their densities are too low to draw reliable conclusions.

The influence of physiography is not as explicit as that of disturbances. The only exception, as might be expected, are the specific circumstances of valley bottoms. Some species uniquely occur in this environment, such as *Raphia montbuttorum* (Zam) and *Mitragyna stipulosa* (Afobezam). But also *Pterocarpus soyauxii* (Mbe or 'Paduk') and the Marantaceae *Halopegia azurea* (Nken) show a clear preference for valley bottoms.

Quite a number of species seem to avoid valley bottoms, such as *Coula edulis*, (Ewomen), *Trichoscypha arborea* (Engong), *Tabernaemontana crassa* (Etoan), *Garcinia lucida* (Esok), *Scorodophloeus zenkeri* (Olon) and *Irvingia gabonensis* (Ando'o).

Table III.5 The distribution of NTFP species in relation to the physiography

Fam.[2]	Scientific name	Bulu/'Pilot name'	Average density adults (stems/ha)	Vegetation Disturb.	Vegetation Undisturb.	Topography[1] Val.	Pla.	Slo/Sum	Slr/Smr
ANAC	*Antrocaryon klaineanum*	Ozakong/'Angongui'	1.8	+	-	-	+	+-	-
ANAC	*Trichoscypha arborea*	Engong	0.5	-	+	--	+-	+-	+-
ANAC	*Trichoscypha acuminata*	Mvut/Abut	1.4	-	+	-	-	+	+-
ANNO	*Anonidium floribundum*	Ebom afan	0.2	--	++	-	+	+	-
ANNO	*Enantia chlorantha*	Mfo	2.4	+-	+-	-	+	+-	+-
ANNO	*Hexalobus crispiflorus*	Owe	1.1	+-	+-	+	-	+-	+-
ANNO	*Monodora myristica*	Fio	1.3	-	+	--	-	+-	++
ANNO	*Pachypodanthium staudtii*	Ntom	1.9	-	+	+-	-	+	-
ANNO	*Xylopia aethiopica*	Nkala	3.0	+	-	-	+	-	-
ANNO	*Xylopia quintasii*	Mvomba	1.0	--	++	--	-	+-	+
APOC	*Alstonia boonei*	Ekuk	2.2	-	+	+-	-	+	+
APOC	*Funtumia elastica*	Etendamba	9.6	++	--	--	+	--	-
APOC	*Picralima nitida*	Ebam	1.0	-	+	+	+-	-	+-
APOC	*Rauvolfia caffra*	Esombo	2.7	++	--	--	+	-	-
APOC	*Rauvolfia vomitoria*	Obaton	1.0	++	--	--	+	-	-
APOC	*Strophanthus gratus*	Enay	0.2	+	-	--	+-	+-	+-
APOC	*Tabernaemontana crassa*	Etoan	9.7	+-	+-	--	+	-	-
BIGN	*Spathodea campanulata*	Esusuk	0.8	++	--	-	+-	++	--
BOMB	*Ceiba pentandra*	Dum	0.9	++	--	+	+-	-	+-
BURS	*Canarium schweinfurthii*	Otu/'Aiele'	2.2	+	-	+	+	-	-
BURS	*Dacryodes edulis*	Assa	0.4	+	--	-	+	-	--
BURS	*Dacryodes edulis*	Assa mingung	6.3	-	+	+	-	+	-
BURS	*Dacryodes macrophylla*	Tom	0.4	-	+	++	-	+	--
BURS	*Santiria trimera*	Ebaptom	4.3	--	++	-	-	++	+
CAES	*Distemonanthus benthamianus*	Eyen/'Movingui'	2.3	+	-	--	+	+-	-
CAES	*Erythrophloeum ivorense*	Elon/'Tali'	0.6	+	-	+	+-	+-	-

[1] Val: Valley bottoms; Pla: Plains; Slo/Sum: Slopes and summit areas; Slr/Smr: Slopes and summit areas with rock outcrops
++ the densities/saplings at least twice as high as the average; + densities of saplings and/or adults higher than the average; +- densities of saplings/seedlings about the average; densities of saplings and/or seedlings lower than the average; -- densities adults/saplings twice as low than the average

[2] See list abbreviations scientific names of families

Table III.5 The distribution of NTFP species in relation to the physiography

Fam.[2]	Scientific name	Bulu/'Pilot name'	Average density adults (stems/ha)	Vegetation		Topography[1]			
				Disturb.	Undisturb.	Val.	Pla.	Slo/Sum	Slr/Smr
CAES	*Guibourtia tessmannii*	Oveng/'Bubinga'	0.2	+-	+-	--	+	+-	--
CAES	*Scorodophloeus zenkeri*	Olon	6.6	-	+	--	--	++	+
CECR	*Myrianthus arboreus*	Angokom	2.0	++	--	--	+	+-	-
COMB	*Terminalia superba*	Akom/'Frake'	3.7	++	-	-	+	-	+
COMP	*Vernonia conferta*	Abangak	0.3	+	--	-	+	-	-
EUPH	*Alchornia cordifolia*	Aboe	0.1	++	--	--	+	+	--
EUPH	*Discoglypremma caloneura*	Ata'a	0.5	+	-	-	+	-	-
EUPH	*Phyllanthus muellerianus*	Awum	0.0	-	+	-	+	-	-
EUPH	*Ricinodendron heudelotii*	Ezezang	2.1	+	-	--	+	-	+
EUPH	*Tetrorchidium didymostemon*	Dilik	2.4	+	-	+-	+	-	-
GUTT	*Garcinia kola*	Onyai	0.4	-	+	--	+-	+-	+-
GUTT	*Garcinia lucida*	Esok	5.1	--	++	--	--	++	+
HUMI	*Sacoglottis gabonensis*	Bidu	0.5	+-	+-	+-	+-	+-	+
HYPE	*Harungana madagascariensis*	Atondo	0.5	++	--	+	+	-	--
IRVI	*Irvingia gabonensis*	Ando'o	2.0	+	-	--	+-	+-	+
LOGA	*Strychnos asterantha*	Mfas	0.1	+	-	-	+	-	-
MARA	*Entandrophragma cylindricum*	Asié/'Sapelli'	0.1	+	-	--	-	+	+
MARA	*Khaya ivorensis*	Ngollon/'Acaju'	0.2	-	+	+-	+-	+-	+-
MARA	*Lovoa trichilioides*	Bibolo/'Bibolo'	0.4	+	-	--	-	+	+
MELI	*Pentaclethra macophylla*	Ebay	4.5	+-	+-	-	+	+	-
MELI	*Piptadeniastrum africanum*	Atui/'Dabema'	3.4	+-	+-	-	+	-	+
MELI	*Tetrapleura tetraptera*	Kpwa'sa	0.5	++	--	--	+	+-	++
MIMO	*Milicia excelsa*	Abang/'Iroko'	0.9	++	--	+-	+	--	-
MIMO	*Musanga cecropioides*	Asseng	4.7	++	--	--	+-	+-	--
MIMO	*Treculia africana*	Etui	0.4	+-	+-	+	+-	+-	-
MORA	*Pycnanthus angolensis*	Eteng	11.5	+	-	+	+	-	+-
MORA	*Staudtia kamerunensis*	Mbonda/'Niove'	18.3	+-	+-	+-	+	-	-
MORA	*Lophira alata*	Okwa/'Azobe'	0.5	+	-	-	+	--	-
MYRI	*Coula edulis*	Ewomen	4.7	-	+	--	+-	+	-
MYRI	*Ongokea gore*	Anguek	0.3	+	-	--	+	+	--
OCHN	*Calamus* sp.	Mfop	0.5	+	-	+	-	+	--
OLAC	*Elaeis guineensis*	Alen	4.6	++	--	-	+	-	--

Table III.5 The distribution of NTFP species in relation to the physiography

Fam.[2]	Scientific name	Bulu/'Pilot name'	Average density adults (stems/ha)	Vegetation		Topography[1]			
				Disturb.	Undisturb.	Val.	Pla.	Slo/Sum	Slr/Smr
OLAC	*Raphia montbuttorum*	Zam	0.9	++	--	++	-	--	-
PALM	*Panda oleosa*	Afane	0.7	+	-	-	+	+	--
PALM	*Pterocarpus soyauxii*	Mbe/'Paduk'	2.7	+	-	++	+	-	-
PALM	*Barteria fistulosa*	Mekbenga	1.6	+	-	-	+	-	-
PALM	*Poga oleosa*	Angale	0.3	-	+	--	+	+	-
PALM	*Mitragyna stipulosa*	Afobezam/'Bahia'	3.0	+	-	++	--	--	-
PAND	*Morinda lucida*	Atjek	0.5	+	-	+-	+	+-	--
PAPI	*Nauclea diderrichii*	Akondok/'Bilinga'	0.9	+	-	-	+	-	-
PASS	*Zanthoxylum gilleti*	Bongo/'Olon'	4.2	+	-	-	+	-	--
POLY	*Zanthoxylum heitzii*	Elelongo/Ngues/ 'Olon'	0.9	+	-	--	+	-	-
RHIZ	*Baillonella toxisperma*	Adjap/'Moabi'	0.2	+	-	-	+	+-	+-
RUBI	*Cola acuminata/C. nitida*	Abu	2.4	+	-	+	-	-	+
RUBI	*Cola ricinifolia*	Akomngwoé	0.7	-	+	--	-	+	+
RUBI	*Cola* spp.	Mvoi	4.7	-	+	--	--	-	++
RUTA	*Eribroma oblonga*	Eyong/'Eyong'	2.1	-	+	+	+	--	+
RUTA	*Cissus* sp.	Fazo'o	0.3	-	+	+	+	-	--
SAPO	*Halopegia azurea*	Nken	0.3	+-	+-	++	-	--	--
STER	*Megaphrynium macrostachyum*	Okakon/Nden	0.8	+	-	-	++	-	+-
STER	*Sarcophrynium prionogonium*	Angwafan	0.2	++	--	+	+-	-	+
STER	*Ancistrophyllum secundiflorum*	Nkan/Minkam	1.8	--	++	+	+	-	--
STER	*Rattan species*	Nlong	0.3	-	+	+	+-	+-	--
VITA	*Carpolobia lutea*	Onong	-	-	+	-	+-	+-	+-
ZING	*Aframomum* sp.	Adjom	0.6	++	--	-	++	-	--

Many species are rare or absent on the slopes, which are in general rather steep with rock outcrops, and hardly any of the selected species occurs significantly more abundant in this habitat type. Exceptions are the species groups *Monodora* spp. (Fio) and *Cola* spp. (Mvoi).

A few species seem to avoid the plains. These are *Garcinia lucida* (Esok), *Santiria trimera* (Ebaptom) and *Scorodophloeus zenkeri* (Olon). These species are characteristic for the vegetation of the higher altitude (see Section I.3.3.3) where the physiography is determined by hills and mountains and hardly any flat areas occur.

III.2.3.2 Habitat preference: the influence of the altitude on the distribution
In order to evaluate the influence of altitude, the data were post-stratified in three altitude classes according to the preliminary classification resulting from the soil and vegetation survey:
- lowest parts of the area i.e. below 340 m;
- an intermediate level of 340-540 m;
- highest parts of the area with altitudes above 540 m.

Within these altitude classes, a subdivision was made in undisturbed forest and those areas which are affected by agriculture and logging. The results are summarised in Table III.6. Some of the classes are poorly represented. The sampled areas affected by logging in the lowest and the highest altitude classes cover less than one hectare. This is also the case for areas affected by agriculture at the highest altitudes.

For two of the listed species the influence of altitude appears to be the predominant determining factor with regard to their distribution. *Garcinia lucida* (Esok), the region for the production of palm wine, appears to occur uniquely in at altitudes above 540 m. As the species occurred only in two transects, both above an altitude of 700 m, it is likely that it is a submontane species.

The 'garlic tree', *Scorodophloeus zenkeri* (Olon) is completely absent the lowest altitude class. This species, occurs in the forests at the intermediate level, but the densities are much higher at altitudes above 540 m.

All other species listed in Table III.6 occur throughout the area. Some species show, however, a clear preference. *Dacryodes edulis* (Assa mingun), *Santiria trimera* (Ebaptom) and to a lesser extent *Coula edulis* (Ewomen) are more abundant at higher altitudes.

The preference for lowland conditions is less pronounced. Only *Staudtia kamerunensis* (Mbonda) and *Cola* spp. (Mvoi or 'monkey cola') have a clearly higher abundance at the lowest altitudes.

Table III.6 The impact of altitude and disturbance on the distribution of NTFP species

Fam.[1]	Scientific name	Bulu name	Disturbed: agriculture (all types)				Disturbed: Logged-over				Undisturbed forest			
			High[2]	Interm.[3]	Low[4]	Aver.	High[2]	Interm.[3]	Low[4]	Aver.	High[2]	Interm.[3]	Low[4]	Aver.
ANAC	*Antrocaryon klaineanum*	Ozakong	4.2	2.3	1.5	2.1	5.8	1.4	1.2	2.3	0.9	0.9	1.2	1.0
ANAC	*Trichoscypha arborea*	Engong	1.2		0.3	0.4		0.9		0.5	0.6		1.6	0.7
ANAC	*Trichoscypha acuminata*	Mvut/Abut		0.6	0.5	0.4		0.5	4.8	1.3	2.0	1.2	1.2	1.6
ANNO	*Anonidium floribundum*	Ebom afan				0.0				0.0	0.3	0.9		0.4
ANNO	*Enantia chlorantha*	Mfo	0.6	1.0	0.5	0.7	1.2	8.8	2.4	5.7	1.7	4.9	2.4	2.7
ANNO	*Hexalobus crispiflorus*	Owe	0.6	0.3	0.5	0.5	1.2		1.2	0.5	0.8	0.9	0.8	0.8
ANNO	*Monodora myristica*	Fio			0.5	0.3			2.4	0.5		2.4	1.6	1.0
ANNO	*Pachypodanthium staudtii*	Ntom			0.7	0.4		4.2	1.2	2.6	2.8	1.5	2.4	2.3
ANNO	*Xylopia aethiopica*	Nkala	3.0	4.8	4.8	4.5	3.5	4.2	2.4	3.7	0.9	0.6	1.6	1.0
ANNO	*Xylopia quintasii*	Mvomba				0.0			1.2	0.3	2.4	1.2	4.3	2.5
APOC	*Alstonia boonei*	Ekuk	4.6	2.9	2.1	2.7		1.9		1.1	2.0	1.5	2.0	1.8
APOC	*Funtumia elastica*	Etendamba	16.3	38.7	17.3	23.2	3.5	7.4	1.2	5.2	1.5	3.4	3.2	2.4
APOC	*Picralima nitida*	Ebam				0.0		1.9		1.1	1.5		2.8	1.4
APOC	*Rauvolfia caffra*	Esombo	10.9	5.8	8.2	7.9		1.9		1.1	0.2	0.9	0.8	0.5
APOC	*Rauvolfia vomitoria*	Obaton	0.6	1.3	2.6	1.9		1.4		0.8	0.2	1.5		0.5
APOC	*Strophanthus gratus*	Enay			0.5	0.3				0.0		0.6	0.4	0.2
APOC	*Tabernaemontana crassa*	Etoan	4.8	6.1	5.0	5.3	18.5	8.4	13.1	11.7	9.6	10.7	11.0	10.1
AREC	*Elaeis guineensis*	Alen	8.5	19.0	13.9	14.5		1.9		1.1			0.8	0.2
AREC	*Raphia montbuttorum*	Zam	0.6	0.3	1.7	1.1		0.5		0.3		0.3		0.1
BIGN	*Spathodea campanulata*	Esusuk	2.3	0.6	2.4	1.9	1.8			0.4				0.0
BOMB	*Ceiba pentandra*	Dum	3.6	1.0	2.1	2.0	1.2			0.3	0.2		0.4	0.2
BURS	*Canarium schweinfurthii*	Otu/'Abel'	4.8	1.6	3.4	3.1	1.2	1.4	2.0	1.5	0.6	1.2	2.0	1.1
BURS	*Dacryodes edulis*	Assa mingung	0.6	2.6	0.5	1.1	2.3	1.9	7.1	3.1	13.7	2.1	4.7	8.5
BURS	*Dacryodes edulis*	Assa	1.8	0.6	1.2	1.1				0.0				0.0
BURS	*Dacryodes klaineana*	Tom afan			0.7	0.4	1.2	0.5	1.2	0.8	1.6	1.2	0.8	1.3
BURS	*Dacryodes macrophylla*	Tom	0.6		0.7	0.5				0.0		0.6	0.8	0.3
BURS	*Santiria trimera*	Ebaptom			1.0	0.6	4.7	0.5	2.4	1.8	11.0	2.7	4.3	7.2
CAES	*Distemonanthus benthamianus*	Eyen	3.0	4.2	3.4	3.6		2.3	2.4	1.8	1.3	2.7	1.6	1.7
CAES	*Erythrophleum ivorense*	Elon	0.6	2.3	2.7	2.3	1.2	0.9		0.8	0.5	1.2	3.6	1.4
CAES	*Guibourtia tessmannii*	Oveng				0.0				0.0		1.2		0.3

[1] See list abbreviations scientific names of families
[2] high:>540 m. asl
[3] interm.: 340-540 m. asl
[4] low:<340 m. asl

Table III.6 The impact of altitude and disturbance on the distribution of NTFP species (cont'd)

			Disturbed: agriculture (all types)				Disturbed: Logged-over				Undisturbed forest			
Fam.[1]	**Scientific name**	**Bulu name**	**High**[2]	**Interm.**[3]	**Low**[4]	**Aver.**	**High**[2]	**Interm.**[3]	**Low**[4]	**Aver.**	**High**[2]	**Interm.**[3]	**Low**[4]	**Aver.**
CAES	*Scorodophloeus zenkeri*	Olon				0.0	25.4	3.2		7.9	28.2	0.6		14.4
CECR	*Myrianthus arboreus*	Angokom	4.0	2.3	6.7	5.0	2.3	0.9		1.1	0.2		0.8	0.3
COMB	*Terminalia superba*	Akom	5.4	5.2	7.2	6.3		0.5		0.3	0.2	1.8	6.7	2.0
COMP	*Vernonia conferta*	Abangak		1.0	1.5	1.1				0.0				0.0
EUPH	*Alchornea cordifolia*	Aboe		0.3	0.5	0.4				0.0		0.3		0.1
EUPH	*Discoglypremma caloneura*	Ata'a	0.6	0.3	1.9	1.2		1.4	1.2	1.0	0.2		0.4	0.2
EUPH	*Phyllanthus muellerianus*	Awum				0.0				0.0			0.4	0.1
EUPH	*Ricinodendron heudelotii*	Ezezang	3.0	4.5	3.4	3.6	1.2	4.6	1.2	3.1	0.5	1.5	1.2	0.9
EUPH	*Tetrorchidium didymostemon*	Dilik	1.8	7.4	1.7	3.3	3.5	4.6	1.2	4.1	0.5	0.6	0.8	0.6
GUTT	*Garcinia kola*	Onyai				0.0	1.2	1.4		1.1	0.5	0.9		0.5
GUTT	*Garcinia lucida*	Esok				0.0				0.0	22.7			11.5
HUMI	*Sacoglottis gabonensis*	Bidu		0.3	0.3	0.3		0.5	1.2	0.5	0.2	1.5	1.2	0.8
HYPE	*Harungana madagascariensis*	Atondo	1.2	1.9	0.3	0.9				0.0			0.8	0.2
IRVI	*Irvingia gabonensis*	Ando'o	0.6	0.6	1.5	1.1		3.2	4.8	3.0	1.9	2.4	3.6	2.4
LOGA	*Strychnos asterantha*	Mfas				0.0				0.0			0.4	0.1
MELI	*Entandrophragma cylindricum*	Asié/'Sapelli'		0.6	0.2	0.3	2.3	0.5		0.8	0.8	0.3		0.5
MELI	*Khaya ivorensis*	Ngollon			0.2	0.1		0.5		0.3		0.9	0.4	0.3
MELI	*Lovoa trichilioides*	Bibolo	0.6	1.0		0.4		0.5		0.3	1.0	2.1	1.2	1.3
MIMO	*Pentaclethra macophylla*	Ebay	2.3	4.5	3.6	3.6	5.8	7.0	2.4	5.7	4.6	4.3	3.2	4.2
MIMO	*Piptadeniastrum africanum*	Atui	6.3	3.5	1.5	2.8	9.2	3.7		4.1	2.8	5.5	3.6	3.7
MIMO	*Tetrapleura tetraptera*	Kpwa'sa			0.7	0.4	4.6	1.4		1.8		0.3		0.1
MORA	*Milicia excelsa*	Abang	2.4	1.0	1.2	1.3		0.9		0.5	0.2	0.3	0.4	0.3
MORA	*Musanga cecropioides*	Asseng	12.7	29.7	32.7	28.6	11.7	28.3	10.7	21.1	1.3	4.6	4.7	2.9
MORA	*Treculia africana*	Etui		0.6	0.7	0.6		2.8	2.4	2.1	0.8	1.2	0.4	0.8
MYRI	*Pycnanthus angolensis*	Eteng	10.9	15.8	9.4	11.4	18.5	11.1	3.6	11.1	6.3	9.8	11.8	8.4
MYRI	*Staudtia kamerunensis*	Mbonda	1.2	4.5	6.2	4.9	10.4	41.3	51.2	36.6	9.6	29.6	39.4	21.4
OCHN	*Lophira alata*	Okwa/'Azobe'				0.0		1.4	2.4	1.3		0.6	1.2	0.4
OLAC	*Coula edulis*	Ewomen		0.6	0.7	0.6	3.5	3.5	8.4	4.6	10.1	7.6	6.3	8.5
OLAC	*Ongokea gore*	Anguek				0.0		0.5		0.3	0.2	0.3	2.0	0.6
PAND	*Panda oleosa*	Afane			0.5	0.3		0.5	3.5	1.1	0.5	0.3	2.0	0.8

1 See list abbreviations scientific names of families
2 high:>540 m. asl
3 interm.: 340-540 m. asl
4 low:<340 m. asl

Table 30 The impact of altitude and disturbance on the distribution of NTFP species (cont'd)

Fam.[1]	Scientific name	Bulu name	Disturbed: agriculture (all types)				Disturbed: Logged-over				Undisturbed forest			
			High[2]	Interm.[3]	Low[4]	Aver.	High[2]	Interm.[3]	Low[4]	Aver.	High[2]	Interm.[3]	Low[4]	Aver.
PAPI	*Pterocarpus soyauxii*	Mbe	0.6	2.9	2.6	2.4	3.5	3.2	6.0	3.9	1.6	2.7	1.2	1.8
PASS	*Barteria fistulosa*	Mekbenga		3.2	1.7	1.9		2.3	1.2	1.5	0.3	2.1	2.8	1.3
RHIZ	*Poga oleosa*	Angale		0.3		0.1				0.0	0.5		0.4	0.3
RUBI	*Mitragyna stipulosa*	Afobezam		0.3	0.2	0.2	1.2	2.8		1.8		1.8		0.5
RUBI	*Morinda lucida*	Atjek			1.5	0.8				0.0	0.5			0.3
RUBI	*Nauclea diderrichii*	Akondok	1.2	2.3	0.5	1.1	1.2	0.9		0.8	0.6	0.3	1.2	0.6
RUTA	*Zanthoxylum gilleti*	Bongo	1.8	5.8	7.7	6.2		2.8	8.3	3.4	0.8	2.7	4.7	2.2
RUTA	*Zanthoxylum heitzii*	Elelongo/Ngues		1.6	1.0	1.0	1.2	0.5		0.5	0.5	0.6	1.6	0.8
SAPO	*Baillonella toxisperma*	Adjap		0.3	0.2	0.2				0.0	0.3	0.3		0.2
STER	*Cola acuminata/C. nitida*	Abu	1.8	2.6	0.3	1.2	2.3	5.6		4.0	1.9	3.1	1.2	2.1
STER	*Cola ricinifolia*	Akom ngwoé				0.0	1.2	0.9		0.8	0.6	0.6	3.2	1.2
STER	*Cola* spp.	Mvoi	1.8		0.3	0.5	6.9	0.9		2.0	2.5	15.6	18.9	9.6
STER	*Eribroma oblonga*	Eyong		2.3	1.9	1.7	3.5	3.7	1.2	3.1	0.8	3.4	3.2	2.0
VITA	*Cissus* sp.	Fazo'o			0.2	0.1		0.5		0.3			1.2	0.3

1 See list abbreviations scientific names of families
2 high:>540 m. asl
3 interm.: 340-540 m. asl
4 low:<340 m. asl

Noticeable are the rather high densities of typical pioneer species in undisturbed forest vegetation at lower altitudes, such as *Terminalia superba* (Akom or 'Fraké'), *Zanthoxylum gilletti* (Bongo) and to a lesser extent *Canarium schweinfurthii* (Otu or 'Aiele'') and *Barteria fistulosa* (Mekbenga). In the highest parts of the area, steep slopes impede both logging and agriculture and the forest are likely to have maintained its primary character. The human population density is lower than in the lower, western part of the area. Moreover, the fact that the human occupation started earlier in the western part of the area, may also have an impact on the floristic composition. The share of the areas covered by old secondary forests tends to be higher than in the highest parts of the area.

III.2.4 Abundance in relation to habitat preference

From analyses in the previous Sections, it can be concluded that the distribution of the NTFP species is mainly influenced by human interventions, especially agriculture and to a lesser extent logging. In undisturbed forest, altitude is the main factor which influences species occurrence. As for the physiography, only valley bottoms appear to provide very specific growing conditions. This leads to the following major habitat types: undisturbed forests at low (<340 m), intermediate (340-540 m), high (>540 m) altitude levels and on valley bottoms (swamp forests); logged-over forests; late secondary forests; young fallow lands and (productive and abandoned) cocoa plantations. The abundance of the NTFP species was considered with regard to these habitat types. In Appendix VIII the densities of all the recorded species is presented within each of the distinguished habitat types.

Table III.7 summarises the results for the selected species, by presenting the average densities of the species, the type of habitat in which the species reaches the highest densities, as well as the stocking rate within these preferred habitats. Noticeable is the high number of species (40%) which reach the highest densities in vegetation types resulting from agriculture.

Table III.7 The abundance of a selected number of species; average densities and densities within preferred habitats

Fam.[1]	Scientific name	Bulu/ 'Pilot name'	Average density stems/ha	Max. density stems/ha	Preferred habitat
ANAC	*Antrocaryon klaineanum*	Ozakong/'Angongui'	1.8	3.3	Cocoa plantations
ANAC	*Trichoscypha arborea*	Engong	0.5	1.6	Forest low altitude
ANAC	*Trichoscypha acuminata*	Mvut/Abut	1.4	3.2	Forest high altitude
ANNO	*Anonidium floribundum*	Ebom afan	0.2	0.9	Forest intermediate altitude
ANNO	*Enantia chlorantha*	Mfo	2.4	4.9	Logged over forest
ANNO	*Hexalobus crispiflorus*	Owe	1.1	0.9	Cocoa plantations
ANNO	*Monodora myristica*	Fio	1.3	2.4	Forest intermediate altitude
ANNO	*Pachypodanthium staudtii*	Ntom	1.9	3.0	Forest high altitude
ANNO	*Xylopia aethiopica*	Nkala	3.0	5.7	Secondary forest

Table III.7 The abundance of a selected number of species; average densities and densities within preferred habitats (cont'd)

Fam.[1]	Scientific name	Bulu/ 'Pilot name'	Average density stems/ha	Max. density stems/ha	Preferred habitat
ANNO	*Xylopia quintasii*	Mvomba	1.0	4.2	Forest low altitude
APOC	*Alstonia boonei*	Ekuk	2.2	5.2	Cocoa plantations
APOC	*Funtumia elastica*	Etendamba	9.6	37.9	Secondary forest
APOC	*Picralima nitida*	Ebam	1.0	3.6	Swamp forest
APOC	*Rauvolfia caffra*	Esombo	2.7	12.4	Secondary forest
APOC	*Rauvolfia vomitoria*	Obaton	1.0	3.3	Secondary forest
APOC	*Strophanthus gratus*	Enay	0.2	1.4	Cocoa plantations
APOC	*Tabernaemontana crassa*	Etoan	9.1	12.2	Logged over forest
BIGN	*Spathodea campanulata*	Esusuk	0.8	2.2	Young fallow/field
BOMB	*Ceiba pentandra*	Dum	0.9	3.8	Cocoa plantations
BURS	*Canarium schweinfurthii*	Otu/'Aiele'	2.2	4.2	Cocoa plantations
BURS	*Dacryodes edulis*	Assa mingung	6.4	13.7	Forest high altitude
BURS	*Dacryodes edulis*	Assa	0.4	3.8	Cocoa plantations
BURS	*Dacryodes klaineana*	Tom afan	1.0	2.0	Forest low altitude
BURS	*Dacryodes macrophylla*	Tom	0.3	2.1	Swamp forest
BURS	*Santiria trimera*	Ebaptom	4.3	11.8	Forest high altitude
CAES	*Distemonanthus benthamianus*	Eyen/'Movingui'	2.3	6.3	Secondary forest
CAES	*Erythrophloeum ivorense*	Elon/'Tali'	1.6	4.1	Secondary forest
CAES	*Guibourtia tessmannii*	Oveng/'Bubinga'	0.2	1.2	Forest intermediate altitude
CAES	*Scorodophloeus zenkeri*	Olon	6.6	29.9	Forest high altitude
CECR	*Myrianthus arboreus*	Angokom	2.0	7.6	Secondary forest
COMB	*Terminalia superba*	Akom/'Frake'	4.1	14.2	Cocoa plantations
COMP	*Vernonia conferta*	Abangak	0.3	1.3	Secondary forest
EUPH	*Alchornia cordifolia*	Aboe	0.1	0.7	Secondary forest
EUPH	*Discoglypremma caloneura*	Ata'a	0.5	3.8	Cocoa plantations
EUPH	*Phyllanthus muellerianus*	Awum	0.1	0.7	Forest low altitude
EUPH	*Ricinodendron heudelotii*	Ezezang	2.1	4.1	Secondary forest
EUPH	*Tetrorchidium didymostemon*	Dilik	2.4	4.1	Logged over forest
GNET	*Gnetum* sp.	Ocok	-	-	Secondary forest
GUTT	*Garcinia kola*	Onyai	0.4	1.1	Logged over forest
GUTT	*Garcinia lucida*	Esok	5.4	22.7	Forest high altitude
HUMI	*Sacoglottis gabonensis*	Bidu	0.5	1.5	Forest intermediate altitude
HYPE	*Harungana madagascariensis*	Atondo	0.5	1.5	Young fallow lands/fields
IRVI	*Irvingia gabonensis*	Ando'o	2.1	3.6	Forest low altitude
LOGA	*Strychnos asterantha*	Mfas	0.0	0.5	Forest low altitude
MELI	*Entandrophragma cylindricum*	Asié/'Sapelli'	0.1	0.8	Forest high altitude/logged-over forest
MELI	*Khaya ivorensis*	Ngollon/'Acaju'	0.2	0.9	Forest intermediate altitude
MELI	*Lovoa trichilioides*	Bibolo/'Bibolo'	0.4	2.1	Forest intermediate altitude
MIMO	*Pentaclethra macophylla*	Ebay	4.5	6.1	Cocoa plantations
MIMO	*Piptadeniastrum africanum*	Atui/'Dabema'	3.4	6.4	Swamp forest
MIMO	*Tetrapleura tetraptera*	Kpwa'sa	0.5	1.8	Logged over forest
MORA	*Milicia excelsa*	Abang/'Iroko'	0.8	2.8	Cocoa plantations
MORA	*Musanga cecropioides*	Asseng	14.7	40.1	Young fallow lands / fields
MORA	*Treculia africana*	Etui	1.0	2.1	Logged over forest

Table III.7 The abundance of a selected number of species; average densities and densities within preferred habitats (cont'd)

Fam.[1]	Scientific name	Bulu/ 'Pilot name'	Average density stems/ha	Max. density stems/ha	Preferred habitat
MYRI	*Pycnanthus angolensis*	Eteng	11.5	18.3	Secondary forest
MYRI	*Staudtia kamerunensis*	Mbonda/'Niove'	18.3	39.4	Forest low altitude
OCHN	*Lophira alata*	Okwa/'Azobe'	0.5	1.2	Logged over forest
OLAC	*Coula edulis*	Ewomen	4.7	10.1	Forest high altitude
OLAC	*Ongokea gore*	Anguek	0.3	2.0	Forest low altitude
PALM	*Elaeis guineensis*	Alen	4.6	21.8	Cocoa plantations
PALM	*Raphia montbuttorum*	Zam	1.3	16.5	Swamp forest
PAND	*Panda oleosa*	Afane	0.7	2.0	Forest low altitude
PAPI	*Pterocarpus soyauxii*	Mbe/'Paduk'	2.7	7.1	Swamp forest
PASS	*Barteria fistulosa*	Mekbenga	1.6	3.7	Secondary forest
RHIZ	*Poga oleosa*	Angale	0.3	0.9	Forest intermediate altitude
RUBI	*Mitragyna stipulosa*	Afobezam/'Bahia'	3.0	24.9	Swamp forest
RUBI	*Morinda lucida*	Atjek	0.5	1.5	Cocoa plantations
RUBI	*Nauclea diderrichii*	Akondok/'Bilinga'	0.9	1.9	Cocoa plantations
RUTA	*Zanthoxylum gilleti*	Bongo/'Olon'	4.2	10.9	Secondary forest
RUTA	*Zanthoxylum heitzii*	Elelongo/Ngues/ 'Olon'	0.9	1.6	Forest low altitude
SAPO	*Baillonella toxisperma*	Adjap/'Moabi'	0.2	0.3	Forest high/interm. altitude
STER	*Cola acuminata/C. nitida*	Abu	2.4	4.3	Logged-over forest
STER	*Cola ricinifolia*	Akomngwoé	0.7	3.2	Forest low altitude
STER	*Cola* spp.	Mvoi	4.7	18.9	Forest low altitude
STER	*Eribroma oblonga*	Eyong/'Eyong'	2.1	5.0	Swamp forest
VITA	*Cissus* sp.	Fazo'o	0.3	2.8	Swamp forest

Note : [1] See list of abbreviations of the scientific names of families (Appendix VII)

For some species logged-over forests appear to be the habitat type in which they reach the highest number of adult trees per hectare, such as *Tetrapleura tetraptera* (Kpwa'sa) and *Staudtia kamerunensis* (Mbonda). However, the differences in densities per habitat type are rather small (see Appendix VIII).

From Table III.6 it appears that most frequently used NTFP species occur with low densities ranging from 1-5 specimen per hectare, even in those habitats where they reach the highest stocking rates.

Very rare NTFP species, with average densities of < 0.5 stems per hectare (st/ha) and which do not occur distinctly more abundant in a specific habitat type (< 1 st/ha) are *Baillonella toxisperma, Guibourtia tessmannii, Poga oleosa, Khaya ivorensis, Garcinia kola* and *Anonidium floribunda.* The latter is a small tree, occurring somewhat more abundantly in the subplots used to inventory saplings (6.8 st/ha).

Only few species can be found distinctly more abundantly in specific habitats. Habitats in which a number of species occur in high densities are the forests of high altitudes, swamp forest and the secondary vegetation types which result from agricultural practices (e.g. secondary forest, fallow lands and cocoa plantations). In swamp forests, *Raphia montbuttorum* (Zam) and *Mitragyna stipulosa* (Afobezam)

occur in densities of respectively 36.0 and 16.5 st/ha. They are almost absent in other habitat types. The valley bottoms cover only a small part of the study area [1].

In secondary vegetation, some pioneer species reach relatively high densities, Examples are the umbrella tree *Musanga cecropioides* (Asseng), the African rubber tree *Funtumia elastica* (Etendamba) and the oil palm *Elaeis guineensis*. Also abundant in secondary vegetation type are species such as the commercial timber species *Terminalia superba* (Akom or 'Fraké') as well as *Zanthoxylum gilletii* (Bongo) and *Rauvolfia macrophylla* (Esombo).

The 'garlic tree' *Scorodophloeus zenkeri* (Olon) and *Garcinia lucida* (Esok) occur only at higher altitudes, where their average stocking rates are respectively 28.2 and 22.7 st/ha. Other species which occur far more abundantly at higher altitudes, but which also can be found at lower altitudes, are *Santiria trimera* (Ebaptom) and *Coula edulis* (Ewomen).

From the listed species only 'Mvoi', the edible fruit producing *Cola* spp. group, is distinctly more abundant at lower altitudes.

Of the selected species, only *Pycnanthus angolensis* (Eteng or 'Ilomba'), *Staudtia kamerunensis* (Mbonda) *Tabernaemontana crassa* (Etoan), *Dacryodes edulis* (Assa mingun), the African rubber tree *Funtumia elastica* (Etendamba), *Musanga cecropioides* (Asseng), *Garcinia lucida* (Esok), *Scorodophloeus zenkeri* (Olon) have average densities of over 5 stems/ha (Table III.6). The first three species occur fairly abundant in most habitats *Scorodophloeus zenkeri* and *Garcinia lucida*, as well as the pioneer species (*Funtumia elastica* and *Musanga cecropioides*) owe their high average densities to their high abundance in specific habitats.

From a commercial point of view, NTFP species which occur with high densities tend to be the most promising (Ros-Tonen *et al.*, 1995). Many species which are traded on urban, national or international markets (see Section II.10.2.2), are rather abundant. Peters (1996) presented a number of ecological indicators to evaluate the management potential of NTFP resources. With regard to one of these indicators, the tree density, he presents a threshold of >10 adults per hectare for a high management potential. Species which meet this criterion are the palm wine additive and medicinal bark providing *Garcinia lucida*, the flavourer (bark/seeds) *Scorodophloeus zenkeri* in the high altitude forests, the oil-containing nut-bearing and timber providing tree *Coula edulis* in all the undisturbed forest types, the fresh fruit producing *Cola* spp. (Mvoi) in lowland forests and the multi-purpose palm trees *Elaeis guineensis* and *Raphia montbuttorum* in respectively cocoa plantations/fallow lands and swamp forests.

[1] Van Gemerden and Hazeu (1997) state that 1% of the area is covered by valley bottoms (see Section I.3.2.2). In reality the swamp forests will cover a larger surface. Contrarary to this study, they took only the largest valley bottoms into account.

III.2.5 Abundance and distribution of herbs, vines, shrubs and canes

Only a few of vines and herbs were taken into consideration. In spite of its potential economic importance, the vine 'Ocok' (*Gnetum* spp.) was not recorded, as the field assistants did not recognise the species. Two of the three *Aframomum* spp. (Ndong') and Mvolong) were also not found during the general inventory. They were subject of the detailed inventory (see Section III.1.3).

The various cane species were initially not distinguished, but all classified as 'Nlong', the generic term for canes. Only in a few transects, the different species were recorded.

Frequently used food wrapping leaves are *Megaphrynium macrostachyum* (Okakon/Nden), *Halopegia azurea* (Nken) and *Sarcophrynium prionogonium* (Angwafan). The first species appears to be the most frequently occurring one and has a clear preference for secondary vegetation types. The other two species show a preference for valley bottoms, and prefer the disturbed parts of this habitat.

Table III.8 The abundance of species and distribution of herbs, vines and shrubs: densities in number of clumps/ha

			Undisturbed forest types[2]				Disturbed Forest types[3]				
Fam.[1]	**Scientific name**	**Bulu**	**Fhi**	**Fin**	**Flo**	**Val**	**Slo**	**Sag**	**Cpl**	**Fyo**	**Average**
DICH	*Hypselodelphus scandens*	Engangwoa	0.3		0.7						0.1
MARA	*Halopegia azurea*	Nken	0.2			1.9	1.1				0.3
MARA	*Megaphrynium macrostachyum*	Okakon/Nden	0.2	0.4	2.8		2.2	4.9	0.8	2.3	1.8
MARA	*Sarcophrynium priogonum*	Angwafan	0.2				0.8	0.5			0.3
PALM	*Ancistrophyllum secundiflorum*	Nkan	3.3	6.7	0.7	2.9	5.0	1.0			2.8
PALM	*Calamus* sp.	Mfop	0.8	0.9			1.7	0.5			0.7
PALM	*Ratttan* spp.	Nlong	1.8	0.9			0.8				0.7
POLY	*Carpolobia lutea*[4]	Onong	18.7	15.8	58.1	13.3	12.1	23.3	5.6	4.8	23.9
ZING	*Aframomum* sp.	Adjom	0.3				0.8	3.9		1.7	1.1

[1] Fhi: high altitude forest; Fin: intermediate altitude forest; Flo: low altitude forest; Val: forest on valley bottoms

[2] Slo: logged-over forest; Sag: old secondary forest; Cpl: cocoa plantations; Fay: young fallow lands

[3] See list abbreviations scientific names of families

[4] Densities expressed in # stems/ha

Rattan species (*Ancistrophyllum secundiflorum* (Nkan), *Calamus* spp. (Nlong/Obok nlong/Mfop) reach highest densities at higher altitudes and in logged-over forest. They probably profit from smaller gaps. These can be created by logging, or by natural tree fall which occurs frequently on exposed slopes in mountainous areas. *Aframomum* sp. (Adjom) is a typical pioneer species which is common in old fallow

lands and along old logging roads. In similar habitats, *Aframomum* citratum (Mvolong) can be found. This species was found only once during the inventory. During the detailed survey the villagers of Ebom identified eight locations near their village of which six concerned fallow lands and two old logging roads. The areas varied from 0.3-2 ha. The number of plants per hectare can be very high, varying from 2,800-3,600 plants/ha. Apparently, the species is locally abundant, and absent elsewhere.

For *Aframomum melegueta* (Ndong), no wild stands were found or could be indicated by the villagers although people stated that they do exist. The species is cultivated in small plots (0.03-0.3 ha) in the study area, growing in cocoa plantations. Apparently *Aframomum melegueta* requires shadow. The average density is about 7,500 plants/ha.

III.3 IMPACT OF EXPLOITATION ON THE NTFP RESOURCES

III.3.1 Agriculture and logging

The impact of logging and agriculture was analysed at plant community level, as well as for a number of individual species.

In Figure III.1, the size class distributions of the NTFP plant communities in the various habitats are presented. The population structures of the communities do not vary very much for the various habitat types.

As could be expected, of agriculture leads to relatively high numbers in the lowest size class (10-20 cm DBH) and in the largest diameter class (> 100 cm DBH). This reflects the abundant regeneration after agriculture and the conservation of large trees in the fields in order to provide some shade.

In logged-over forest, the smallest diameter class is somewhat better represented than in undisturbed stands, indicating that logging stimulates regeneration. The second and third diameter class (20-40 cm DBH) are relatively poorly represented, probably as results of logging damage.

The impact of logging and agriculture on the abundance and distribution of species is illustrated in Table III.9 and Figure III.2. Most species, except for *Scorodophloeus zenkeri* (Olon) and *Garcinia lucida* (Esok), are not abundant. The low numbers of individuals do not permit to include all selected species (see Table III.4). *Poga oleosa*, *Trichoscypha arborea* and *Tetrapleura tetraptera* were not taken into account as they are only represented by respectively 12, 18 and 15 adult individuals. *Garcinia lucida* (Esok) was not included in the analyses because it was found nor in logged-over areas nor in secondary vegetation types as a result of agriculture. This is not surprising, as the species prefers steep slopes in mountainous areas.

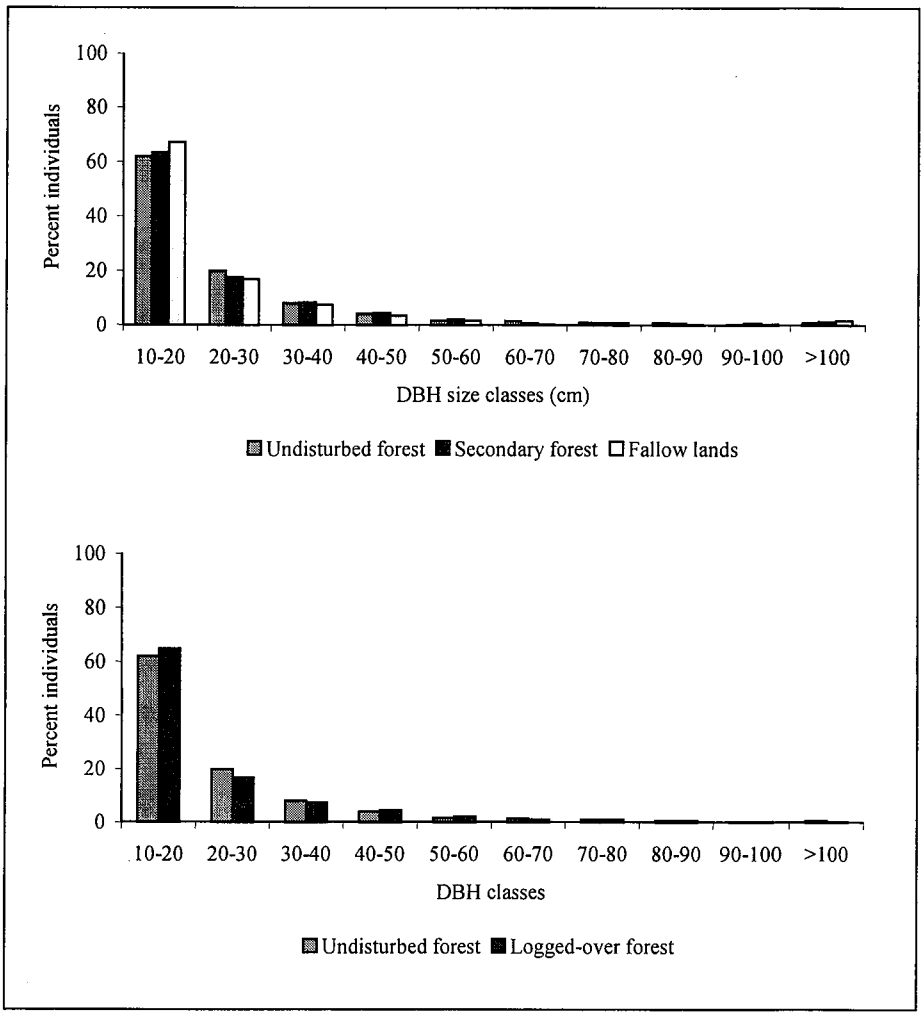

Figure III.1 Size class distribution of NTFP plant communities in undisturbed forest versus secondary vegetation types (above) and versus logged-over forests (below).

Table III.9 summarises the densities of eight species in undisturbed versus logged-over and secondary forest types. For five out the eight species, the abundance in the logged-over forests is intermediate between the densities in secondary and undisturbed forests. Typical shade-bearers (*Coula edulis, Scorodophloeus zenkeri* and *Trichoscypha acuminata*) are less represented in logged-over forests than in undisturbed forests but better than in secondary forest. Two pioneer species (*Antrocaryon klaineanum* and *Ricinodendron heudelotii*) show the opposite

distribution. The other three species do not show such a regular pattern. As most species are not abundant, the size classes had to be combined resulting in five global classes (Fig. 18).

The regular reverse J-shaped size class distribution of *Scorodophloeus zenkeri* (Olon), *Coula edulis* (Ewomen) and the bush mango or *Irvingia gabonensis* (Ando'o) in the undisturbed forests confirms their preference for this habitat type.

Scorodophloeus zenkeri (Olon) did not occur in sample plots formerly used for agriculture. It is not clear whether this species does not or hardly regenerates in formerly burned areas with well-established secondary vegetation, or that the sampled area of the secondary forests at higher altitudes was too. For this species, logging damage appears to affect mainly the smaller diameter classes. However, the regeneration (DBH < 10 cm) is quite abundant.

Apparently *Coula edulis* (Ewomen) is completely removed from the fields. The highest diameter classes are totally absent in the secondary forests. As its timber is highly valued, especially for the construction of houses, they might be exploited or otherwise be burned. Regeneration (DBH <10 cm) does appear but only slowly as the second diameter class (DBH 10-30 cm) is under-represented. Logging has only a small impact on the size class distribution. Mainly the size class of 10-30 cm is less well represented.

Undisturbed forest is also the preferred habitat for the bush mango or *Irvingia gabonensis* (Ando'o). However, both logging and agricultural practices hardly seem to influence the size class distribution of the species. The species is well conserved in the fields, as is shown also by the good representation in the highest diameter class (DBH > 90 cm). The effect of logging on the size class distribution is about the same as for *Coula edulis* (Ewomen) with a slight under-representation of the size class 10-30 cm DBH.

The size class distributions of the fruit tree *Trichoscypha acuminata* (Mvut) and of *Erythrophloeum ivorense* (Elon or 'Tali') show patterns which are difficult to explain. The first species is rather poorly represented with only 45 adults specimen. It is probably a shade-bearer, although Figure III.2 d. shows a rather poor regeneration in undisturbed forest. *Erythrophloeum ivorense* shows in both undisturbed forests and logged-over forests a poor representation in the middle diameter classes.

The size class distributions of *Antrocaryon klaineanum* (Ozakong or 'Angongui'), *Ricinodendron heudelotii* (Ezzezang or 'Njansang') and *Terminalia superba* (Akom or 'Fraké') show more or less the pattern of pioneer species. The regeneration (DBH <10 cm) is far more abundant in disturbed areas than in undisturbed forest, where it may even be absent.

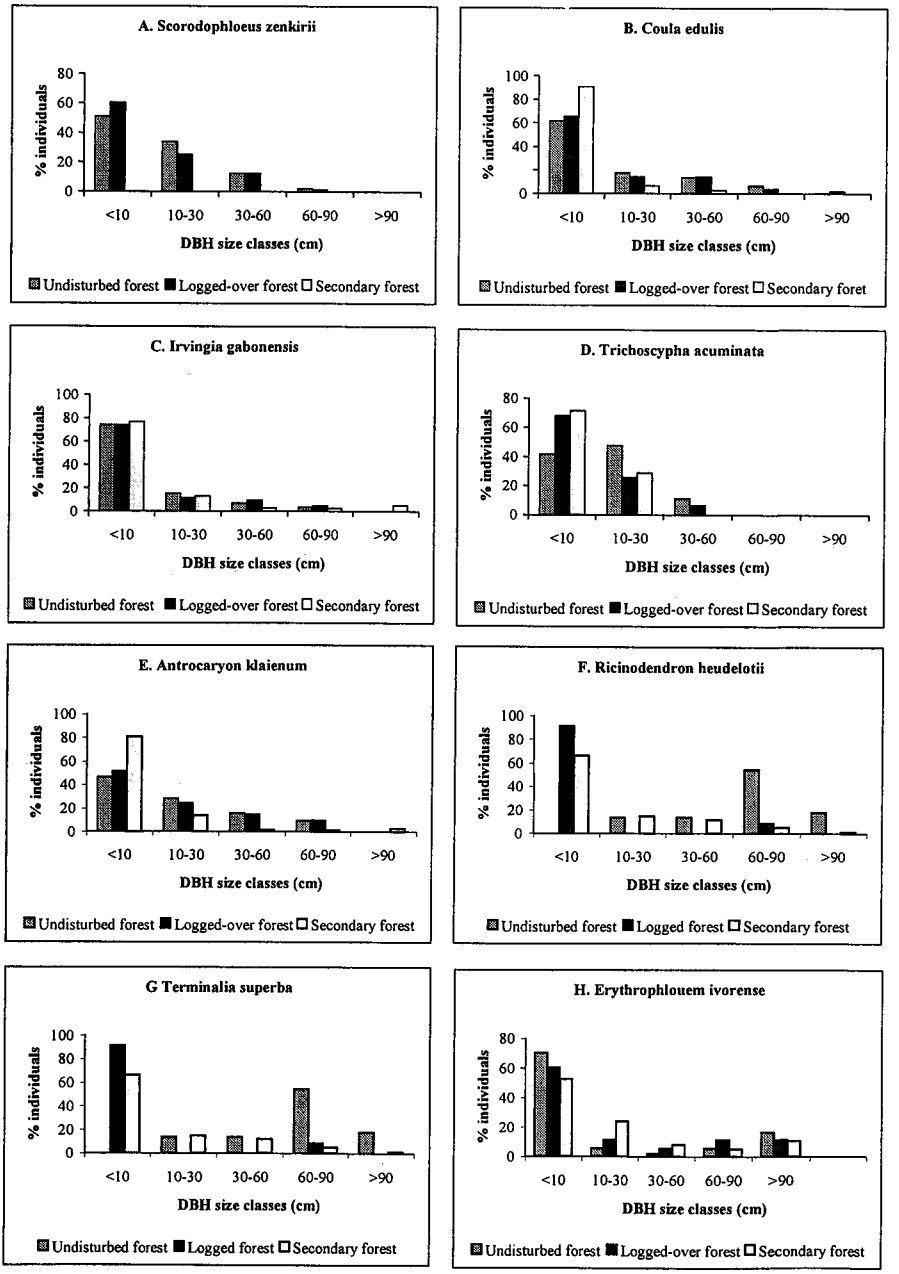

Figure III.2 Size class distributions in undisturbed, logged-over and secondary forests

Table III.9 Densities of some NTFP species in secondary, logged-over and undisturbed forest (in st/ha of trees > 10 cm DBH)

Species name	Secondary Forest	Logged-over forest	Undisturbed forest (all)
Antrocaryon klaineanum [1]	3.3	2.4	1.0
Coula edulis	1.1	4.6	8.5
Erythrophloeum 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	-	7.9	14.4
Terminalia superba [1]	8.0	0.3	2.0
Trichoscypha acuminata	0.9	1.4	1.6

Notes: [1] Commercial timber species, exploited by the present concessionaire
Source: fieldwork 1994-1995, NTFP ecological inventory

The impact of logging on the size class distribution of *Antrocaryon klaineanum* is not very evident, although the regeneration seems to be slightly favoured. For *Ricinodendron heudelotii*, however, logging appears to result in abundant regeneration. The presence of trees in the highest diameter in secondary forest is probably caused by conservation of this species in the fields before burning.

Figure III.2 g, which presents the size class distribution of *Terminalia superba* is misleading. In logged-over forest only two specimen were found, although the species is common elsewhere. Why this species is so poorly represented in logged-over parts of the transects is unknown.

From the above it can be concluded that logging operations have a similar influence on the population dynamics as agriculture, although lesser pronounced. The regeneration of pioneer NTFP species is strongly favoured by logging. For those species which show a clear preference for undisturbed forest sites, the abundance and size class distribution show also an intermediate position between secondary forest and undisturbed forest.

III.3.2 Extraction of NTFPs

III.3.2.1 Introduction

The impact of NTFP extraction on the population structure was studied for a species.

The effects of exploitation on *Garcinia lucida* (Esok) could be determined by comparing exploited and non-exploited population types as there exist specific collection sites. Moreover, the effects of harvesting are very obvious. The decortication (removal of the bark) often leads to the death of the tree.

For other species, the effects of harvesting are less visible. For these species the impact of exploitation was analysed by comparing the population structures in relation to the distance to the village.

III.3.2.2 Coula edulis and Irvingia gabonensis

For two species, *Coula edulis* (Ewomen) and *Irvingia gabonensis* (Ando'o), the effect of extraction was analysed in relation to the distance to village.

Coula edulis is exploited in various ways. It is a commonly used timber for construction purposes. In addition, its seeds are frequently collected as snack, but also as a condiment. *Irvingia gabonensis* is mainly exploited for the fruits and seeds.

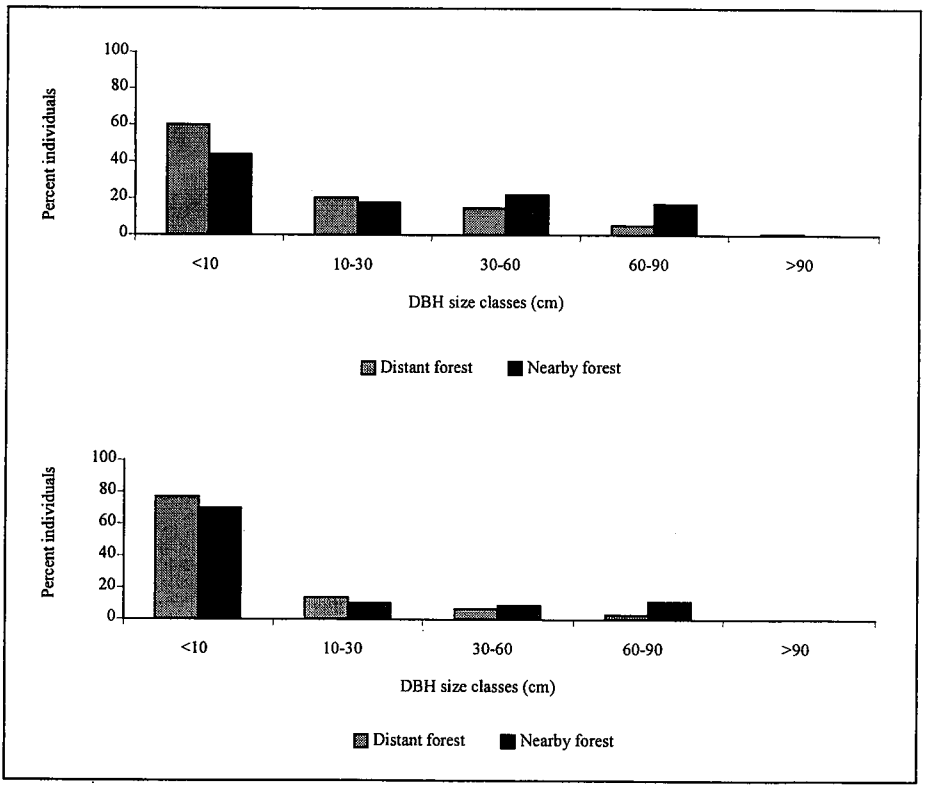

Figure III.3 Size class distributions of Irvingia gabonensis (above) and Coula edulis (below) at proximal and distant sites

In the analysis, only old and well-developed forests were taken into consideration. The limit between proximal sites and distant sites was set at 750 m from the village or road. This is an arbitrary limit and it is not based on the distance people travel for extraction.

In absolute figures, the densities of *Irvingia gabonensis* in proximal and distant sites differ little (resp. 12.4 and 9.6 trees per hectare of which 8.3 and 7.3 saplings). For *Coula edulis* the figures differ more (resp. 9.6 and 20.8 trees per hectare of which 4.2 and 9.6 are saplings).

Figure III.3 presents the comparison of the population structures for the two species. In the distant sites, both species show a reverse J-shaped population structure, indicating healthy populations. For *Irvingia gabonensis*, the population structure at the proximal sites is comparable to the one at distant sites. The only difference is the comparatively high number of large trees. The conservation of the trees, practised by farmers since a long time, might explain this situation.

The population structure of *Coula edulis* at proximal sites shows a somewhat irregular shape. Although effects of exploitation, probably mainly the use of its timber, on the absolute number of individuals as well the population structure are evident, the rate of recruitment seems little affected.

III.3.2.3 Garcinia lucida

Garcinia lucida (Esok) is a well-appreciated additive applied in palm wine. The seeds, but especially the bark are extracted. Many people exploit the species regularly for home consumption, but it is also exploited commercially in response to the demand in urban centres (see Sections II.4.6 and II.10).

Several techniques are applied to exploit the bark. Some people only decorticate a part of the bark. Others decorticate the tree all around the stem or even fell the tree before decortication.

A number of additional transects (8.45 ha) were surveyed at the collection sites of *Garcinia lucida*. In these transects, all trees with a diameter of over 5 cm were enumerated and their DBH measured. These collection sites were indicated by extractors. They are mostly located at long distances from the villages and they are poorly accessible due to steep slopes. The trees are growing in dense populations. In the 8.45 ha, the average density was 57.0 trees/ha. However, the densities may very significantly, ranging from 12 to 234 trees/ha in the various transects.

Figure III.4 reflects the population structure in the collection sites, including dead and the living stems of decorticated trees.

The mortality due to felling but also to decortication is very high. Within the transects, the mortality ranged from 0 to 58%, with a mean of 33.8%. Figure III.4 shows that the mortality is highest in the larger diameter classes. Apparently, mainly the largest trees are exploited. Above the DBH of 15 cm, more than 50% of the trees are decorticated, and above on DBH of 20 cm, more than half of the trees is dead.

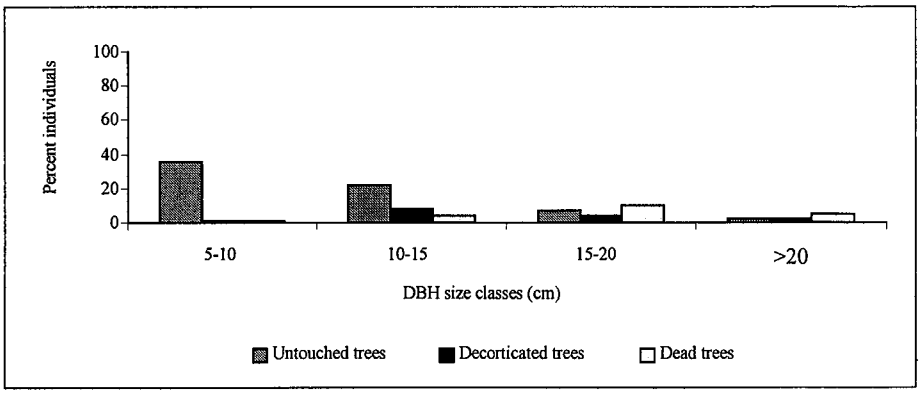

Figure III.4 Size class distribution and mortality of *Garcinia lucida* in exploited populations

In Figure III.5 the population structures of non-exploited (using the data from the general inventory) and the exploited populations (in the collection sites) are given. Apparently there is a good recruitment of seedlings in the exploited sites, as the share of the smallest size classes (1-5 cm) in the total population is even higher than in non-exploited populations.

Although this type of harvesting is destructive to individual trees, it is not evident that the extraction will lead to future depletion of the resources in the in the collection sites. Other data, such as the rate of mortality, growth and recruitment, phenology and the reproductivity as well as the influence of various harvesting techniques on individual specimen and the population structure, are required to determine the effects on population dynamics.

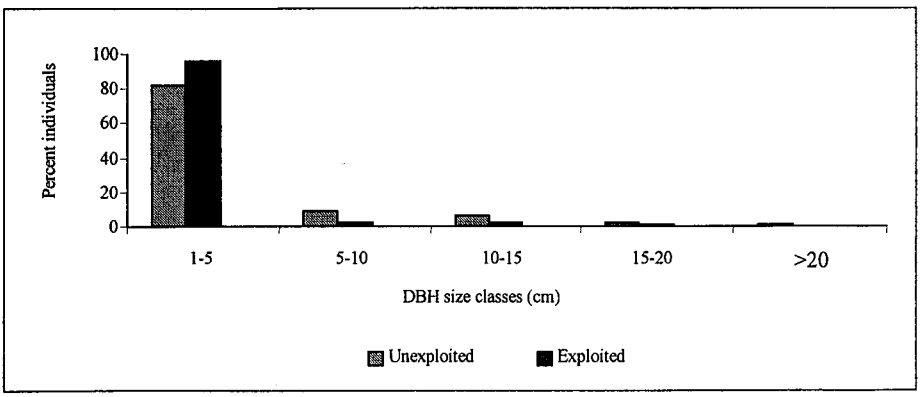

Figure III.5 Size class distribution of *Garcina lucida* in undisturbed and exploited populations

III.4 SUMMARY AND CONCLUSIONS

III.4.1 Methodology

The ecological inventories of the major plant NTFP species consisted of a series of transect studies covering in total 32 ha. In these transects most NTFP species recorded during the reconnaissance survey were present. Some species were rare, and instead of the 85 species selected after the reconnaissance survey data from only 74 species could be analysed. Restrictions with respect to the available time did not permit to measure the DBH of all species. This was only done for 20 major NTFP species, which were selected in advance. The above implies that a number of parameters which are frequently used in ecological analyses such as for example the Importance Value Index, could not be determined. This approach seems justified in view of (i) the total lack of information on the abundance and distribution of NTFP species in the region and on the vegetation types in general, (ii) the important spatial variation within the area, and (iii) the low densities of the majority of NTFP species. Even in a situation where more information on the vegetation types is available, and where thus a more selective sampling can be realised, one can strongly doubt whether sample designs covering 3-10 hectares, as is mostly the case in NTFP research, are representative.

Due to the low densities of most NTFP species it was difficult to make a thorough analysis regarding the impact of various kinds of exploitation on the availability of NTFP resources. Such an analysis could be made only for a few species.

It can be concluded that the inventories provided in an accurate picture of the abundance and distribution of all important NTFP species a relatively short period. Moreover, the major factors influencing the distribution and abundance could be determined, as well as in which way and to what extent these factors affect the occurrence of NTFP species.

III.4.2 Factors affecting distribution of NTFP species

The major factors which influence the distribution and abundance of NTFP species in the area, and thus the availability, were determined on the basis of the distribution patterns of individual NTFP species, as well the species diversity and the species richness of the NTFP plant communities. The variation in distribution of specific NTFPs is considerable. There are two major variables which affect this distribution, i.e. ecological conditions and human impact. The major factors with respect to human impact are the effect of agricultural cultivation, and to a lesser extent the effect of logging.

With respect to ecological conditions, differences in altitude and poor drainage conditions of valley bottoms cause significant variation in forest types. This variation is further increased by the creation of anthropogenic land-use types. The

following preliminary distinction in major habitat types with a distinct configuration of NTFP species was made: undisturbed forests at low (<340 m), intermediate (340-540 m), high (>540 m) altitude levels; valley bottoms (swamp forests); logged-over forests; late secondary forests; young fallow lands and (productive and abandoned) cocoa plantations.

The habitat types which are strongly influenced by agricultural activities, such as fallow lands, secondary forests and especially cocoa plantations, are very important sources for many NTFPs. Forty percent of the selected most important NTFP species find their maximum densities in these habitats. Moreover, in these land-use types the diversity in NTFP species is high, especially when account is taken of the low tree densities in these habitats. Especially women collect NTFPs in these agricultural environments. In future research, the contribution of the various habitats for NTFP extraction should be studied more in detail.

In the forest habitats the abundance of most important NTFP species rather low. Most of these species occur with average densities of 0-5 stems/ha, without a clear higher abundance in a specific habitat. This category include also the species which provide frequently commercialised NTFPs in the TCP area: *Irvingia gabonensis* and *Ricinodendron heudelotii*, as well as a number of species for which a market exists but which are at the present not extracted for commercial purposes.

In view of the potential to develop commercial extraction of NTFPs, those species which occur with the highest densities often are the most promising (Peters, 1996; Ros-Tonen *et al.*, 1995). In the TCP study area, quite a number of NTFPs that are actually extracted for trade stem from species occurring in high densities, especially in specific habitats. Examples of species which are rather abundant (> 10 st/ha) are the palm wine additive and medicinal bark providing *Garcinia lucida*, the flavourer (bark/seeds) *Scorodophloeus zenkeri,* both in the high altitude forests, the oil-containing nut-bearing and timber providing tree *Coula edulis* in all undisturbed forest types, the fresh fruit producing *Cola* spp. (Mvoi) in lowland forests, and the multi-purpose palm trees *Elaeis guineensis* and *Raphia montbuttorum*) in respectively cocoa plantations/fallow lands and swamp forests. However, it is evident that many other factors than density have an effect on the economic feasibility for a (further) development of sustainable commercial NTFP extraction.

III.4.3 Impact of forest exploitation on NTFP resources

In addition to the presence in various habitat types, the presence of NTFP resources may also influenced by the impact of either commercial timber exploitation or the extraction of NTFP itself.

Timber logging affects the vegetation structure and the floristic composition of the forest by creating canopy gaps; this favours light-demanding pioneer species while typical shade-bearers are negatively affected. In general, the population densities of

the species in logged-over forests hold an intermediate position between secondary forests resulting from shifting cultivation of agricultural crops and undisturbed forests. A few, NTFP species reach their maximum densities in logged-over forests (see Table III.6). However, the differences in densities of NTFP species in undisturbed and logged-over forests are not significant.

Logging may not only affect species distribution, but also the population dynamics of species. At the level of plant community and the population level of individual species it was noted that in logged-over areas a comparative low number of trees of smaller diameter classes (10-30cm) are present. However, even in the case of shade-bearers, saplings (< 10cm DBH) are relative well represented. This might indicate that in case logging is executed carefully, e.g. by respecting appropriate felling cycles and damage-control logging methods, the survival of most NTFP populations will not be endangered. The results of other on-going research projects dealing with the damage control of logging will provide more detailed information on the effect of logging on the population of NTFP trees.

The greatest threat of commercial logging is related to rare NTFP species, especially when these are exploited for their timber. The elimination of large, reproductive adults in these low-density populations will have an important impact on the apparently low regeneration capacity. Examples of such species are *Guibourtia tessmannii* (Bubinga or Oveng) and *Baillonella toxisperma* (Moabi or Adjap); these species have a density of respectively 0.3 and 0.2 trees/ha with a DBH of >10cm. The precarious position of such NTFP species justifies the anxious attitude of the local population to the effect of commercial logging on NTFP species. The fate of these species deserves special consideration in the redesign of the actual logging practices.

In addition to logging, also the harvesting of NTFP products may have a negative effect on the presence of these species. The analysis of the impact of harvesting of three NTFP species on the population structure shows indications of distinct effects for two species, namely *Coula edulis* and *Garcinia lucida.* For the third species, *Irvingia gabonensis* no impact was detected. The present data do not permit, however, to determine whether the actual types and/or rates of harvesting endanger the survival of the populations and threaten the survival of the natural stocks. Further research on the question whether the present NTFP harvesting techniques are sustainable will be carried out in the second phase of this research project.

III.4.4 Overall conclusion

The following conclusions can be drawn from the information presented in this report:

- non-timber forest products play an important role in the household economies of local communities in the Tropenbos research area. Over 500 plant species are

collected for either household consumption or sale; these are used for about 1,100 different purposes. In addition, 280 animal species are used for food purposes. Trade in bushmeat is probably directed at satisfying the local demand.

- many NTFP products are used mostly for household consumption, notably food products such as fruits, nuts exudates, medicinal products, materials used for utensils and house construction and, to a lesser extent vegetables and starchy foods. A relatively small number of products, notably fruit products such as seeds, fruits, exudates and mushrooms are sold on local markets or to urban markets. Only a few products are traded in sharply fluctuating amounts to international markets.
- the abundance and distribution of most NTFP species within the natural forests is highly variable. In most cases the densities of NTFP species are low, especially those of commercial timber species. Several species have less than one producing individual per hectare, which limits the availability of resources and which constraints the development of efficient extraction systems.
- those species which have a higher average density are mostly restricted to specific habitat types. Except for spontaneous and semi-domesticated species growing in secondary forests, young fallow lands and cocoa plantations, such relatively gregarious species are generally absent in large parts of the research area. Therefore, they are not available to everyone.
- both commercial timber logging and unsustainable NTFP harvesting affect the availability of NTFP products. The impact of commercial timber harvesting seems minor for most NTFP resources. Some rare species yielding both commercial timber and NTFPs, however, are seriously threatened, with consequences for the availability of their NTFPs. A high risk of unsustainable NTFP harvesting was determined especially in the case of the bark exploitation of *Garcinia lucida*. The destructive harvesting techniques and the high levels of exploitation resulting from a growing demand in the cities, cause a high mortality rate which might affect the survival of the species on the long-term.
- secondary forests and cocoa plantations are important collection areas for several NTFP products. The high availability of some important NTFP resources, the easy physical access, the high level of control over access and control prevailing on these land types and the clear signs of active management indicate opportunities for further development of NTFP extraction in garden-like land-use systems.

On the basis of these findings, the following conclusions about options for forest management and future research are suggested:

- the survey demonstrated that there are a large number of NTFP species, which are used by the local people for subsistence consumption; the surplus collected may be traded on the local markets. In addition, some NTFPs are specifically collected for commercial purposes. The level of commercialisation is low due to their scattered presence in the forests, low densities, tedious processing and

limited marketing opportunities. The development of improved extraction and marketing opportunities for these products seems to offer prospects for the improvement of local incomes and sustainable forest management.

- the present information suggests that both commercial timber extraction and NTFP harvesting have an impact on the availability of certain NTFPs. Consequently, both aspects should be taken into account when developing more sustainable management systems for forest resources.
- in view of the low stocking rates, it is doubtful whether enough NTFP resources are available in sufficiently large densities, to allow a sustainable and efficient increase of extraction levels. There seem to be serious limitation to management strategies with the dual aim of raising income of local people through increased NTFP extraction from natural forest as well as enhancing forest conservation. The intensification of NTFP cultivation and management in anthropogenic land-use types and the development of domestication of selected NTFP species might be a more promising option to raise farmers' incomes.

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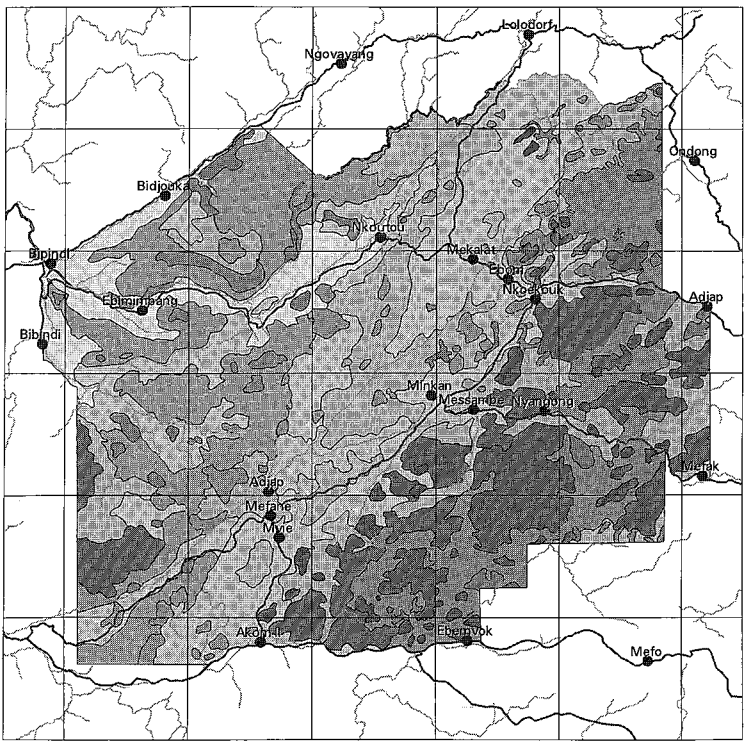
APPENDIX I Landscape ecological map of the research area

Bipindi– Akom II– Lolodorf region, Southwest Cameroon
scale 1:400 000



0 5 10 15 20
Kilometers

LEGEND

Zone A: altitude > 700 m asl
Maranthes – Anisophyllea submontane forest; Nyangong soil
- mountain
- isolated hill

Zone B: altitude 500 – 700 m asl
Podococcus – Polyalthia lowland forest; Nyangong + Ebom soils
- isolated hill
- complex of hills
- hilly upland
- rolling upland

Zone C: altitude 350 – 500 m asl
Strombosia – Polyalthia lowland forest; Ebom soil
- isolated hill
- hilly upland
- rolling upland

Zone D: altitude < 350 m asl
Diospyros – Polyalthia lowland forest; Ebimimbang soil
- isolated hill
- hilly upland
- rolling upland
- dissected plain

Zone E: poorly drained soil
Carapa – Mitragyna swamp forest; valley bottom soil
- valley bottom

KEY
- village
- river
- main road

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APPENDIX II Checklist of use categories of NTFP species

Food products	
- Spices and soup thickeners	- plant saps for beverages
- Cooking oil	- barks for alcoholic drinks
- Vegetables	- hunted mammals
- Starchy foods (tubers/fruits)	- hunted reptiles/amphibians
- Edible fruits	- hunted birds
- Edible nuts	- fishes/crustaceans
- Mushrooms	- edible snails/insects
Medicinal plants	
- Headache	- treatment of wounds
- Diarrhoea	- burns/blisters
- Worm infections	- eye infections/filaria
- Stomachache/food poisoning	- antidotes for snake bites
- Fever/malaria	- menstruation problems
- Jaundice	- pregnancy problems
- Measles	- aphrodisiacs
- Colds/coughing/pulmonary problems	- articulation (children)
- Skin diseases	- childhood diseases
- Cleaning teeth	- venereal diseases
- Toothache	- anaemia
- Backache	- diseases caused by witchcraft
Household equipment	
- Furniture	- mezzanine
- Mats	- utensils
- Baskets	- grinding equipment
Construction materials	
- Roof	- ropes
- Wall	- doors/window frames
Agricultural/hunting/fishing equipment	
- Hafts of tools	- traps for fishing
- Trap (game) construction	- nets/baskets
- Lures	- poisons
- Canoes	

APPENDIX III Database of NTFP plant species: names, types and parts of the species used and the frequency of use

Column 1: Abbreviation scientific name of the plant family
Column 2: Scientific name of the species
Column 3: Habit of the species:
- tr: tree
- sh: shrub
- vi: vine
- he: herb

Column 4: Wild or cultivated species:
- wi: wild
- cu: introduced and/or cultivated
- cu/wi: introduced species; regenerates spontaneously

Column 5-9: Use category (food plants; medicinal plants; construction materials; equipment and others) and the part of the species used:
- le: leaves
- ro: roots
- st: stem
- pl: entire plant
- ba: bark
- wo: wood
- fr: fruit
- se: seeds
- ex: exudate
- sp: sprouts
- bu: buds

Column 10: Number of times the specific use was indicated by the respondents (N=29)
Column 11: Description of the utilisation
Column 12: Ethnic group which indicated the specific use

APPENDIX III Database of NTFP plant species (cont'd)

Fam.	Scientific name	Type	Cult./ Wild	Food	Part of the plant used Medic	Const.	Equip.	Other	# times	Utilization	Ethnic groups
ACAN	*Acanthus sp. ('Ndoi')*	he	w		le				1	to treat hemorrhaging of pregnant women	bu
ACAN	*Asystasia gangetica*	he	w		pl				1	treats backaches	fa
ACAN	*Justicia extensa*	he	w					pl	7	poison used for killing fish	fa
ACAN	*Justicia insularis? ('File')*	he	w	le					1	vegetable	bu
AGAV	*Dracaena arborea*	tr	w/c					tr	0	ornamental plant for fencing or cemeteries	
AGAV	*Dracaena mannii*	sh	w		?				0	medicinal properties	
AGAV	*Dracaena veridiflora*	sh	w		?				0	medicinal properties	
AMAR	*Amaranthus hybridus subsp. cruentus*	he	c	le					6	cultivated vegetable	bu
AMAR	*Amaranthus spinosus*	he	C	le					2	vegetable	bu
AMAR	*Amaranthus spinosus*	he	c	le					0	fodder	
AMAR	*Celosia argentea*	he	c	le					6	cultivated vegetable	bu
ANAC	*Antrocaryon klaineanum*	tr	w	fr					20	edible fruit	bu/fa/ba
ANAC	*Antrocaryon klaineanum*	tr	w		ba				2	treats toothaches	bu
ANAC	*Antrocaryon klaineanum*	tr	w	se					1	condiment	bu
ANAC	*Antrocaryon klaineanum*	tr	w		ba				1	treatment for diarrhoea	bu
ANAC	*Lannea welwitschii*	tr	w		?				1	treats childhood diseases	fa
ANAC	*Lannea welwitschii*	tr	w			wo			0	construction wood, rarely used	
ANAC	*Mangifera indica*	tr	c		ba				10	purgative to treat diarrhoea	bu/fa
ANAC	*Mangifera indica*	tr	c		ba				8	bark in mixture of palm wine as purgative to treat measles	bu/fa
ANAC	*Mangifera indica*	tr	c		ba				6	treatment of toothache	bu/fa
ANAC	*Mangifera indica*	tr	c		ba				1	treatment of backache	fa
ANAC	*Mangifera indica*	tr	c		ba				1	solution of the bark to treat scabies	bu
ANAC	*Mangifera indica*	tr	c	fr					0	introduced edible fruit	
ANAC	*Pseudospondias longifolia? ('Ofo')*	tr	w	fr						see Pseudospondias spp.	
ANAC	*Pseudospondias microcarpa*	tr	w	fr						see Pseudospondias spp.	
ANAC	*Pseudospondias spp.*	tr	w	fr					19	edible fruit	bu/fa/ba
ANAC	*Spondias cytherea*	tr	c	fr					0	introduced fruit tree	
ANAC	*Trichocsypha acuminata*	tr	w	fr					27	fruit as snack	bu/fa/ba
ANAC	*Trichocsypha acuminata*	tr	w					fr	9	commercialized fruit	bu/fa/ba
ANAC	*Trichocsypha acuminata*	tr	w		ba				2	treatment for colds	bu/ba
ANAC	*Trichocsypha acuminata*	tr	w				wo		1	making pestles	fa
ANAC	*Trichoscypha abut? ('Olat mvut')*	tr	w	fr					0	edible fruit	
ANAC	*Trichoscypha arborea*	tr	w	fr					26	edible fruit	bu/fa/ba
ANAC	*Trichoscypha arborea*	tr	w					fr	8	commercialized fruits	

APPENDIX III Database of NTFP plant species (cont'd)

Fam.	Scientific name	Type	Cult./ Wild	Food	Part of the plant used: Medic	Const.	Equip.	Other	# times	Utilization	Ethnic groups
ANAC	*Trichoscypha arborea*	tr	w		ba				2	treats colds (children)	bu
ANNO	*Annona muricata*	tr	c	fr					0	cultivated edible fruit	
ANNO	*Anonidium spp.*	tr	w		ba/le				5	treatment of worm infections, especially of pregnant women	bu/fa
ANNO	*Anonidium spp.*	tr	w	fr					1	edible fruit	fa
ANNO	*Anonidium mannii*	tr	w	fr	ba/le					see Anonidium spp.	
ANNO	*Anonidium floribundum*	tr	w	fr	ba/le					see Anonidium spp.	
ANNO	*Cleistopholis glauca? ('Avom afan')*	tr	w		ba				0	medicinal properties	
ANNO	*Cleistopholis patens*	tr	w			ba			0	unrolled bark for wall construction	
ANNO	*Cleistopholis patens*	tr	w				wo		0	construction of traps	
ANNO	*Enantia chlorantha*	tr	w		ba				13	decoction of bark treats jaundice	bu/fa/ba
ANNO	*Enantia chlorantha*	tr	w				wo		10	manufacturing of furniture	bu/fa/ba
ANNO	*Enantia chlorantha*	tr	w		ba				7	febrifugal by drinking decoction of bark	bu
ANNO	*Enantia chlorantha*	tr	w		ba				6	treatment for river blindness	ba/fa/ba
ANNO	*Enantia chlorantha*	tr	w		ba				4	vermifuge	bu/ba
ANNO	*Enantia chlorantha*	tr	w		ba				2	treatment of wounds	bu/fa
ANNO	*Enantia chlorantha*	tr	w		le				1	treatment of headaches	bu
ANNO	*Enantia chlorantha*	tr	w				wo		1	hafts of tools	fa
ANNO	*Enantia chlorantha*	tr	w		ba				1	treats colds	bu
ANNO	*Enantia chlorantha*	tr	w			wo			1	poles for the construction of houses	fa
ANNO	*Greenwayodendron suaveolens*	tr	w				st		1	construction of traps	bu
ANNO	*Greenwayodendron suaveolens*	tr	w			wo			1	poles for house construction	bu
ANNO	*Hexalobus crispiflorus*	tr	w	fr					14	fruit eaten as a snack	bu/fa/ba
ANNO	*Hexalobus crispiflorus*	tr	w	fr					6	lure for hunting	bu/fa
ANNO	*Hexalobus crispiflorus*	tr	w	fr					3	boiled fruit as a condiment	bu/fa
ANNO	*Hexalobus crispiflorus*	tr	w				wo		0	making crossbows	ba
ANNO	*Isolona hexaloba*	tr	w		ba				1	treatment of wounds	bu
ANNO	*Isolona hexaloba*	tr	w		ba				1	purgative of bark treats diarrhoea	fa
ANNO	*Meiocarpidium lepidotum*	tr	w		ba					see Isolona hexaloba	
ANNO	*Monodora brevipes*	tr	w	se						see Monodora spp.	
ANNO	*Monodora myristica*	tr	w	se						see Monodora spp.	
ANNO	*Monodora spp.*	tr	w	se					3	seeds used as spice	bu/fa
ANNO	*Monodora spp.*	tr	w	se					0	grinded seeds added to tobacco	bu
ANNO	*Monodora spp.*	tr	w					se	1	seeds commercialized (more frequently in other regions)	

APPENDIX III Database of NTFP plant species (cont'd)

Fam.	Scientific name	Type	Cult./ Wild	Food	Part of the plant used Medic	Const.	Equip.	Other	# times	Utilization	Ethnic groups
ANNO	*Monodora tenuifolia*	tr	w							see Monodora spp.	
ANNO	*Pachypodanthium staudtii*	tr	w		ba				21	treatment for head lice	bu/fa/ba
ANNO	*Pachypodanthium staudtii*	tr	w		ba				20	treats loasis	bu/fa/ba
ANNO	*Pachypodanthium staudtii*	tr	w		ba				1	washing of the head with maceration of bark treats headaches	fa
ANNO	*Pachypodanthium staudtii*	tr	w		ba				1	treatment for abdominal pains	bu
ANNO	*Pachypodanthium staudtii*	tr	w		ba				1	treatment for crabs	fa
ANNO	*Xylopia aethiopica*	tr	w			wo			17	poles for house construction	bu/fa/ba
ANNO	*Xylopia aethiopica*	tr	w				wo		11	furniture	bu/fa/ba
ANNO	*Xylopia aethiopica*	tr	w	fr					7	condiment	bu/fa
ANNO	*Xylopia aethiopica*	tr	w				wo		2	hafts of tools	bu
ANNO	*Xylopia aethiopica*	tr	w					fr	0	fruits sold on markets	
ANNO	*Xylopia parviflora? ('Nkala afan')*	tr	w			wo			0	poles for house construction	
ANNO	*Xylopia quintasii*	tr	w		ba				1	treats backache	bu
ANNO	*Xylopia quintasii*	tr	w			ba			0	bark formerly used for wall construction	
ANNO	*Xylopia sp. ('Akui')*	tr	w					fr	0	fermented fruits commercialized	
ANNO	*Xylopia staudtii*	tr	w			wo			0	poles for construction of houses	
APOC	*Alstonia boonei*	tr	w		ba/ex				28	treatment for malaria and other fever diseases	bu/fa/ba
APOC	*Alstonia boonei*	tr	w		ex				16	treatment for colds, especially children	bu/fa/ba
APOC	*Alstonia boonei*	tr	w		ba				12	vermifuge	bu/fa/ba
APOC	*Alstonia boonei*	tr	w		ex				6	antidote for snakebites	bu/fa/ba
APOC	*Alstonia boonei*	tr	w		ba				5	to treat ultimate malaria cases (children)	bu/fa/ba
APOC	*Alstonia boonei*	tr	w		ex				4	to stimulate lactation of women	bu
APOC	*Alstonia boonei*	tr	w	ba					4	additive for palm wine	bu/fa
APOC	*Alstonia boonei*	tr	w		ba				2	treats headaches	bu/fa
APOC	*Alstonia boonei*	tr	w		ba				1	treats backaches	bu
APOC	*Alstonia boonei*	tr	w		?				1	treatment for pregnancy problems	fa
APOC	*Alstonia boonei*	tr	w		ba				0	treats stomachaches	
APOC	*Alstonia congensis*	tr	w	ba	ba/ex				0	probably the same uses as for Alstonia boonei	
APOC	*Anthoclitandra robustior? ('Ongam')*	li	w		st				3	toothbrush	fa
APOC	*Funtumia elastica*	tr	w		ba?				5	febrifugal	bu
APOC	*Funtumia elastica*	tr	w				wo		4	furniture-making	bu/fa
APOC	*Funtumia elastica*	tr	w			wo			3	poles for house construction	bu

Fam.	Scientific name	Type	Cult./ Wild	Part of the plant used: Food	Medic	Const.	Equip.	Other	# times	Utilization	Ethnic groups
APOC	*Funtumia elastica*	tr	w		ba?				1	treats headaches	bu
APOC	*Funtumia elastica*	tr	w					ex	0	formerly exported local rubber	
APOC	*Landolphia sp.*	li	w				st		5	to stretch traps	bu
APOC	*Landolphia spp.*	li	w	fr					9	edible fruits	bu/fa/ba
APOC	*Landolphia spp.*	li	w		le				2	treatment for pregnancy problems	bu/fa
APOC	*Picralima nitida*	tr	w		ba				13	decoction of the bark treats malaria	bu/fa/ba
APOC	*Picralima nitida*	tr	w		ro				6	vermifuge	bu/fa/ba
APOC	*Picralima nitida*	tr	w				wo		3	manufacturing of pestles	fa
APOC	*Picralima nitida*	tr	w		ba				2	treatment for headaches	bu
APOC	*Picralima nitida*	tr	w		ba				1	antidote for snakebites	bu
APOC	*Picralima nitida*	tr	w		ba				1	treatment for colds	bu
APOC	*Picralima nitida*	tr	w		ba				1	treatment of jaundice	fa
APOC	*Picralima nitida*	tr	w		st				1	used as toothbrush	bu
APOC	*Rauvolfia caffra*	tr	w		le				6	young leaves to treat backaches	bu/fa
APOC	*Rauvolfia caffra*	tr	w					ba	0	fibers used to make crossbow strings	
APOC	*Rauvolfia vomitoria*	tr	w		fr/ro				23	febrifuge	bu/fa/ba
APOC	*Rauvolfia vomitoria*	tr	w		ba				8	antidote for snake bites	bu/fa/ba
APOC	*Rauvolfia vomitoria*	tr	w		ba/le				4	decoction as vermifuge	bu/fa/ba
APOC	*Rauvolfia vomitoria*	tr	w		fr				4	treats children's malaria ('rate')	bu/fa
APOC	*Rauvolfia vomitoria*	tr	w		ro				2	treats wounds, injuries and abscesses	bu/fa
APOC	*Rauvolfia vomitoria*	tr	w		le?				1	treats colds	bu
APOC	*Rauvolfia vomitoria*	tr	w		fr				0	tonic for lactating women	
APOC	*Strophanthus gratus*	li	w					se	2	hunting poison	fa/ba
APOC	*Strophanthus gratus*	li	w					se	2	seeds commercialized for pharmaceutical industry	ba/fa
APOC	*Tabernaemontana crassa*	tr	w		ba/ex				21	bark and exudate to treat wounds	bu/fa/ba
APOC	*Tabernaemontana crassa*	tr	w		le				7	compresses in which Aframomum melegueta is added to treat backaches	bu/fa
APOC	*Tabernaemontana crassa*	tr	w		ba				3	treatment for food poisoning/diarrhoea	fa/ba
APOC	*Tabernaemontana crassa*	tr	w		ba				2	febrifugal	bu/ba
APOC	*Tabernaemontana crassa*	tr	w		ba				1	antidote for snakebites	bu
APOC	*Tabernaemontana crassa*	tr	w		le				1	crushed leaves to treat toothache	fa
APOC	*Tabernaemontana crassa*	tr	w		ba				1	vermifugal	ba
APOC	*Tabernaemontana crassa*	tr	w		ba				1	treatment for jaundice	fa
APOC	*Tabernaemontana crassa*	tr	w		ba				1	treatment for pregnancy problems	bu

APPENDIX III Database of NTFP plant species (cont'd)

Fam.	Scientific name	Type	Cult./ Wild	Part of the plant used: Food	Medic	Const.	Equip.	Other	# times	Utilization	Ethnic groups
APOC	*Tabernaemontana sp. ('Obaton afan')*	tr	w						-		
APOC	*Thevetia nerifolia*	tr	c					?	1	fishing poison	bu
ARAC	*Anchomanes difformis*	he	w		le				2	to control/shorten women's periods	bu/fa
ARAC	*Cercestis sp.*	vi	w	le					13	vegetable	bu/fa
ARAC	*Culcasia simiarum*	vi	w	le					1	vegetable	bu
ARAC	*Culcasia simiarum*	vi	w				st		5	manufacturing of baskets/shrimp traps	bu/fa
ARAC	*Nephtytis poissonii*	vi	w	le					13	vegetable	bu/fa
ARAC	*Rhektophyllum mirabile*	vi	w	le					2	young leaves as vegetable	bu
ARAC	*Rhektophyllum mirabile*	vi	w				st		1	basketry	bu
ARAC	*Xanthosoma sagittifolium*	he	c	le					3	vegetable (young leaves)	bu
ARAC	*Xanthosoma sagittifolium*	he	c		?				2	antidote for snakebites	fa
ARAC	*Xanthosoma sagittifolium*	he	c		?				1	treatment for jaundice	fa
ARAC	*Xanthosoma sagittifolium*	he	c	ro					0	cultivated edible tuber	
BASE	*Basella alba*	he	w		le				1	vegetable	fa
BIGN	*Markhamia tomentosa? ('Angossa')*	tr	w		ba				1	treatment to stimulate healing of wounds	bu
BIGN	*Newbouldia laevis*	tr	w				wo		1	hafts of tools	fa
BIGN	*Newbouldia laevis*	tr	w	le?					1	treats toothaches	bu
BIGN	*Newbouldia laevis*	tr	w			wo			1	construction material	bu
BIGN	*Spathodea campanulata*	tr	w		ba				8	treatment of the most serious stage of malaria (children)	bu/fa
BIGN	*Spathodea campanulata*	tr	w		ex				5	treatment of wounds	bu
BIGN	*Spathodea campanulata*	tr	w		ba				4	treatment for headaches	bu
BIGN	*Spathodea campanulata*	tr	w		ba				1	treats colds	bu
BIGN	*Spathodea campanulata*	tr	w		ba				1	treatment of diarrhoea	fa
BOMB	*Ceiba pentandra*	tr	w		ba				2	treatment for headaches	bu/fa
BOMB	*Ceiba pentandra*	tr	w		ba				2	treatment for venereal diseases	bu/fa
BOMB	*Ceiba pentandra*	tr	w	le					1	vegetable	fa
BORA	*Cordia aurantiaca*	tr	w					fr	0	glue	
BORA	*Cordia platytyrsa*	tr	w		ba				0	treatment of scabies	
BROM	*Ananas comosus*	he	c		fr				5	young fruit to treat colds	bu/fa
BROM	*Ananas comosus*	he	c		fr				2	treatment for diarrhoea	bu/fa
BROM	*Ananas comosus*	he	c		fr				1	young fruits to treat childhood diseases	bu
BROM	*Ananas comosus*	he	c		?				1	treats anemia	fa
BROM	*Ananas comosus*	he	c	fr					0	cultivated fruit	
BROM	*indeterminata ('Zek mevele')*	he	w					?	2	fishing poison	fa

APPENDIX III Database of NTFP plant species (cont'd)

Fam.	Scientific name	Type	Cult./ Wild	Food	Part of the plant used: Medic	Const.	Equip.	Other	# times	Utilization	Ethnic groups
BURS	*Canarium schweinfurthii*	tr	w					ex	4	inflammable resin as fuel for torches	bu/fa/ba
BURS	*Canarium schweinfurthii*	tr	w					tr?	2	protection against witchcraft	bu
BURS	*Canarium schweinfurthii*	tr	w	se					2	seeds as condiment	ba
BURS	*Canarium schweinfurthii*	tr	w		ba				1	treatment for toothache	bu
BURS	*Canarium schweinfurthii*	tr	w		?				1	treats skin diseases	bu
BURS	*Dacryodes edulis ('Assa')*	tr	c		ba				1	treatment of measles	bu
BURS	*Dacryodes edulis ('Assa')*	tr	c	fr					0	domesticated; fruit as vegetable	
BURS	*Dacryodes edulis ('Assa')*	tr	c	fr					0	fruits commercialized	
BURS	*Dacryodes edulis ('Assa mingun')*	tr	w		ba				1	treatment of toothache	bu
BURS	*Dacryodes edulis ('Assa mingun')*	tr	w	fr					2	fruit as a snack	bu
BURS	*Dacryodes klaineana*	tr	w	fr					2	edible fruit	bu
BURS	*Dacryodes macrophylla*	tr	w	fr					18	edible fruit eaten as snack	bu/fa/ba
BURS	*Dacryodes macrophylla*	tr	w					fr	3	commercialized edible fruit	bu/fa/ba
BURS	*Santiria trimera*	tr	w	fr					2	edible fruit	bu
CAES	*Afzelia bipindensis*	tr	w						-		
CAES	*Afzelia pachyloba*	tr	w			wo			0	poles for house construction	bu
CAES	*Anthonotha ferrigunea*	tr	w						-		
CAES	*Anthonotha fragans*	tr	w						-		
CAES	*Anthonotha macrophylla*	sh	w				fr		4	lure for hunting	bu
CAES	*Berlinia bracteosa*	tr	w					tr	0	?	
CAES	*Berlinia confusa*	tr	w					tr	0	?	
CAES	*Cassia alata*	sh	c/w		le				14	treats jaundice	bu/fa
CAES	*Cassia alata*	sh	c/w		le				7	treatment of scabies and fungal infections	bu/fa
CAES	*Cassia alata*	sh	c/w		?				1	treats snake bites	bu
CAES	*Cassia alata*	he	c/w		le				1	treatment of eye diseases	fa
CAES	*Cassia alata*	sh	c/w		?				1	to treat venereal diseases	fa
CAES	*Cassia sp. ('Ebay si')*	he	w		le				2	treats children's possession	bu/fa
CAES	*Cassia sp. ('Ebay si')*	he	w		le				2	vermifuge	bu/fa
CAES	*Cassia sp. ('Ebay si')*	he	w		le				2	treatment for pregnancy problems	bu/fa
CAES	*Cynometra hankei*	tr	w						-		
CAES	*Cynometra sp. ('Ababekwe')*	tr	w		?				0	medicinal properties	
CAES	*Daniella ogea*	tr	w						-	commercial timber, locally not used	
CAES	*Detarium macrocarpa*	tr	w			wo			0	commercial timber, hardly used by population	
CAES	*Dialium bipindense*	tr	w	se				tr		see Dialium spp.	

APPENDIX III Database of NTFP plant species (cont'd)

Fam.	Scientific name	Type	Cult./ Wild	Food	Part of the plant used: Medic	Const.	Equip.	Other	# times	Utilization	Ethnic groups
CAES	*Dialium guineense*	tr	w	se				tr		see Dialium spp.	
CAES	*Dialium pachyphyllum*	tr	w	se				tr		see Dialium spp.	
CAES	*Dialium spp. ('Mfang')*	tr	w	se					3	seeds as condiment	bu
CAES	*Dialium spp. ('Mfang')*	tr	w					tr	2	shadow tree	bu
CAES	*Dialium spp. ('Mfang')*	tr	w	se					1	seeds consumed as snack	bu
CAES	*Dialium tessmannii*	tr	w	se				wo		see Dialium spp.	
CAES	*Dialium zenkeri*	tr	w	se				wo		see Dialium spp.	
CAES	*Didelotia letouzeyi? ('Evele ekop')*	tr	w						-	commercial timber; locally not used	
CAES	*Didelotia sp. ('Ekop ngomba')*	tr	w						-	commercial timber; locally not used	
CAES	*Distemonanthus benthamianus*	tr	w			wo			3	construction material for houses	bu
CAES	*Distemonanthus benthamianus*	tr	w		ba				1	to treat diarrhoea caused by amoebas	fa
CAES	*Distemonanthus benthamianus*	tr	w		ba				1	treatment for pregnancy problems	bu
CAES	*Distemonanthus benthamianus*	tr	w					tr?	1	protection against witchcraft	bu
CAES	*Erythrophloeum ivorense*	tr	w		ba				10	treatment for scabies	bu/fa/ba
CAES	*Erythrophloeum ivorense*	tr	w		ba				8	solution of bark for washing the skin to treat measles	bu/fa/ba
CAES	*Erythrophloeum ivorense*	tr	w		ba				5	treats lumbar pains	bu/ba
CAES	*Erythrophloeum ivorense*	tr	w			wo			1	construction material	bu
CAES	*Erythrophloeum ivorense*	tr	w		ba				1	treats toothaches	fa
CAES	*Erythrophloeum ivorense*	tr	w				wo		1	manufacturing of grinding materials	bu
CAES	*Erythrophloeum ivorense*	tr	w		ba				0	poisonous bark has medicinal properties	bu
CAES	*Gilbertiodendron dewevrei*	tr	w						-	commercial timber; locally not used	
CAES	*Gossweilerodendron balsimiferum*	tr	w						-	commercial timber; locally not used	
CAES	*Guibourtia tessmannii*	tr	w					ba/tr	23	protects against evil spirits	bu/fa/ba
CAES	*Guibourtia tessmannii*	tr	w		ba				3	aphrodisiac adjusted as purgative	bu/fa
CAES	*Guibourtia tessmannii*	tr	w						3	treats headaches	bu/fa/ba
CAES	*Guibourtia tessmannii*	tr	w	ex					3	drinkable exudate	bu/fa
CAES	*Guibourtia tessmannii*	tr	w		?				2	treatment for snake bites	bu
CAES	*Guibourtia tessmannii*	tr	w		ba				2	treats toothache	bu/ba
CAES	*Guibourtia tessmannii*	tr	w				wo		2	mortars and furniture	bu
CAES	*Guibourtia tessmannii*	tr	w					wo	1	wood carving statues	bu
CAES	*Guibourtia tessmannii*	tr	w		ba				1	treatment for skin diseases	bu
CAES	*Guibourtia tessmannii*	tr	w		ba				1	prophylaxis childhood diseases	bu
CAES	*Guibourtia tessmannii*	tr	w		?				1	febrifugal	bu
CAES	*Guibourtia tessmannii*	tr	w		ba				1	treatment for pregnant women	bu

APPENDIX III Database of NTFP plant species (cont'd)

Fam.	Scientific name	Type	Cult./ Wild	Food	Part of the plant used: Medic	Const.	Equip.	Other	# times	Utilization	Ethnic groups
CAES	*Guibourtia tessmannii*	tr	w		ba				1	treats food poisoning	fa
CAES	*Guibourtia tessmannii*	tr	w		ba				0	treatment against colic's	
CAES	*Guibourtia tessmannii*	tr	w		ba				0	treats colds	
CAES	*Hylodendron gabunense*	tr	w			wo			1	poles for house construction	bu
CAES	*Hylodendron gabunense*	tr	w					pl	0	indicator of infertility of soils	-
CAES	*Julbernardia seretii*	tr	w						-	commercial timber; locally not used	
CAES	*Microberlinia sp. ('Zingana')*	tr	w						-	commercial timber; locally not used	
CAES	*Monopetalanthus microfilus*	tr	w						-	commercial timber; locally not used	
CAES	*Oxystigma bucholzii*	tr	w		ba				1	purgative to treat diarrhoea	bu
CAES	*Oxystigma bucholzii*	tr	w		ba				1	treatment of colds	bu
CAES	*Oxystigma manni*	tr	w						-	commercial timber; locally not used	
CAES	*Pachyelasma tessmannii*	tr	w					fr	3	poison for fishing	
CAES	*Plagiosyphon multijugus? (Ekop I)*	tr	w						-	commercial timber; locally not used	
CAES	*Scorodophloeus zenkeri*	tr	w	ba					27	condiment	bu/fa/ba
CAES	*Scorodophloeus zenkeri*	tr	w					ba/se	5	seeds/bark commercialized	bu/fa/ba
CAES	*Tetraberlinia bifoliolata*	tr	w						-	commercial timber; locally not used	
CAES	*Toubaouate brevipaniculata*	tr	w						-	commercial timber; locally not used	
CANN	*Canna indica*	he	c		le				4	treatment for headaches	bu
CANN	*Cannabis sativa*	sh	c		?				3	treatment for river blindness	bu/fa
CANN	*Cannabis sativa*	sh	c		fr				3	treatment for abdominal pains	bu
CANN	*Cannabis sativa*	sh	c						0	cultivated drug	
CARI	*Carica papaya*	tr	c/w		le				14	heated leaves as compress to treat backache	bu/fa/ba
CARI	*Carica papaya*	tr	c/w		le				7	vermifuge	bu/fa
CARI	*Carica papaya*	tr	c/w						5	treatment of anemia	fa/ba
CARI	*Carica papaya*	tr	c/w		se				1	treatment of measles	bu
CARI	*Carica papaya*	tr	c/w		le?				1	treatment for diarrhoea	bu
CARI	*Carica papaya*	tr	c/w		?				1	treatment of toothache	fa
CARI	*Carica papaya*	tr	c/w		le				1	treatment of wounds	ba
CARI	*Carica papaya*	tr	c/w	fr					0	introduced/cultivated fruit bearing tree	
CARY	*Drymeria cordata*	he	w		le				1	treats headaches	bu
CARY	*Drymeria cordata*	he	w		le				3	treatment for colds	bu/fa
CARY	*Drymeria cordata*	he	w		le				1	treatment against diarrhoea	bu
CECR	*Myrianthus arboreus*	tr	w	fr					18	fruit as snack	bu/fa/ba
CECR	*Myrianthus arboreus*	tr	w		ba				2	febrifugal, especially for children	bu/fa
CECR	*Myrianthus arboreus*	tr	w		ba				1	treatment of toothache	bu

APPENDIX III Database of NTFP plant species (cont'd)

Fam.	Scientific name	Type	Cult./ Wild	Food	Part of the plant used Medic	Const.	Equip.	Other	# times	Utilization	Ethnic groups
CECR	*Myrianthus arboreus*	tr	w		ba				1	treatment of venereal diseases	bu
CECR	*Myrianthus arboreus*	tr	w		ba				1	treatment of anemia	fa
CECR	*Myrianthus arboreus*	tr	w	le					1	vegetable	fa
CECR	*Myrianthus arboreus*	tr	w		ba				1	purgative to treat diarrhoea	fa
CECR	*Myrianthus arboreus*	tr	w			wo			1	construction of houses	fa
CECR	*Myrianthus arboreus*	tr	w		ba				0	treats rheumatism	fa
CECR	*Myrianthus arboreus*	tr	w		ba				0	treatment for women's breast problems	fa
CHRY	*Maranthes glabra? ('Alep')*	tr	w						1	seed as condiment	fa
COMB	*Pteleopsis hylodendron*	tr	w						-		
COMB	*Terminalia catappa*	tr	w					pl	0	shadow tree on compounds	
COMB	*Terminalia catappa*	tr	w	se					0	edible nuts, consumed by children	
COMB	*Terminalia superba*	tr	w		ba				13	bark as purgative used to treat diarrhoea	bu/fa/ba
COMB	*Terminalia superba*	tr	w		ba				2	to treat toothache	fa
COMB	*Terminalia superba*	tr	w	se					2	edible nuts	bu
COMB	*Terminalia superba*	tr	w		ba				1	stops bleeding during childbirth	bu
COMB	*Terminalia superba*	tr	w	ex					1	consumable exudate	bu
COMB	*Terminalia superba*	tr	w		ba				1	treatment of measles in mixture with palm wine	bu
COMB	*Terminalia superba*	tr	w		ba				1	febrifuge	bu
COMB	*Terminalia superba*	tr	w			wo			1	house construction	bu/fa
COMB	*Terminalia superba*	tr	w		ba				1	treatment for venereal diseases	ba
COMB	*Terminalia superba*	tr	w		ba				1	purgative for backache	fa
COMB	*Terminalia superba*	tr	w		ba				1	to treat colds	bu
COMB	*Terminalia superba*	tr	w					pl	0	buttresses used for grinding	
COMP	*Ageratum conyzoides*	he	w		le				6	treatment for loasis	bu/fa
COMP	*Ageratum conyzoides*	he	w		le				3	treatment for indigestion; especially for children	bu
COMP	*Ageratum conyzoides*	he	w		le				3	treats headaches	bu
COMP	*Ageratum conyzoides*	he	w		le				2	treatment for diarrhoea	bu
COMP	*Ageratum conyzoides*	he	w		le				1	to shorten menstrual periods	bu
COMP	*Ageratum conyzoides*	he	w		le				1	treats wounds and injuries	bu
COMP	*Chromolaena odorata*	he	c/w		le				2	leaves put on articulations to stimulate children to start walking	bu
COMP	*Chromolaena odorata*	he	c/w		le				1	treats backaches	fa
COMP	*Chromolaena odorata*	he	c/w	le					1	vegetable	fa

Fam.	Scientific name	Type	Cult./ Wild	Food	Part of the plant used					Utilization	Ethnic groups
					Medic	Const.	Equip.	Other	# times		
COMP	*Chromolaena odorata*	he	c/w					le	1	toilet paper	fa
COMP	*Chromolaena odorata*	he	c/w		le				1	treats injuries	ba
COMP	*Chromolaena odorata*	he	c/w		le				1	treatment for eye diseases	fa
COMP	*Emilia sp. ('Alomvu')*	he	w		pl				9	mixed in with sugar cane to treat jaundice	bu/fa
COMP	*Emilia sp. ('Alomvu')*	he	w		le				3	to treat the eyes in case of bewitching	fa
COMP	*Emilia sp. ('Alomvu')*	he	w		le				2	mixed wit Costus sp. and sugar cane to treat venereal diseases	bu
COMP	*Emilia sp. ('Alomvu')*	he	w		le				2	treatment for headaches	fa
COMP	*Emilia sp. ('Alomvu')*	he	w		pl				1	treatment for skin diseases	fa
COMP	*indeterminata ('Mvu mvu')*	he	w		le				4	treatment for loasis	bu/fa
COMP	*indeterminata ('Mvu mvu')*	he	w		fr				0	purgative to treat children's stomachaches	
COMP	*indeterminata ('Akiba')*	he	w		?				1	compresses to treat backaches	bu
COMP	*Mikania cordata*	he	w		le				1	treats headaches	fa
COMP	*Mikania cordata*	he	w		le				1	treatment for skin diseases	fa
COMP	*Solanecio biafrae*	he	w		le				1	treats measles	bu
COMP	*Solanecio biafrae*	he	w	le					7	vegetable	bu
COMP	*Spilanthes filicaulis*	he	w		pl				5	febrifuge for children	bu
COMP	*Spilanthes filicaulis*	he	w		pl				4	treatment for caries	bu/fa
COMP	*Spilanthes filicaulis*	he	w		pl				2	antidote for snakebites	bu
COMP	*Spilanthes filicaulis*	he	w		pl				1	treats eye diseases	fa
COMP	*Thitonia diversifolia*	sh	w		le				16	purgative to treat measles	bu/fa
COMP	*Vernonia amygdalina*	sh	c		le				14	decoction of bark as treatment intestinal worms	bu/fa
COMP	*Vernonia amygdalina*	sh	c	le					13	cultivated vegetable	bu/fa/ba
COMP	*Vernonia amygdalina*	sh	c		le				7	treatment for scabies	bu/fa
COMP	*Vernonia amygdalina*	sh	c		le				3	febrifugal	bu
COMP	*Vernonia amygdalina*	sh	c		le				1	treatment for river blindness	bu
COMP	*Vernonia amygdalina*	sh	c		le				1	treats food poisoning	fa
COMP	*Vernonia conferta*	tr	w		ba				13	treatment of wounds	bu
COMP	*Vernonia conferta*	tr	w	le					2	food wrapping	bu
COMP	*Vernonia conferta*	tr	w		le				2	compresses of heated leaves to treat backaches	bu/fa
COMP	*Vernonia conferta*	tr	w		ba				1	treatment for toothache	bu
COMP	*Vernonia conferta*	tr	w		ba				1	treatment for jaundice	bu
COMP	*Vernonia conferta*	tr	w		ba				1	treatment for diarrhoea	bu

APPENDIX III Database of NTFP plant species (cont'd)

Fam.	Scientific name	Type	Cult./ Wild	Part of the plant used: Food	Medic	Const.	Equip.	Other	# times	Utilization	Ethnic groups
COMP	*Vernonia conferta*	tr	w		ba				1	to ease childbirth	fa
COMP	*Vernonia sp. (filigera?) ('Ayolo mesak')*	sh	w	le					6	vegetable	bu/fa
CONN	*Cnestis ferrigunea*	tr	w						-		
CONV	*Ipomoea batatas*	vi	c		le				2	bandeau to treat headaches	fa/ba
CONV	*Ipomoea batatas*	vi	c		le				1	treatment for diarrhoea	fa
CONV	*Ipomoea batatas*	vi	c	le					0	vegetable	
CONV	*Ipomoea batatas*	vi	c	ro					0	cultivated starchy food	
CONV	*Ipomoea pes-caprae*	vi	w		st				4	stem as bandeau to treat headache	bu
CUCU	*Cucumeropsis mannii*	vi	c	se					4	cultivated condiment ('pistachio')	bu/fa
CUCU	*Cucurbita maxima*	vi	c	le					1	cultivated vegetable	bu
CUCU	*Cucurbita maxima*	vi	c	se					1	cultivated vegetable	bu
CUCU	Momordica charantia	vi	w		le				2	purgative to treat measles	fa
CUCU	*Rhigiocarya racemifera*	vi	w		le				7	febifugal	bu
CUCU	*Rhigiocarya racemifera*	vi	w		le				4	vermifuge	bu/fa
CUCU	*Rhigiocarya racemifera*	vi	w		le				2	treatment of the most serious stage of children's malaria	bu
CUCU	*Rhigiocarya racemifera*	vi	w		le				1	treatment for headaches	bu
CUCU	*Rhigiocarya racemifera*	vi	w		le				1	treats jaundice	bu
CUCU	*Telfaira occidentalis? ('Dji zok')*	vi	w	se					1	condiment	ba
CYPE	*Scleria barteri*	vi	w		le				1	aphrodisiac	bu
DICH	*Dichapetalum sp. ('Engangoa')*	li	w	ex					5	water containing liana	bu/fa/ba
DIOS	*Dioscorea alata*	vi	c		?				1	treats eye diseases	
DIOS	*Dioscorea alata*	vi	c	ro					0	cultivated starchy food	
DIOS	*Dioscorea dumetorum*	li	w		le				1	to treat children's diseases	fa
DIOS	*Dioscorea dumetorum*	li	w		le				1	treatment of toothache	bu
DISC	*Dioscorea cayenensis-rotundata*	li	c	ro					2	edible tuber	bu/ba
DISC	*Dioscorea claesseni*	li	w	ro					14	edible tuber	bu/fa/ba
DISC	*Dioscorea claesseni*	li	w				st		1	stretching traps	fa
DISC	*Dioscorea esculenta*	li	c				ro		1	lure for hunting	fa
DISC	*Dioscorea esculenta*	li	c	ro					1	cultivated starchy food	bu
DISC	*Dioscorea mangenotiana*	li	w	ro					25	edible tuber	bu/fa/ba
DISC	*Dioscorea mangenotiana*	li	w	ro					4	edible tuber	bu/fa
DISC	*Dioscorea mangenotiana*	li	w		le				4	young sprouts as vegetable	bu/fa
DISC	*Dioscorea praehensilis*	li	w	ro					1	edible tuber	ba

APPENDIX III Database of NTFP plant species (cont'd)

Database of NTFP plant species, names, types and parts of the species used and the frequency of use

Fam.	Scientific name	Type	Cult./ Wild	Food	Part of the plant used: Medic	Const.	Equip.	Other	# times	Utilization	Ethnic groups
DISC	*Dioscorea sansibarensis*	li	w	ro					2	edible tuber	fa
EBEN	*Diospyros bipindense*	tr	w		ro		st			see Diospyros spp.	
EBEN	*Diospyros canaliculata*	tr	w		ro		st			see Diospyros spp.	
EBEN	*Diospyros conocarpa*	tr	w		ro		st			see Diospyros spp.	
EBEN	*Diospyros crassiflora*	tr	w					wo	1	wood carving/statues	bu
EBEN	*Diospyros kamerunensis*	tr	w		ro		st			see Diospyros spp.	
EBEN	*Diospyros simulans*	tr	w		ro		st			see Diospyros spp.	
EBEN	*Diospyros spp.*	tr	w				st		3	making traps	bu/fa
EBEN	*Diospyros spp.*	tr	w		ro				1	treatment for diarrhoea	fa
EBEN	*Diospyros suaveolens*	tr	w		ro		st			see Diospyros spp.	
ERYT	*Erythroxylum mannii*	tr	w					wo	0	firewood	
EUPH	*Alchornea floribunda*	sh	w		st				6	toothbrush	bu
EUPH	*Alchornea floribunda*	sh	w				st		1	construction of traps	bu
EUPH	*Alchornea cordifolia*	sh/tr	w		le				24	cleaning teeth; treatment for toothache	bu/fa/ba
EUPH	*Alchornea cordifolia*	sh/tr	w				wo		7	hafts of tools	bu/fa
EUPH	*Alchornea cordifolia*	sh/tr	w		le				6	dead leaves for treatment of anemia	bu/fa
EUPH	*Alchornea cordifolia*	sh/tr	w		le				1	treatment for diarrhoea	bu/fa
EUPH	*Alchornea cordifolia*	sh/tr	w		le				1	treatment for measles	fa
EUPH	*Alchornea cordifolia*	sh/tr	w				fr		5	lure for trapping birds	bu/fa
EUPH	*Antidesma laciniatum*	tr	w						-		
EUPH	*Bridelia grandis*	tr	w		ba	wo	wo	wo		see Macaranga spp./Bridelia spp.	
EUPH	*Bridelia micrantha ('Assas rouge')*	tr	w		ba	wo	wo	wo		see Macaranga spp./Bridelia spp.	
EUPH	*Bridelia spp.*	tr	w		?				1	treatment of anemia	fa
EUPH	*Cleistanthus polystachyus? ('Tongso')*	tr	w						-		
EUPH	*Dichostemma glaucescens*	tr	w					wo	0	(rarely) used as firewood	
EUPH	*Discoglypremna caloneura*	tr	w		ba				14	treatment of headaches by washing the head	bu/fa/ba
EUPH	*Discoglypremna caloneura*	tr	w		ba				1	febrifuge	ba
EUPH	*Discoglypremna caloneura*	tr	w		ba				1	treatment of eye diseases	bu
EUPH	*Drypetes gossweileri*	tr	w		?				0	to treat stomachaches	fa
EUPH	*Drypetes preussi*	tr	w		ba				0	see Drypetes spp.	-
EUPH	*Drypetes sp.*	tr	w		ba				0	see Drypetes spp.	
EUPH	*Drypetes spp.*	tr	w		ba				1	treatment for colds	ba
EUPH	*Drypetes spp.*	tr	w		ba				1	to treat skin diseases	bu
EUPH	*Drypetes spp.*	tr	w		ba				1	protection against witchcraft	bu

APPENDIX III Database of NTFP plant species (cont'd)

					Part of the plant used						
Fam.	Scientific name	Type	Cult./ Wild	Food	Medic	Const.	Equip.	Other	# times	Utilization	Ethnic groups
EUPH	*indeterminata ('Asoukong')*	tr	w		ba				1	treatment of child diseases	fa
EUPH	*indeterminata ('Asoukong')*	tr	w		ba				0	treatment for toothache	bu
EUPH	*indeterminata ('Asoukong')*	tr	w		?				1	to treat skin diseases	bu
EUPH	*Macaranga hurifolia*	tr	w		ba	wo	wo	wo		see Macaranga spp./Bridelia spp.	
EUPH	*Macaranga sp.*	tr	w		ba	wo	wo	wo		see Macaranga spp./Bridelia spp.	
EUPH	*Macaranga spp./Bridelia spp.*	tr	w		ba				2	treatment of toothache	bu
EUPH	*Macaranga spp./Bridelia spp.*	tr	w			wo			1	construction of houses	fa
EUPH	*Macaranga spp./Bridelia spp.*	tr	w		ba				1	treatment of skin diseases	ba
EUPH	*Macaranga spp./Bridelia spp.*	tr	w				wo		1	furniture	fa
EUPH	*Macaranga spp./Bridelia spp.*	tr	w					wo	0	firewood	
EUPH	*Macaranga spp./Bridelia spp.*	tr	w		ba				0	treatment for women's stomachache	
EUPH	*Manihot esculenta*	sh	c		le				13	young leaves to treat burns	bu/fa/ba
EUPH	*Manihot esculenta*	sh	c		le				8	young leaves to treat measles	bu/fa/ba
EUPH	*Manihot esculenta*	sh	c	le					3	young leaves as vegetable (Kpwem)	bu
EUPH	*Manihot esculenta*	sh	c		le				1	to control the menstruation of women	fa
EUPH	*Manihot esculenta*	sh	c	ro					0	cultivated starchy food	
EUPH	*Manniophyton fulvum*	li	w		ex				1	treatment of scabies	bu
EUPH	*Mareyopsis longifolia*	tr	w						-		
EUPH	*Margaritaria discoidea*	tr	w		ba				0	bark has medicinal properties	
EUPH	*Margaritaria discoidea*	tr	w					wo	0	fire wood	
EUPH	*Phyllanthus muellerianus*	li	w	ba					24	bark added to palm wine	bu/fa/ba
EUPH	*Phyllanthus muellerianus*	li	w		ex				8	treatment for eye diseases	bu/fa
EUPH	*Phyllanthus muellerianus*	li	w		?				1	treatment for toothache	bu
EUPH	*Plagiostyles africana*	tr	w		ba				2	child diseases: purgative or dripped on nails, mouthe and fontanel	bu
EUPH	*Ricinodendron heudelotii*	tr	w	se					23	condiment in sauces	bu/fa/ba
EUPH	*Ricinodendron heudelotii*	tr	w					se	20	seeds commercialized	bu/fa/ba
EUPH	*Ricinodendron heudelotii*	tr	w		ba				3	treatment for pregnant women	bu/fa
EUPH	*Ricinodendron heudelotii*	tr	w					se	0	children's games	
EUPH	*Ricinus communis*	he	c/w		?				1	treatment for measles	bu
EUPH	*Tetracarpidium conophorum*	sh	w	se					1	nut consumed as snack	ba
EUPH	*Tetracarpidium conophorum*	sh	w	se					1	nut used as condiment in sauces	ba
EUPH	*Tetrorchidium didymostemon*	tr	w		ba				5	treatment for river blindness	bu
EUPH	*Tetrorchidium didymostemon*	tr	w			wo			1	construction wood	bu
EUPH	*Tetrorchidium didymostemon*	tr	w		ba				1	treatment for headaches	bu

APPENDIX III Database of NTFP plant species (cont'd)

Fam.	Scientific name	Type	Cult./ Wild	Food	Part of the plant used: Medic	Const.	Equip.	Other	# times	Utilization	Ethnic groups
EUPH	*Tetrorchidium didymostemon*	tr	w		ba				1	treatment for jaundice	bu
EUPH	*Tetrorchidium didymostemon*	tr	w		ba				1	painkiller for menstruation pains	bu
EUPH	*Uapaca acuminata*	tr	w		?				1	treatment for venereal diseases	bu
EUPH	*Uapaca guineensis*	tr	w	se	st/ba	wo		wo		see utilization Uapaca spp.	
EUPH	*Uapaca spp. ('Assam')*	tr	w	fr					11	fruit as a snack	bu/fa/ba
EUPH	*Uapaca spp. ('Assam')*	tr	w		st				3	tooth sticks	bu
EUPH	*Uapaca spp. ('Assam')*	tr	w			wo			2	construction of houses (poles)/furniture	bu
EUPH	*Uapaca spp. ('Assam')*	tr	w		ro?				1	aphrodisiac	ba
EUPH	*Uapaca spp. ('Assam')*	tr	w					wo	0	firewood	
EUPH	*Uapaca spp. ('Assam')*	tr	w		ba				0	infusion to treat sour throat	
EUPH	*Uapaca staudtii*	tr	w	se	st/ba	wo		wo		see utilization Uapaca spp.	
EUPH	*Uapaca vanhouttei*	tr	w	se	st/ba	wo		wo		see utilization Uapaca spp.	
FLAC	*Caloncoba gilgiana*	tr	w	fr	ba			wo		see Caloncoba spp.	
FLAC	*Caloncoba spp. ('Miamingomo')*	tr	w		?				1	to control the menstruation of women	bu
FLAC	*Caloncoba spp. ('Miamingomo')*	tr	w				wo		1	hafts of tools	bu
FLAC	*Caloncoba spp. ('Miamingomo')*	tr	w	fr					1	edible fruit	fa
FLAC	*Caloncoba spp. ('Miamingomo')*	tr	w			wo			1	construction material for houses	bu
FLAC	*Caloncoba spp. ('Miamingomo')*	tr	w					wo	0	firewood	
FLAC	*Caloncoba welwitschii*	tr	w	fr	ba			wo		see Caloncoba spp.	
GENT	*Swertia sp. ('Zelane')*	he	w		le				5	purgative for children, stimulates the articulation	bu
GNET	*Gnetum bulcholzianum*	vi	w	le					23	vegetable	bu/fa
GNET	*Gnetum bulcholzianum*	vi	w	le					0	commerciable vegetable	
GNET	*Gnetum bulcholzianum*	vi	w		le				1	treatment for colds	fa
GRAM	*Bambusa vulgaris*	tr	c/w				st		2	manufacturing of furniture/houses	bu/fa/ba
GRAM	*Cymbopogon citratus*	he	c			pl			5	treatment of colds	bu/fa
GRAM	*Cymbopogon citratus*	he	c			pl			5	spice	bu/fa
GRAM	*Cymbopogon citratus*	he	c			pl			1	febrifuge	fa
GRAM	*Cymbopogon citratus*	he	c			pl			1	stimulates lactation women	bu
GRAM	*Cymbopogon citratus*	he	c			pl			1	treats measles	fa
GRAM	*Cymbopogon citratus*	he	c			pl			1	aphrodisiac	fa
GRAM	*Cymbopogon citratus*	he	c			pl			1	treats jaundice	fa
GRAM	*Cymbopogon citratus*	he	c			pl			1	control of menstruation period	fa
GRAM	*Paspalum paniculatum*	he	w		le				1	treatment for children's diseases	bu
GRAM	*Paspalum sp.? ('Obut')*	he	w		le				1	treatment for snakebites	fa

Fam.	Scientific name	Type	Cult./ Wild	Food	Part of the plant used: Medic	Const.	Equip.	Other	# times	Utilization	Ethnic groups
GRAM	*Paspalum sp.? ('Obut')*	he	w		le				1	basketry	fa
GRAM	*Saccharum officinarum*	he	c		ex				3	production alcoholic drinks	bu/fa
GRAM	*Saccharum officinarum*	he	c		ex?				2	treatment of wounds and injuries	bu
GRAM	*Saccharum officinarum*	he	c					le	3	toilet paper	fa
GRAM	*Saccharum officinarum*	he	c		?				2	treatment of jaundice	bu/fa
GRAM	*Saccharum officinarum*	he	c	st					0	cultivated mainly as a snack	
GRAM	*Saccharum officinarum*	he	c		ex				0	added to many medicines to facilitate ingestion	
GRAM	*Setaria anceps*	he	w				le		2	washing dishes	fa
GRAM	*Setaria anceps*	he	w		le				1	treatment for venereal diseases	fa
GRAM	*Setaria anceps*	he	w		?				1	treats childhood diseases	fa
GRAM	*Setaria anceps*	he	w	le					0	fodder	
GRAM	*Zea mays*	he	c					le	2	toilet paper	bu/fa
GRAM	*Zea mays*	he	c	se					0	cultivated starchy food	
GUTT	*Allanblackia spp. ('Anioy')*	tr	w				fr/se		4	lure for hunting	bu
GUTT	*Allanblackia spp. ('Anioy')*	tr	w		?				1	aphrodisiac	bu
GUTT	*Allanblackia floribunda*	tr	w		?		fr/se			see Allanblackia spp.	bu
GUTT	*Allanblackia staneriana*	tr	w		?		fr/se			see Allanblackia spp.	
GUTT	*Endodesmia calophylloides*	tr	w		st				2	toothbrush	
GUTT	*Garcinia kola*	tr	w		se/ba				27	added to palm wine	bu/fa/ba
GUTT	*Garcinia kola*	tr	w	se					19	consumed as a snack ('bita kola')	bu/fa
GUTT	*Garcinia kola*	tr	w					se/ba	7	seeds(bark) commercialized	bu/fa/ba
GUTT	*Garcinia kola*	tr	w		se				6	aphrodisiac	bu
GUTT	*Garcinia kola*	tr	w		ba				2	treatment for food poisoning	bu/fa
GUTT	*Garcinia lucida*	tr	w		ba/se				27	bark added to palm wine (anti-toxic properties)	bu/fa/ba
GUTT	*Garcinia lucida*	tr	w					ba/se	9	bark(seed) commercialized	bu/fa
GUTT	*Garcinia lucida*	tr	w		ba/se				21	treats food poisoning/diarrhoea	bu/fa/ba
GUTT	*Garcinia lucida*	tr	w	se					15	nut consumed as snack/aphrodisiac	bu/fa/ba
GUTT	*Garcinia lucida*	tr	w		ba				6	antidote for snakebites	bu/fa/ba
GUTT	*Garcinia lucida*	tr	w		ba				4	treatment of intestinal worms	bu
GUTT	*Garcinia lucida*	tr	w		ba				1	treatment of measles	fa
GUTT	*Garcinia lucida*	tr	w				se		1	lure for hunting	bu
GUTT	*Garcinia mannii*	tr	w		ro				1	aphrodisiac	bu
GUTT	*Garcinia mannii*	tr	w				st		0	to stretch traps	

APPENDIX III Database of NTFP plant species (cont'd)

Fam.	Scientific name	Type	Cult./ Wild	Food	Part of the plant used Medic	Const.	Equip.	Other	# times	Utilization	Ethnic groups
GUTT	*Garcinia mannii*	tr	w		ba				0	treats filariasis of the eye	
GUTT	*Garcinia staudtii*	tr	w		ro/ba		st			see G. mannii	
GUTT	*Mammea africana*	tr	w						-		
GUTT	*Pentadesma butyracea? ('Nom oniay')*	tr	w						-		
GUTT	*Symphonia globulifera*	tr	w						-		
HUAC	*Afrostyrax kamerunensis*	tr	w	ba/fr					1	garlic-like bark and seeds used as spice	fa
HUAC	*Afrostyrax kamerunensis*	tr	w					ba/fr	0	commerciable bark/seeds	
HUMI	*Sacoglottis gabonensis*	tr	w	ba					21	bark added to palm wine	bu/fa/ba
HUMI	*Sacoglottis gabonensis*	tr	w		ba				12	purgative to treat backache	bu/fa/ba
HUMI	*Sacoglottis gabonensis*	tr	w				?		2	fishing poison	fa
HUMI	*Sacoglottis gabonensis*	tr	w		ba				1	regulation of women's periods	bu
HUMI	*Sacoglottis gabonensis*	tr	w		ba				1	vermifuge	ba
HUMI	*Sacoglottis gabonensis*	tr	w					ba	1	bark commercialized	bu
HYPE	*Harungana madagascariensis*	tr	w		ba				18	bark boiled in water as treatment for jaundice	bu/fa/ba
HYPE	*Harungana madagascariensis*	tr	w			wo			4	rafters for construction of houses	bu/fa
HYPE	*Harungana madagascariensis*	tr	w				wo		2	furniture-making	bu/fa
HYPE	*Harungana madagascariensis*	tr	w		ba				1	treatment for colds	bu
HYPE	*Harungana madagascariensis*	tr	w		ba				1	treatment for diarrhoea	bu
HYPE	*Harungana madagascariensis*	tr	w					wo	0	fire wood	
ICAC	*Lasianthera africana*	tr	w		ba				2	antidote for snakebites	bu/ba
ICAC	*Lasianthera africana*	tr	w						1	treats childhood diseases	fa
ICAC	*Lasianthera africana*	tr	w				st		1	stretching of traps	bu
ICAC	*Lasianthera africana*	tr	w		ex				1	treats eye diseases	bu
ICAC	*Leptaulus daphnoides*	tr	w				st		0	to stretch traps	
ICAN	*Lavigeria macrocarpa*	li	w					ro	0	game of children; discs of roots	
IRVI	*Desbordesia glaucescens*	tr	w	se					1	seed as condiment	fa
IRVI	*Irvingia gabonensis*	tr	w	se					26	oil containing seed as condiment	bu/fa/ba
IRVI	*Irvingia gabonensis*	tr	w	se/fr					26	commercialized almonds/fruits	bu/fa/ba
IRVI	*Irvingia gabonensis*	tr	w	fr					19	fruit as snack	bu/fa/ba
IRVI	*Irvingia gabonensis*	tr	w	se					4	cooking oil	bu/fa
IRVI	*Irvingia gabonensis*	tr	w		ba				3	treatment of toothache	bu/fa
IRVI	*Irvingia gabonensis*	tr	w		ba				3	treatment of diarrhoea	bu/fa
IRVI	*Irvingia gabonensis*	tr	w		ba?				2	treatment of backaches	fa
IRVI	*Irvingia gabonensis*	tr	w				fr		2	lure for hunting	bu

APPENDIX III Database of NTFP plant species (cont'd)

Fam.	Scientific name	Type	Cult./ Wild	Part of the plant used: Food	Medic	Const.	Equip.	Other	# times	Utilization	Ethnic groups
MIMO	*Acacia pennata*	li	w		ex				1	treats snake bites	bu
MIMO	*Albizia adianthifolia*	tr	w						-		
MIMO	*Albizia ferruginea*	tr	w		le/ba				0	drives out thorns	
MIMO	*Albizia glaberrima*	tr	w						-		
MIMO	*Albizia sp. ('Esak afan')*	tr	w						-		
MIMO	*Calpocalyx dinklagei*	tr	w						-		
MIMO	*Cylicodiscus gabunensis*	tr	w		ba				1	treatment for lice and scabies	bu
MIMO	*Cylicodiscus gabunensis*	tr	w			wo			1	house construction	fa
MIMO	*Cylicodiscus gabunensis*	tr	w		ba				0	treats stomachaches	fa
MIMO	*Entanda gigas*	li	w		le				0	medicinal properties	
MIMO	*Parkia bicolor*	tr	w	fr					0	arils eaten	
MIMO	*Pentaclethra macrophylla*	tr	w		ba				11	treatment of colds	bu/fa
MIMO	*Pentaclethra macrophylla*	tr	w		ba				5	febrifuge	bu
MIMO	*Pentaclethra macrophylla*	tr	w	ba					2	added to palm wine	fa
MIMO	*Pentaclethra macrophylla*	tr	w					se	2	protection against witchcraft	bu/fa
MIMO	*Pentaclethra macrophylla*	tr	w				ba		1	furniture making	fa
MIMO	*Pentaclethra macrophylla*	tr	w		ba				1	treatment for childhood diseases	fa
MIMO	*Pentaclethra macrophylla*	tr	w		ba				1	treatment for headaches	bu
MIMO	*Pentaclethra macrophylla*	tr	w		ba				1	treats venereal diseases	ba
MIMO	*Pentaclethra macrophylla*	tr	w					wo	0	fire wood	
MIMO	*Pentaclethra macrophylla*	tr	w		ba				1	treats spleen problems	ba
MIMO	*Piptadeniastrum africanum*	tr	w		ba				3	bark as aphrodisiac	bu
MIMO	*Piptadeniastrum africanum*	tr	w					?	2	protection against witchcraft	bu
MIMO	*Piptadeniastrum africanum*	tr	w		ba				2	purgative to treat backaches	bu
MIMO	*Piptadeniastrum africanum*	tr	w		ba				2	to ease childbirth	bu
MIMO	*Piptadeniastrum africanum*	tr	w		ba				1	treatment for hernia	ba
MIMO	*Piptadeniastrum africanum*	tr	w		ba				1	bark/exudate poisonous; infusion for stomachaches	ba
MIMO	*Samanea dinklagei? ('Bikono')*	tr	w						-		
MIMO	*Tetrapleura tetraptera*	tr	w	fr					3	fermented fruit (rarely) used as condiment	bu
MIMO	*Tetrapleura tetraptera*	tr	w		fr				1	treatment of pregnancy problems	fa
MIMO	*Tetrapleura tetraptera*	tr	w	fr					0	fruits commercialized elsewhere	
MONI	*Glossocalyx brevipes*	tr	w						-		
MONI	*Glossocalyx longicuspis? (Menyomngoe)*	tr	w						-		

APPENDIX III Database of NTFP plant species (cont'd)

Fam.	Scientific name	Type	Cult./ Wild	Food	Part of the plant used: Medic	Const.	Equip.	Other	# times	Utilization	Ethnic groups
MORA	*Artocarpus altilis*	tr	c/w	fr					2	edible fruits as starchy food	bu/fa
MORA	*Ficus exasperata*	tr	w		ba				4	treatment for colds	bu/fa
MORA	*Ficus exasperata*	tr	w				le		3	leaves as sponge to clean dishes	fa
MORA	*Ficus exasperata*	tr	w		ba				2	treatment for child diseases	bu
MORA	*Ficus mucuso*	tr	w						-		
MORA	*Ficus natalensis*	tr	w		le				2	treatment for wounds	fa/ba
MORA	*Ficus natalensis*	tr	w		ba				1	treat venereal diseases	ba
MORA	*Ficus sur*	tr	w					ex	0	collagen, a.o.. for capturing parrots	
MORA	*Milicia excelsa*	tr	w		ex		wo		4	stimulates women's' lactation	bu
MORA	*Milicia excelsa*	tr	w				wo		4	manufacturing of mortars	fa
MORA	*Milicia excelsa*	tr	w				wo		3	manufacturing of furniture	bu/fa
MORA	*Milicia excelsa*	tr	w		ba				1	treatment for backaches	bu
MORA	*Milicia excelsa*	tr	w		ba				1	treatment for headache	bu
MORA	*Milicia excelsa*	tr	w		ba				1	treatment for eye problems	bu
MORA	*Musanga cecropioides*	tr	w	ro					19	water containing stilt roots	bu/fa/ba
MORA	*Musanga cecropioides*	tr	w		ba/ex				17	treatment of abscesses/wounds	bu/fa/ba
MORA	*Musanga cecropioides*	tr	w		le				16	treatment of colds	bu/fa/ba
MORA	*Musanga cecropioides*	tr	w		ex				5	to stimulate lactation of women	bu/fa
MORA	*Musanga cecropioides*	tr	w				wo		4	hafts of tools	bu/fa/ba
MORA	*Musanga cecropioides*	tr	w				wo		3	construction of portable canoes	fa
MORA	*Musanga cecropioides*	tr	w		ba				2	treatment of skin diseases	bu/fa
MORA	*Musanga cecropioides*	tr	w		ex				1	treatment for pregnant women	bu
MORA	*Musanga cecropioides*	tr	w		ba				1	treatment of headaches	fa
MORA	*Musanga cecropioides*	tr	w		?				1	treatment of backache	bu
MORA	*Musanga cecropioides*	tr	w		wo				1	ash of the wood to treat diarrhoea	fa
MORA	*Musanga cecropioides*	tr	w		ba				1	treats enlarged spleen	fa
MORA	*Treculia africana*	tr	w				wo		8	hafts of tools	bu/fa
MORA	*Treculia africana*	tr	w	se					2	condiment for sauces	fa/ba
MORA	*Treculia africana*	tr	w	se					1	seeds consumed as a snack	ba
MORA	*Treculia africana*	tr	w	se					1	treatment of diarrhoea	bu
MORA	*Treculia obovoidea*	tr	w				wo		0	construction of traps	
MORA	*Treculia obovoidea*	tr	w				wo		0	blocks of wood used in the past as a hammer	
MUSA	*Musa paradisiaca*	tr	w	le					5	food wrapping	bu/ba
MUSA	*Musa paradisiaca*	tr	w		st				4	treatment of wounds	bu/fa
MUSA	*Musa paradisiaca*	tr	w		le?				2	treatment for measles	bu/fa

APPENDIX III Database of NTFP plant species (cont'd)

Fam.	Scientific name	Type	Cult./ Wild	Food	Part of the plant used: Medic	Const.	Equip.	Other	# times	Utilization	Ethnic groups
MUSA	*Musa paradisiaca*	tr	w		le?				1	treatment of headaches	bu
MUSA	*Musa paradisiaca*	tr	w		le?				1	treatment for headaches	bu
MUSA	*Musa paradisiaca*	tr	w	fr					0	cultivated starchy food	
MUSA	*Musa sapientum*	tr	w				fr		9	used as lure for hunting	bu/fa/ba
MUSA	*Musa sapientum*	tr	w	le			fr		3	leaves for food wrapping	bu/fa
MUSA	*Musa sapientum*	tr	w		fr				3	treatment of wounds	bu
MUSA	*Musa sapientum*	tr	w	fr					0	cultivated edible fruit	
MYRI	*Coelocaryon preussi*	tr	w			wo			0	building bridges	
MYRI	*Coelocaryon preussi*	tr	w					wo	0	firewood	
MYRI	*Pycnanthus angolensis*	tr	w		ba				8	grinded bark to treat wounds	bu/fa
MYRI	*Pycnanthus angolensis*	tr	w				wo		3	canoe making	fa
MYRI	*Pycnanthus angolensis*	tr	w		ba				2	treatment of measles	bu/fa
MYRI	*Pycnanthus angolensis*	tr	w		ba				2	decoction of bark to stimulate lactation	bu
MYRI	*Pycnanthus angolensis*	tr	w		ba				1	washing the head with infusion treats colds	bu
MYRI	*Pycnanthus angolensis*	tr	w		ba				1	treatment for skin diseases	bu
MYRI	*Pycnanthus angolensis*	tr	w		ba				0	treats stomachaches	
MYRI	*Scyphocephalum manni*	tr	w						-		
MYRI	*indeterminata ('Ovos')*	tr	w						-		
MYRI	*Staudtia kamerunensis*	tr	w			wo			5	material for house construction	bu/fa
MYRI	*Staudtia kamerunensis*	tr	w		ba				2	treats diarrhoea	bu/ba
MYRI	*Staudtia kamerunensis*	tr	w		?				1	treatment for anemia	ba
MYRI	*Staudtia kamerunensis*	tr	w		?				1	treatment for pregnancy problems	fa
MYRT	*Psidium guajava*	tr	c		le				19	treatment for diarrhoea	bu/fa/ba
MYRT	*Psidium guajava*	tr	c		le				1	treatment for colds	bu
MYRT	*Psidium guajava*	tr	c	fr					0	cultivated fruit tree, snack	
MYRT	*Syzygium guineense*	tr	w		le/ba				0	medicinal properties	
OCHN	*Lophira alata*	tr	w		ba				14	washing the mouth with decoction treats toothache	bu/fa/ba
OCHN	*Lophira alata*	tr	w		le				5	compress of leaves to treat backache	bu/ba
OCHN	*Lophira alata*	tr	w			wo			3	construction material for houses	fa
OCHN	*Lophira alata*	tr	w		ba				1	treatment for scabies	fa
OCHN	*Lophira alata*	tr	w		?				1	aphrodisiac	bu
OCHN	*Lophira alata*	tr	w		le				1	treatment for headaches	fa
OLAC	*Aptandra zenkeri? ('Mbazo'o')*	tr	w		ba	wo	wo			see Strombosia spp.	
OLAC	*Coula edulis*	tr	w			wo			21	house construction: 'iron wood'	bu/fa/ba

Fam.	Scientific name	Type	Cult./ Wild	Part of the plant used: Food	Medic	Const.	Equip.	Other	# times	Utilization	Ethnic groups
OLAC	*Coula edulis*	tr	w	se					19	condiment in sauces, sometimes transformed in oil	bu/fa/ba
OLAC	*Coula edulis*	tr	w	se					27	nut as a snack	bu/fa/ba
OLAC	*Coula edulis*	tr	w		ba				16	treatment of wounds	bu/ba
OLAC	*Coula edulis*	tr	w				wo		8	furniture making	bu/fa/ba
OLAC	*Coula edulis*	tr	w				se		5	lure for hunting	bu/ba
OLAC	*Coula edulis*	tr	w		ba				2	purgative for backache	bu
OLAC	*Coula edulis*	tr	w		ba				2	treatment of skin diseases	bu
OLAC	*Coula edulis*	tr	w		ba				1	treats snakebites	fa
OLAC	*Coula edulis*	tr	w		ba				1	treatment of measles	bu
OLAC	*Coula edulis*	tr	w		ba				1	treatment of headaches	fa
OLAC	*Coula edulis*	tr	w					se	11	commercialized seeds	bu/fa/ba
OLAC	*Coula edulis*	tr	w		ba				7	treatment for dysentery	bu/fa/ba
OLAC	*Diogoa sp.? ('Mbazo'o')*	tr	w		ba	wo	wo			see Strombosia spp.	
OLAC	*Heisteria parvifolia*	tr	w					wo	0	firewood	
OLAC	*Olax staudtii*	tr	w						-		
OLAC	*Ongokea gore*	tr	w				fr		17	lure for hunting	bu/fa
OLAC	*Ongokea gore*	tr	w		ba				3	to treat children's anemia as result of malaria	bu/fa
OLAC	*Ongokea gore*	tr	w		ba				1	to stop the crying of babies	bu
OLAC	*Ongokea gore*	tr	w		ba				1	treats river-blindness	fa
OLAC	*Ongokea gore*	tr	w		ba				3	treatment for constipation (babies)	fa
OLAC	*Ptychopetalum petiolatum*	tr	w				st		0	making traps	bu
OLAC	*Strombosia grandifolia*	tr	w		ba	wo	wo			see Strombosia spp.	
OLAC	*Strombosia pustulata*	tr	w		ba	wo	wo			see Strombosia spp.	
OLAC	*Strombosia scheffleri*	tr	w		ba	wo	wo			see Strombosia spp.	
OLAC	*Strombosia spp. ('Mbazo'o')*	tr	w				wo		2	poles for the construction of houses	fa
OLAC	*Strombosia spp. ('Mbazo'o')*	tr	w		ba				1	treatment of colds	bu
OLAC	*Strombosia spp. ('Mbazo'o')*	tr	w			wo			1	construction of traps	bu
OLAC	*Strombosiopsis tetandra*	tr	w		ba	wo	wo			see Strombosia spp.	
PALM	*Ancistrophyllum secundiflorum*	li	w				st		2	basketry	bu
PALM	*Ancistrophyllum secundiflorum*	li	w		ex				1	treats snake bites	bu
PALM	*Ancistrophyllum secundiflorum*	li	w	sp					1	edible young sprouts	bu
PALM	*Ancistrophyllum secundiflorum*	li	w		st	ba/st	ba/st			see rattan species	bu/fa/ba
PALM	*Calamus deerratus*	li	w		st	ba/st	ba/st			see rattan species	bu/fa/ba
PALM	*Calamus sp.? (Obok nlong)*	li	w				le		0	to plait mats	

APPENDIX III Database of NTFP plant species (cont'd)

Fam.	Scientific name	Type	Cult./ Wild	Part of the plant used: Food	Medic	Const.	Equip.	Other	# times	Utilization	Ethnic groups
PALM	*Calamus sp.? (Obok nlong)*	li	w		st	ba/st	ba/st			see rattan species	
PALM	*Cocos nucifera*	tr	c	ex					4	palm wine production	fa
PALM	*Cocos nucifera*	tr	c		?				3	treatment of toothaches	bu/fa
PALM	*Cocos nucifera*	tr	c	se					2	oil production	bu
PALM	*Cocos nucifera*	tr	c		ex				2	stimulates lactation of women	fa
PALM	*Cocos nucifera*	tr	c		?				1	treatment for diarrhoea	bu
PALM	*Cocos nucifera*	tr	c	se						cultivated; nuts consumed as snack/drink	
PALM	*Elaeis guineensis*	tr	c/w	ex					26	production of wine and liquor	bu/fa/ba
PALM	*Elaeis guineensis*	tr	c/w	fr					13	oil of the fruits as cooking oil	bu/fa/ba
PALM	*Elaeis guineensis*	tr	c/w	fr					9	fruit as condiment	bu/fa/ba
PALM	*Elaeis guineensis*	tr	c/w				se		8	lure for hunting/fishing	bu/fa/ba
PALM	*Elaeis guineensis*	tr	c/w		ex				8	palm wine as basic solution for medicines, especially measles	bu/fa/ba
PALM	*Elaeis guineensis*	tr	c/w		se				7	oil from seeds as bases for different medicines	bu/fa/ba
PALM	*Elaeis guineensis*	tr	c/w		fr				4	oil (fruit) as basic solution for medicinal treatments, especially for skin problems	bu/fa
PALM	*Elaeis guineensis*	tr	c/w		ex				4	palm wine as tonic to stimulate lactation of women	bu/fa
PALM	*Elaeis guineensis*	tr	c/w		fl				4	buds used to treat venereal diseases	bu/fa/ba
PALM	*Elaeis guineensis*	tr	c/w					se/fr/ex	?	many products commercialized (wine, fruits, seeds, oil)	
PALM	*Elaeis guineensis*	tr	c/w					st	2	music instruments	bu
PALM	*Elaeis guineensis*	tr	c/w		fr				2	plaster to cover wounds	bu
PALM	*Elaeis guineensis*	tr	c/w		ro				1	treatment of jaundice in mixture with plantains	bu
PALM	*Elaeis guineensis*	tr	c/w					le	0	as ornaments for celebrations	
PALM	*Elaeis guineensis*	tr	c/w			le			0	construction of walls; roofing material	
PALM	*Elaeis guineensis*	tr	c/w			le			0	fencing of properties	
PALM	*Eremosphatha sp. ('Nlong')*	li	w		st	ba/st	ba/st			see rattan spp.	
PALM	*Podococcus barteri*	tr	w		st				13	chewing stick as toothbrush	bu
PALM	*Podococcus barteri*	tr	w	ex					2	palm wine production	bu
PALM	*Podococcus barteri*	tr	w				le		1	basketry	bu
PALM	*Raphia montbuttorum*	tr	w				le		29	construction of houses	bu/fa/ba
PALM	*Raphia montbuttorum*	tr	w				le		29	furniture making	bu/fa/ba

APPENDIX III Database of NTFP plant species (cont'd)

Fam.	Scientific name	Type	Cult./ Wild	Food	Part of the plant used Medic	Const.	Equip.	Other	# times	Utilization	Ethnic groups
PALM	*Raphia montbuttorum*	tr	w	ex					25	palm wine production	bu/fa/ba
PALM	*Raphia montbuttorum*	tr	w				le		3	construction of barriers for trapping	bu
PALM	*Raphia montbuttorum*	tr	w				le		3	mats to cover roofs	bu/fa/ba
PALM	*Raphia montbuttorum*	tr	w					le	2	making children's toys	bu
PALM	*Raphia montbuttorum*	tr	w	fr					1	edible fruit	bu
PALM	*Raphia montbuttorum*	tr	w					fr	1	lure for hunting	bu
PALM	*Raphia sp. ('Andim')*	tr	w		st				13	chewing stick as toothbrush	bu
PALM	*Raphia sp. ('Andim')*	tr	w	ex					2	palm wine production	bu
PALM	*Raphia sp. ('Andim')*	tr	w				le		1	basketry	bu
PALM	*Raphia vinifera*	tr	w		ex				15	tapped for palm wine, especially by Bassa	bu/fa
PALM	*Raphia vinifera*	tr	w		ex				1	to stimulate lactation of women	bu/fa
PALM	*Raphia vinifera*	tr	w			le			0	manufacturing of barriers for trapping	
PALM	*Rattan species (all: 'Nlong')*	li	w			ba/st			29	strings/ropes used in house/furniture making	bu/fa/ba
PALM	*Rattan species (all: 'Nlong')*	li	w				ba/st		28	basketry/mats	bu/fa/ba
PALM	*Rattan species (all: 'Nlong')*	li	w		st				10	toothbrush	bu/fa
PALM	*Sclerosperma mannii*	sh	w	le					4	food wrapping	bu
PALM	*Sclerosperma mannii*	sh	w				le		1	basketry	bu
PALM	*Sclerosperma mannii*	sh	w		st	ba/st	ba/st			see rattan species (all)	
PAND	*Panda oleosa*	tr	w	se					22	condiment for sauces	bu/fa/ba
PAND	*Panda oleosa*	tr	w	se					1	nut as snack	bu
PAND	*Panda oleosa*	tr	w						2	seeds commercialized	bu
PAND	*Panda oleosa*	tr	w		ba				1	treatment for diarrhoea	fa
PANN	*Pandanus sp. (candelabrum?) ('Avu')*	sh	w				le		2	to weave mats	fa
PAPI	*Arachis hypogaea*	he	c		?				2	stimulates the articulation of children	bu
PAPI	*Arachis hypogaea*	he	c		?				1	treats venereal diseases	bu
PAPI	*Arachis hypogaea*	he	c	se					0	cultivated condiment	
PAPI	*Baphia leptobotrys*	tr	w						-		
PAPI	*Desmodium adscendens*	he	w		le				3	to treat colics, especially for children	bu
PAPI	*Desmodium adscendens*	he	w		fr				1	treats snake bites	bu
PAPI	*Desmodium adscendens*	he	w		le				1	treats food poisoning	bu
PAPI	*Lonchocarpus sericeus? ('Mviniko')*	sh	w		ba				0	prophylaxis for childhood diseases	
PAPI	*Millettia macrophylla*	tr	w		ba				0	prophylaxis for childhood diseases	
PAPI	*Mucuna flagellipes*	li	w	ex					3	water containing liana	bu/fa
PAPI	*Mucuna flagellipes*	li	w		ex				3	treatment for eye diseases	bu/fa
PAPI	*Pterocarpus soyauxii*	tr	w				wo		10	manufacturing of pestles and mortars	bu/fa/ba

APPENDIX IV Botanical lexicon: scientific, Bulu, Bagyeli and Fang names

Scientific name	Vernacular names		
	Bulu/('pilot name')	Bagyeli	Fang
ACANTHACEAE			
Acanthus sp.	Ndoe	Mpompo?	?
Asystasia gangetica	Ebukbong	Ledjungo?	Ebukbong
Justicia extensa	?	Nguvumu?	Ofya
Justicia insularis?	File	?	Fie?
AGAVACEAE			
Dracaena arborea	Alen okpwe	Myan zambe?	Alen okpwe
Dracaena mannii	Olele afan	?	Olele afan
Dracaena sp. (viridilora?)	Olele afan	?	Olele afan
AMARANTHACEAE			
Amaranthus hybrdus subsp. cruentus	Folong	Folong?	Folong
Amaranthus spinosus	Folong bikabala	Nzume a bekabela?	Folong bikabala
Celosia argentea	Folong	Mayuwaa?	Folong
ANACARDIACEAE			
Antrocaryon klaineanum	Ozakong/'Angongui'	Mbwasum/Ngwasum	Ozakong
Lannea welwitschii	Ekoh	Andimakombo	Ekoh
Mangifera indica	Ando'o ntangan	Ndoa ya ntangan	Andoa ntangan
Pseudospondias longifolia?	Ofo	Fosi	Ofos
Pseudospondias microcarpa	Ofo	Fosi	Ofos
Pseudospondias spp.	Ofo	Fosi	Ofos
Spondias cytherea	Kasamanga	Kasamanga	Kasamanga
Trichocsypha acuminata	Abut (tr)/Mvut (fr)	Lebutu	Abut (tr)/Mvut (fr)
Trichoscypha sp. (abut?)	Olat mvut	Lebvude?	?
Trichoscypha arborea	Engong	Ngong	Engong
ANNONACEAE			
Annona muricata	Ebom	Saba saba	Saba saba
Anonidium floribundum	Ebom afan	Bome	Ebom afan
Anonidium mannii	Ebom afan	Bome	Ebom afan
Cleistopholis glauca?	Avom afan	?	?
Cleistopholis patens	Avom	Wambo	Avom
Enantia chlorantha	Mfo	Mpole	Mfo
Greenwayodendron suaveolens	Otunga	Tungo	Otungui
Hexalobus crispiflorus	Owe	Lesundje	Mimfane
Isolona hexaloba	Mbiabono	Letunlu	Mbiabon
Meiocarpidium lepidotum	Mbiabono	Lempvimba?	Mbiabon
Monodora brevipes	Fio	Pio	Pio
Monodora myristica	Fio	Pio	Pio
Monodora tenuifolia	Fio	Pio	Pio
Pachypodanthium staudtii	Ntom	Ntomo/Ntuma	Ntom
Xylopia aethiopica	Nkala	Nkalo	Oyang
Xylopia parviflora?	Nkala afan	?	?
Xylopia quintasii	Mvomba	Mpaa?	Mvoma?
Xylopia sp.	Akui	?	Ekui
Xylopia staudtii	Odjobe	Landem boano/Tiwo	?
APOCYNACEAE			
Alstonia boonei	Ekuk	Ku'o	Ekuk
Alstonia congensis	Ekuk	Ku'o	Ekuk
Anthoclitandra robustior?	?	Bomena ba tomba?	Ongam
Funtumia elastica	Etendamba	Ndamba	Ndamba
Landolphia sp.	Okpwang	?	?
Landolphia spp.	Avum-ndik	Mbwalo	Avum-ndik
Picralima nitida	Ebam/Ngop	Bambo	Ebam
Rauvolfia caffra	Esombo	Sangbo	Esomo
Rauvolfia vomitoria	Obaton	Ntomanye	Oyemtwe
Strophanthus gratus	Enay	Ne/Nio	Enie

APPENDIX IV Botanical lexicon (cont'd)

Scientific name	Vernacular names		
	Bulu/('pilot name')	Bagyeli	Fang
APOCYNACEAE (cont'd)			
Tabernaemontana crassa	Etoan	Tonya	Etue
Thevetia sp.	?	?	?
Voacanga obtusa	Obaton afan	Nkodong	?
ARACEAE			
Anchomanes difformis	Kabat	Sa ya nzoo?	Kaban
Cercestis sp.	Lomandes	Lelo lekweng?	Lomandes
Culcasia simiarum	Ebabe	Baabo ya sa?	Ebabe?
Nephtytis poissonii	Lomandes	Mbo?	Lomandes
Rhektophyllum mirabile	Ndes	Ndesi	Ndes
Xanthosoma sagittifolium	Ekaba/Lombo	Ekaba	Ekaba/Lombo
BASELLACEAE			
Basella alba	Epinard	Epinard	Epinard
BIGNONIACEAE			
Markhamia tomentosa?	Angossa	Tchiwo	
Newbouldia laevis	Embikam	?	Embikam
Spathodea campanulata	Esusuk	Fosibo/Supo	Evuvon
BOMBACACEAE			
Ceiba pentandra	Dum	Dumo	Dum
BORAGINACEAE			
Cordia aurantiaca	Otolobat	Nambende?	Otolobat?
Cordia platytyrsa	Ebae	Baya	Ebe?
BROMELIACEAE			
Ananas comosus	Zek	Leyanga	Zek
indeterminata	Zek mevele	?	Zek mevele
BURSERACEAE			
Canarium schweinfurthii	Otu/'Abel'	Bele	Otu
Dacryodes edulis	Assa	Lessa	Osa
Dacryodes edulis	Assa mingung	Mbamesa(o)/Mbanya(y)	Osonga
Dacryodes klaineana	Tom afan	Twambo	Ebaptom?
Dacryodes macrophylla	Tom	Twambo	Tom
Santiria trimera	Ebaptom	?	Ebap?
CAESALPINIACEAE			
?	Ekop ayle	?	?
Afzelia bipindensis	Eyen ngoe/Dusye	Ndjibondi	Dusye?
Afzelia pachyloba	Esseng/'Pachyloba'	Seng	Esseng
Anthonota ferrignea	Akung ele	Lebelo?	Akung ele evele
Anthonota fragans	Akung ele	Lebelo?	Akung ele evele
Anthonotha macrophylla	Enak	Bowo'o/Bokwe	Aboa
Berlinia bracteosa	Esabem	Lebelo	Esabem
Berlinia confusa	Esabem	Lebelo	Esabem
Cassia alata	Ndowolo ntangan	Mpa?	Kenkeliba
Cassia sp.	Ebasi	?	Ebesi
Cynometra hankei	'Nganga'	?	?
Cynometra sp.	Ababekwe	?	?
Daniella ogea	Azem/'Faro'	Nanlwange?	Abing?
Detarium macrocarpa	Amuk/E13	Bekango?	Adjap bek?
Dialium bipindense	Mfang	Mpan	Mfang
Dialium guineense	Mfang	Mpan	Mfang
Dialium pachyphyllum	Mfang	Mpan	Mfang
Dialium spp.	Mfang	Mpan	Mfang
Dialium tessmannii	Mfang	Mpan	Mfang
Dialium zenkeri	Mfang	Mpan	Mfang
Didelotia letouzeyi?	Evele ekop/Ekop rouge	?	?
Didelotia sp.	Ekop ngomba	?	?
Distemonanthus benthamianus	Eyen	Selo	Eyen

APPENDIX IV Botanical lexicon (cont'd)

Scientific name	Vernacular names		
	Bulu/('pilot name')	Bagyeli	Fang
CAESALPINIACEAE (cont'd)			
Erythrophloeum ivorense	Elon	Londi	Elon
Erythrophloeum suaveolens?	Elon	Londi	Elon
Gilbertiodendron dewevrei	Abem/'Limbali'	Lebembo	Abem
Gossweilodendron balsimiferum	'Tola'	Lemole	?
Guibourtia tessmannii	Oveng	Venge	Oveng
Hylodendron gabunense	Alan/Mvanda	Babando/Mpapando	Mvane
Julbernardia seretii	Ekop blanc	Lebanga	Man ekop?
Microberlinia sp.	Zingana	?	?
Monopetalanthus microfilus	Andung/'Ekop mayo'	Lebangyo	Ekop andung?
Oxystigma bucholzii	Amvim	Mbimba/Madibimanku	Amvim
Oxystigma manni	Tchitola	?	?
Pachyelasma tessmannii	Eyek	Ngye?	Eyek
Plagiosyphon multijugus?	Ekop I	Ngangwe	Ekop?
Scorodophloeus zenkeri	Olon	Sunzi/Fundji	Esun
Tetraberlinia bifoliolata	Ekop ekaba	Ndungua	Keke?
Toubaouate brevipaniculata	Ekop evele/'Ekop zing'	Esseng	Evele ekop?
CANNACEAE			
Canna indica	Ekonoso	?	Ekonoso
CANNABINACEAE			
Cannabis sativa	Banga	Banga	Banga
CARICACEAE			
Carica papaya	Fofo	Popo	Popo
CHRYSOBALANACEAE			
Maranthes glabra?	Alep	?	Alep
COMBRETACEAE			
Pteleopsis hylodendron	'Sikong'	?	?
Terminalia catappa	Akom ntangan	Landi ya ntangan	Akom ntangan
Terminalia superba	Akom	Landi	Akom
COMPOSITAE			
Ageratum conyzoides	Okpwate	?	Okpwate
Chromolaena odorata	Nkodengui/Ngumngum	Ngum ngum	Ngumngum
Emilia sp.	Alomvu	Djemekwe	Alomvu
Indeterminata	Mvu mvu	?	?
Mikania cordata?	?	?	Ngengan
Solanecio biafrae	Nlot melen	?	Nlot
Spilanthes filicaulis	Ndondo si	Meto a kwato?	Andongsi
Thitonia diversifolia	Bultandje/Marguerite	Flawo ya mintangani?	Marguerite
Vernonia amygdalina	Ayolo/Metet	Bengombwe?	Yoloyolo/Bita ka
Vernonia conferta	Abangak	Lebangak	Abenga
Vernonia sp. (filigera?)?	Ayolo afan?	?	Bita ka mesak
CONNARACEAE			
Cnestis ferrigunea	Abing ntomba	Letulu	Tulum/Ntebesi?
CONVULVULACEAE			
Calycobulus sp.?	?	?	Ngengan
Ipomea batatas	Ndua	Ndugu	Ndugo
Ipomea pes-caprae	Otunden	Ambendi	Otunden
CUCURBITACEAE			
Cucumeropsis mannii	Ngon	Ngwand	Ngon
Cucurbita maxima	Abok	Leboo?	Abok
Rhigiocarya racemifera	Okometele	?	Okometele
Telfaira occidentalis?	Dji zok?	Nzan nflumo	Dji zok?
CYPERACEAE			
Scleria barteri	Fafolo	Pweta/Tenda?	Kanga

APPENDIX IV Botanical lexicon (cont'd)

Scientific name	Vernacular names		
	Bulu/('pilot name')	Bagyeli	Fang
DICHAPETALACEAE			
Dichapetalum sp.	Engangwoa	Ngoe zumbe	Ngengan
DIOSCOREACEAE			
Dioscorea alata	Ekoro	Mbole/Sabo?	Ekoro/Njengon ekoro
Dioscorea dumetorum	Andia	Nankwa?	Andia
Dioscorea cayenensis-rotundata	Sambe	Sabo	Sambe
Dioscorea claessensi	Okumen	Nkom	Nko'o kumen
Dioscorea mangenotiana	Afel	Afue?	Afe
Dioscorea praehensilis	?	Nlung	?
Dioscorea sansibarensis	?	Legyo	Abang
EBENACEAE			
Diospyros bipindense	Evindi afan/Mevini	Bavindi/Vindala/Mvubo	Evindi afan/Mevini
Diospyros canaliculata	Evindi afan/Mevini	Bavindi/Vindala/Mvubo	Evindi afan/Mevini
Diospyros conocarpa	Evindi afan/Mevini	Bavindi/Vindala/Mvubo	Evindi afan/Mevini
Diospyros crassiflora	Evindi afan/Mevini	Bavindi/Vindala/Mvubo	Evindi afan/Mevini
Diospyros kamerunensis	Evindi afan/Mevini	Bavindi/Vindala/Mvubo	Evindi afan/Mevini
Diospyros simulans	Evindi afan/Mevini	Bavindi/Vindala/Mvubo	Evindi afan/Mevini
Diospyros sp.	Evindi afan/Mevini	?	Mimbot mimbot
Diospyros spp.	Evindi afan/Mevini	Bavindi/Vindala/Mvubo	Evindi afan/Mevini
Diospyros suaveolens	Evindi afan/Mevini	Bavindi/Vindala/Mvubo	Evindi afan/Mevini
ERYTHROXYLACEAE			
Erythroxylum mannii	Elon bikotok	Londi ya boti/Puambo	Elon bikot
EUPHORBIACEAE			
Alchornea floribunda	Elobe	Lelando/Lando	Alan?
Alchornea cordifolia	Aboe	Lebondjo	Abwi
Antidesma laciniatum	Oyemze	?	?
Bridelia grandis	Assas rouge/Ewolot/ Nom assas	Lesasso	Assas
Bridelia micrantha?	Assas rouge/Ewolot/ Nom assas	Lesasso	Assas
Bridelia spp.	Assas rouge/Ewolot/ Nom assas	?	Ewok/Nom assas?
Cleistanthus polystachyus?	Tongso	?	?
Dichostema glaucescens	Evivien	Kangne/Kame	?
Discoglypremna caloneura	Ata'a	Wu'o/Djibonde	Ata'a
Drypetes gossweileiri	Olelang	?	?
Drypetes preussi	Akota 'small leaves'	?	?
Drypetes sp.	Akota/Ndondo ele	Lekoto	Akora
Hetteria sp.?	Tongso	?	?
indeterminata	'False Aboe'	?	?
indeterminata	Asukong	?	Asukong
indeterminata	Nom ebebeng	?	Ekimang
Macaranga hurifolia	Assas blanc	Lesasso	Assas
Macaranga spp./Bridelia spp.	Assas	Lesasso	Assas
Manihot esculenta	Mbongo/Kpwem	Mpinga/Kpweme	Mbo/Ngongola/Kpwem
Manniophyton fulvum	Angos	Nkungkwo?	Angos?
Mareyopsis longifolia	Okekela/Nom sikong	?	?
Margaritaria discoidea	Ebebeng	Wasikang	Ebebeng
Phyllanthus muellerianus	Awum/Njat kabat	Lewumbe	Awum/Njat kabat
Plagiostyles africana	Assok bekulu	Nsele	Elomba
Ricinodendron heudelotii	Ezezang	Nzoli	Ezezang
Ricinus communis	Bek	?	Bek
Tetracarpidium conophorum	?	Kasi	?
Tetrorchidium didymostemon	Dilik/Efobele	?	Efobele
Uapaca acuminata	Djip	Mpidi	?
Uapaca guineensis	Assam	Lesambo	Assam

APPENDIX IV Botanical lexicon (cont'd)

Scientific name	Vernacular names		
	Bulu/('pilot name')	Bagyeli	Fang
EUPHORBIACEAE (cont'd)			
Uapaca spp.	Assam	Lesambo	Assam
Uapaca staudtii	Assam	Lesambo	Assam
Uapaca vanhouttei	Assam	Lesambo	Assam
FLACOURTACEAE			
Caloncoba gilgiana	Miamingomo blanc	Dja'obo bakubo	Miamingomo blanc
Caloncoba spp.	Miamingomo	Dja'obo bakubo	Miamingomo
Caloncoba welwitschii	Miamingomo rouge	Dja'obo bakubo?	Miamingomo rouge
GENTIANACEAE			
Swertia sp.	Zelane	Njalane?	Zelane
GNETACEAE			
Gnetum bulcholzianum	Ocok	Ko/Kogo?	Okwa
GRAMINAE			
Bambusa vulgaris	Onwongo	Mbanzi	Onwonga
Cymbopogon citratus	Osang	Ledjanga	Ayang
Paspalum paniculatum	Osang bale	?	?
Paspalum sp.?	Obut	?	Obut
Saccharum officinarum	Nkok	Ngoo	Nkok
Setaria anceps	Ekok	Kuke?	Ekok
Zea mays	Fon	Mpote	Fon
GUTTIFERAE			
Allanblackia floribunda	Anyoy	Mbanwandje	Anyoy
Allanblackia staneriana	Anyoy	Mbanwandje	Anyoy
Endodesmia calophylloides	Kpwekpwa	Kpwekpwa	
Garcinia kola	Onyai	Wale	Onie
Garcinia lucida	Esok	Su'o	Esok
Garcinia mannii	Ndja bewo'o	Ndjanzie	Onie?
Garcinia staudtii	Ndja bewo'o	Ndjanzie	Onie?
Mammea africana	Abotzok	Bote	Abotzok
Pentadesma butyracea?	Nom oniay	Selo/Sole	?
Symphonia globulifera	Nom oniay	Selo/Sole	?
HUACACEAE			
Afrostyrax kamerunensis	'Afrostyrax'	Sa ya fungi?	Esun?
HUMIRICACEAE			
Sacoglottis gabonensis	Bidu	Bidu'o	Bidu
HYPERICACEAE			
Harungana madagascariensis	Atondo	Letuno	Atuigi
ICANACEAE			
Lasianthera africana	Nditip	Letengsi	Nditip
Leptaulus daphnoides	'Leptaulus'	?	?
Lavigeria macrocarpa	Angota	Nkendyo?	Angora
IRVINGIACEAE			
Desbordesia glaucescens	Omang	Leng	Alep
Irvingia gabonensis	Ando'o	Ndtua/Ndoa	Andoa
Irvingia grandifolia	Ando'o ngoe	Eswon/Gyendo?	Andoa ngwin?
Irvingia robur	'Irvingia robur'	?	?
Klainedoxa gabonensis	Ngon	Nviambo	Ngon
Klainedoxa microphylla	Ngon	Nviambo?	Ngon?
LABIATAE			
Ocimum canum	Mecep	Masivi?	Mecep
Ocimum gratissimum	Osim	Singyo?	Osim
Solenostemon sp.	Ayang mimba'a	?	?
LAURACEA			
Beilschmiedia anacardioides	Kanda g.f	?	Kanda/Nsii?
Beilschmiedia obscura	Kanda p.f	?	Kanda/Nsii?
Beilschmiedia spp.	Kanda	?	Kanda/Nsii?

APPENDIX IV Botanical lexicon (cont'd)

Scientific name	Vernacular names		
	Bulu/('pilot name')	**Bagyeli**	**Fang**
LAURACEA'(cont'd)			
Hypodaphnis zenkeri	Fio afan	Ndandendi	Pio afan
Persea americana	Fio	Pe/Pi	Pio
LECYTHIDCEAE			
Petersianthus macrocarpus	Abing	Lebing	?
LEEACEAE			
Leea guineensis	Otebisson	Ndjongasole	Nduasole?
LOGANACEAE			
Anthocleista schweinfurthii	Elelomzam	Tondi	Elelom
Anthocleista vogelii?	Elelomzam	Tondi	Elelom
Strychnos aculeata	Asso	Lewomo	Ewum
Strychnos asterantha	Mfas	?	Mfas
Strychnos camptoneura	Asso	Lewomo	Ewum
Strychnos sp.	Evesku	?	Evesku
LORANTHACEAE			
Agelanthus sp.	Etontja	Tonya/Nwarome?	Etontja
MALVACEAE			
Abelmoschus esculentus	Etetam	Mbole?	Etetam
Gossypium barbadense	Sut	Su si	Sut
Hibiscus acetocella	Esang	Sang?	Esang
Sida acuta	Nsisim	Nsi mbolo	Nsisim
Sida veroniafolia	Obol si	?	?
Urena lobata	Okong	Kung	Okong
MARANTACEAE			
Halopegia azurea	Nken	Mapende	Nken
Haumania danckelmaniana	Se	Nsele	Se
Hypselodelphus scandens?	Nkomenkomo	Mposo	Nkomenkomo
Marantochloa holostachya?	Madoro	Maburane?	Adoro
Megaphrynium macrostachyum	Okakon	Lekong	Okakwi
Megaphrynium macrostachyum	Okakon	Lekong	Okakwi
Sarcophrynium prionogonium	Angwafan	Akiene?	Angokwi
Trachyphrynium sp.?	Nkomenkomen	Mposo	Nkomenkomen
MELASTOMATACEAE			
Dinophora spenneroides	Abelebongo	?	Ole esang/Esang eli?
Dissotis erecta	Abelebongo	?	?
Sarkersia africana	Abelebongo	?	?
Tristemma virusanum	Abelebongo	Lebele le bono ba tua	Abele bongo
MELIACEAE			
Carapa procera	Engang	Ngwigang	Engang
Carapa sp.	Engang oswe	?	?
Carapa sp.	Engang bilobe	?	?
Entandrophragma angolensis	Ebeba/'Tiama'	?	?
Entandrophragma candollei	Atom asie/'Kossipo'	?	?
Entandrophragma cylindricum	Asie/'Sapelli'	Lessie	Asie
Entandrophragma utile	Asseng asie/'Sipo'	Mbalobo?	Asseng?
Guarea cedrata	Bosse 'c ' (1)	Mabinde ma ngu?	Embikam(?)
Guarea thompsonii	Bosse 't' (2)	?	Embikam(?)
Khaya ivorensis	Ngollon	Ngolo	Ngollon
Lovoa trichilioides	Bibolo	Wo	Bibilo
Trichilia heudelotii	Ebe'bemva oswe	?	?
Trichilia rubescens	Ebe'bemva	?	Ekimang(?)
Trichilia spp	Ebe'bemva	?	Ekimang(?)
Trichilia welwitschii	Ebe'bemva	?	Ekimang(?)
Turraeanthus africanus	Avodire	?	?

APPENDIX IV Botanical lexicon (cont'd)

Scientific name	Vernacular names		
	Bulu/('pilot name')	Bagyeli	Fang
MENISPERMACEAE			
Jateorizha macrantha	Ndik ngwoe	Nkodengo	Ndik ngwe
Peniantus longifolius	Ndzip	Ndua	Ndzip
Stephania sp.	Edjibili	?	Edjibili
MIMOSACEAE			
Acacia pennata	Nsinik	?	Nsinigui
Albizia adianthifolia	Esak	Sa'a	Angwa
Albizia ferruginea	Sene esak	Zian sa'a	Angwa
Albizia glaberrima	Esak	Sa'a	Angwa
Albizia sp.	Esak afan	?	?
Calpocalyx dinklagei	'Minsii'	Pito	Minsi?
Cylicodiscus gabunensis	Adum	Dumo	Adum
Entanda gigas	Mbasum	Mba afumbo	?
Parkia bicolor	Esseng 'small leaves'	Seng	Esseng
Pentaclethra macrophylla	Ebay	Mbae	Ebe
Piptadeniastrum africanum	Atui	Ntombo	Tom
Samanea dinklagei?	Bikono	?	?
Tetrapleura tetraptera	Kpwasa	Nsinsa	Kpwasa
MONIMIACEAE			
Glossocalyx brevipes	Menyom-ngoe	Lenya nlego'o	?
Glossocalyx longicuspis?	Menyom-ngoe	Lenya nlego'o	?
MORACEAE			
Artocarpus altilis	Abok ntangan	Mbiti	Ele abok?
Ficus exasperata	Ako	?	Ako
Ficus mucuso	Etotole	Letole	?
Ficus natalensis	Ekekam	Kakambo	Ekekam
Ficus sur	Ekekam	Lekambo	Ekekam
Milicia excelsa	Abang	Lebang	Abang
Musanga cecropioides	Asseng	Lesseng	Asseng
Myrianthus arboreus	Angokom	Mengame/Angame	Mengame
Treculia africana	Etui	Nfumo	Etup
Treculia obovoidea	Ebobolo	Nfumo	?
MUSACEAE			
Musa paradisiaca	Ekon	Kwaando	Ekon
Musa sapientum	Adjoy	Adjoy	Anjue
MYRISTICACEAE			
Coelocaryon preussi	Ebukzo'o/Nom eteng	Tombe	Ekun
Pycnanthus angolensis	Eteng	Teng	Eteng
Scyphocephalum manni	Zole	Nzole	Zole
indeterminata	Ovos	Mbondjo	?
Staudtia kamerunensis	Mbonda	Mbunzo'o	Mbonda
MYRTACEAE			
Psidium guajava	Afele	Amfel	Amfel
Syzygium guineense	Ebobok	Lenjang?	Eboboa
OCHNACEAE			
Lophira alata	Okwa/Azobe	Leku'o	Akoga
OLACACEAE			
Aptandra zenkeri?	Mbazo'o	Mabanpando	Mbazoa
Coula edulis	Ewomen/Ngom; Komen(se)	Ngumo	Ewomo/(Komo(se)
Diogoa sp.?	Mbazo'o	Lekiwa	Mbazoa
Heisteria parvifolia	Ewankang	?	?
Olax staudtii	Elesuzu	?	?
Ongokea gore	Anjek	Kpweme/Nge?	Anjek
Ptychopetalum petiolatum	Ewai	Vesakuli	?
Strombosia grandifolia	Efumele mbazo'o	Nkemelo	Mbazoa

APPENDIX IV Botanical lexicon (cont'd)

Scientific name	Vernacular names		
	Bulu/('pilot name')	**Bagyeli**	**Fang**
OLACACEAE (cont'd)			
Strombosia pustulata	Efumele mbazo'o	Nkemelo	Mbazoa
Strombosia scheffleri	Mbazo'o	Nkemelo	Mbazoa
Strombosia spp.	Mbazo'o	Nkemelo	Mbazoa
Strombosiopsis tetandra	Edip mbazo'o	Mpindi	Mbazoa
PALMAE			
Ancistrophyllum secundiflorum	Nkan/Minkam	Nkando	Nkan/Minkam
Calamus deerratus	Mfop	?	?
Calamus sp.?	?	?	Ako
Cocos nucifera	Mbanga	Mbanga	Anguima
Elaeis guineensis	Alen	Lendi	Alen
Eremosphatha spp.	Nlong	Nlong	Nlong
Podococcus barteri	Andim	?	?
Raphia montbuttorum	Zam	Djibo/Ndimbo	Zam
Raphia sp.	Andim	Ledimo	Andjim
Raphia vinifera	Ako	?	Ako
Rattan indeterminata	?	Sale	?
Rattan species	Nlong	Nlong	Nlong
Sclerosperma mannii	Mvie	Bimvio?	Mvio
PANDACEAE			
Panda oleosa	Afane	Pande	Fane
PANDANACEAE			
Pandanus sp. (candelabrum?)	?	Lekwu?	Awup
PAPILONIACEAE			
Arachis hypogaea	Owono	Wound ya meko'o	Owono
Baphia leptobotrys	Ele metok	?	?
Baphia sp.?	'Bafia'	?	?
Desmodium adscendens	Obe-obezene/ Owondo bekon	Wunde ya menkwo	Owondo bekon
Lonchocarpus sericeus?	Mviniko'o	Nwazinzoa	
Millettia macrophylla	Mviniko'o	Nwazinzoa	
Mucuna flagellipes	Kotendo'o	?	Eseknio
Pterocarpus soyauxii	Mbe	Mbele	Mbe
Pueraria phaseoloides	Kailale	?	Kailale
Tephrosia vogelii	Ndowolo	?	Ndowolo
PASSIFLORACEAE			
Barteria fistulosa	Mekbenga	Mabengwe	Mekbenga
Barteria nigritiana	Mekbenga	Mabengwe	Mekbenga
PIPERACEAE			
Piper guineensis	Abominjang ndik	Mbwale	Enan ndik/Ndondo ndik
Piper umbellatum	Abominjang	Lebombele?	Abominjang
POLYGALACEAE			
Carpolobia lutea	Onong	Nwango	Onong
PORTULACACEAE			
Talinum fruticosum	Elok supe	?	Elok supe
PTERODOFYTAE			
Ferns (general)	Zeng	Lei nsa	Zeng
indeterminata	Zeng	Lei nsa	Zeng
Pteridium aquilla?	Aku/Mbaku	?	Mbakwa
RHAMNACEAE			
Maesopsis eminii	Nkangele	Ngwiyang (?)	Nkangele
RHYZOPHORACEAE			
Anisophyllea polyneura	Etatmbaye	Ngumu	Ngumo?
Poga oleosa	Angale	Ngale	Ngala

APPENDIX IV Botanical lexicon (cont'd)

Scientific name	Vernacular names		
	Bulu/('pilot name')	Bagyeli	Fang
RUBIACEAE			
Bertiera elabensis?	Kofi afan	Kofi ya dii/Lebumaku	
Borreria intricans	Oyemze	Ngimo ya nze?	Oyemze?
Psydrax arnoldiana	Ebukbong	Mbang/Kosi/Buka bongo	?
Psydrax sp.	Ndjenda	Ndjema	Ndjenda
Coffea sp.	Kofi	Kofi	Kofi
Coffea sp.?	Kofi afan	Kofi ya dii/Lebumaku	
Corynanthe pachyceras	Nom akela/Tchangya	?	?
Grossera longifolia	Tsangya/ Efomele zo'o/Akela	?	?
Mitragyna stipulosa	Afobezam	Ndtuabo/Nduabo	Elelomzam
Heinsia crinita?	Avem	Lo ya legyembo?	Avem?
Massularia acuminata	Zo'o	Ndjebe/Ngwibe	Ayebe
Morinda lucida	Atjek	Bilo	Akeng
Nauclea diderrichii	Akondok	Ntomba	Aloma
Pausinystalia macroceras	Efumele zo'o/Tchangya	Nlo'o	?
Pausinystalia yohimbe	Atjek afan	Nlo'o	?
RUBIACEAE			
Psychotria sp.	Anguek mven	Ngwen nbampen	Mevini ngwin?
Rothmannia lujae?	Endon	?	?
Stipularia africana	Ngende	?	?
RUTACEAE			
Afraegle asso	Asso	?	?
Citropsis articulata	Ofumbi afan	?	?
Citrus grandis	Ofumbi bikabala	'Pamplemus'	Epumba bikabala
Citrus limon	Ngombang	Nio piang	Ngombang
Citrus reticulata	Mandarine	Mandarine	Mandarine
Citrus sinensis	Ofumbi	Poma	Opumba
Zanthoxylum gilletii	Bongo	Lendjio/Lendjion	Bongo
Zanthoxylum heitzii	Elelongo/Ngues	Ledjon	Olom
Zanthoxylum spp.	Elelongo/Bongo	Ledjon	Olom
SAMYDACEAE			
Homalium africana	Mbafolo	Banjo?	Abemoro
SAPINDACEAE			
Blighia unijungata?	Bembe	?	?
Blighia welwitschii	Awonog	?	Ngong
Eriocoelum macrocarpum	Awonog	?	?
Ganophyllum giganteum	Engak	?	?
SAPOTACEAE			
Aningeria robusta	Abam longwi	Babame	Abem?
Autranella congolensis	Adjapzok	Byadjio	Adjapzok?
Baillonella toxisperma	Adjap	Djiabo	Adjap
Chrysophyllum africana	Abam	Babame	Abam?
Chrysophyllum beguei	Abam	Babame	Abam?
Chrysophyllum spp.	Abam	Babame	Abam?
Omphalocarpum sp.	Mbe mingon	Bambo	Mbe mingon
Omphalocarpum sp.	Mbe mingon	Bambo	Mbe mingon
Tieghemella africana	Adjapzok	Byadjio?	Adjapzok?
SCROPHULARIACEAE			
Digitalis purpurea	?	?	Abindja
SCYTOPETALACEAE			
Oubanguia africana	'Oubanguia'	?	?
SOLANACEAE			
Capsicum annuum	Mendom	Akiaga	Mendum
Capsicum frutescens	Ndondo ndondo/Ntang	?	Ndondo
Capsicum spp.	Ndondo	Kala?	Ndondo

APPENDIX IV Botanical lexicon (cont'd)

Scientific name	Vernacular names		
	Bulu/('pilot name')	Bagyeli	Fang
SOLANACEAE (cont'd)			
Lycopersicum esculentum	Ongoto	Bingong	Ongoro
Nicotiana tabacum	Ta'a	Ndalu	Ta'a
Solanum aethiopicum	Okum bekwe	Lekung	Okum
Solanum aethiopicum	Zom	Njume?	Zom
Solanum scabrum?	?	Lenzwen?	Angzong
Solanum sp.?	?	?	Osang bikabala
Solanum torvum	Akung bele	Lekwan le ngwele?	Angzong?
STERCULIACEAE			
Cola acuminata	Abu	Lebele	Abu
Cola chlamydantha?	Efop?	?	?
Cola crispiflora?	Akomengwe	Kombo/Kokwambo	Ekokom
Cola ficifolia	Etabewo'o/'Akpwai'	Ngoabo	?
Cola hypochrysea	Efop?	?	?
Cola lateritia?	?	Lendji	?
Cola lepidota	Mvoi	Ngwo?	Mvoi
Cola nitida	Abu/Goro	Lebele	Abu/Goro
Cola pachycarpa	Mvoi	Ngwo	Mvoi
Cola ricinifolia	Akomengwe	Kombo/Kokwambo	Ekokom
Cola rostrata	Akpwai	Ngoabo (?)	?
Cola semecarpophylla?	Mvoi	Ngwo/Miwoh	Mvoi
Cola verticillata	Abu afan/Eyabe	Eyabeli	Abu afan
Eribroma oblonga	Eyong	Ngwiyongo	Ndjong
Leptonychia sp.	Kaka afan	?	Kaka afan
Pterygota bequartii	?	Nkaya	?
Pterygota macrocarpa	Koto	Ngwen	?
Scaphopetalum sp.	Kaka afan	?	Kaka afan
Sterculia subviolacea	Efok ayus	?	?
Sterculia tragacantha	Efok ayus	Bwalo (?)	?
Theobroma cacao	Kaka	Kaka	Kaka
Triplochiton scleroxylon	Ayus	Leyose?	Ayos?
TILIACEAE			
Ancistrocarpus sp.	Aka ndik	Nambande?	Aka ndik
Clappertonia polyandra?	Okong	Lekong?	Okong
Corchorus olitorius	Kelang kelang	Nkeleng nkeleng	Keleng keleng
Desplatsia dewevrei	Mfendek	?	Adjibi/Mfenenge(fr)
Duboscia macrocarpa	Akak	Ka'a	Aka
Grewia coriacea	Akena	Nwaze	?
Triumfetta cordofolia	Okong	Lekwong	Okong
ULMACEAE			
Celtis milbraedii	Ngo/Odu	Leko'o/Leko'olele	Odu?
Celtis zenkeri	Ngo/Odu	Leko'o/Leko'olele	Odu?
Holoptelea grandis	Avep ele	Lwambo	Avep ele?
Trema guineense	Eve'e	Leve sa'a	Evega
URTICACEAE			
Fleurya ovalifolia	Sasbiteng	?	Sas
VERBENACEAE			
Clerodendrum splendens	Beyeme elok	?	Beyeme elok
Vitex grandifolia	Kenkeliba/Evula/ Chocokam	Mvuli	Evula
VIOLACEAE			
Rinorea dentata	Ove	?	?
Rinorea kamerunensis	Ezate	Ndiendo/Ngossi/Lesolo	Ezate

APPENDIX IV Botanical lexicon (cont'd)

Scientific name	Vernacular names		
	Bulu/('pilot name')	**Bagyeli**	**Fang**
VITACEAE			
Cissus aralioides	Angongi	?	AngongI
Cissus sp.	Fazo'o	Lewendjo	Fazoa
ZINGIBERACEAE			
Aframomum citratum	Adjom(pl)/Bison(fr)	Levili	Adjom(pl)/Bison(fr)
Aframomum melegueta	Ndong	Memete wa kwato	Ndong
Aframomum sp.	Mvolong	Mpongolo	Mvongolo
Costus spp.	Mian	Mwanzue	Mian
Renealmia congensis	Obal adjom	Levili le sa?	Oba azom?
Zingiber officinale	Kokobianko	Levili	Jinja
INDETERMINATA: VASCALURA PLANTS			
?	?	Lekunulele	?
?	?	Vuma	?
?	?	Djimane	?
?	?	Nzansi	?
?	?	?	Abol nzoa
?	?	?	Assas ndik
?	?	?	Ensangong
?	?	?	Eyensom
?	?	?	Mbe minjka
?	?	?	Mbemvai
?	?	?	Ndetung
?	?	?	Ndjip
?	?	?	Njam
?	?	?	Tsigui
?	?	?	?
?	Afye	?	?
?	Anding	?	?
?	Ava	?	Ava
?	Avongwo'o	?	?
?	Bapleba	?	?
?	Bedjedje	?	?
?	Buk	?	?
?	Demze	?	Demze
?	Ebonewono	?	?
?	Ekula	?	?
?	Ele mevang	?	?
?	Ele so ayam?	?	?
?	Enfolo?	?	?
?	Enkon	?	?
?	Etok mofolo	?	?
?	Kengenge	?	Kengenge
?	Malambala	?	?
?	Mas mas	?	?
?	Mbol	?	?
?	Mvomka'a	?	?
?	Ndoi	?	?
?	Ngonga?	?	?
?	Oyeya	?	Oyeya
?	Sasbiteng	?	?
?	Ti'i	?	Ti'i

APPENDIX V Animal lexicon (cont'd)

Scientific name	Bulu	Bagyeli	Fang	English
MAMMALS (cont'd)				
PHOLIDOTA (cont'd)				
SCIURIDAE (cont'd)				
Helioscurius rufobrachium	Ovae	Palli/Navoke?	Ovae/Vele?	Red-legged Sun Squirrel
Protoxerus stangeri	Mvok	Mpoo?	Mvok	Giant Forest Squirrel
ANOMALURIDAE				
Anomalurus sp.	Ngwi	Gu/Ngu	Ngwi	Flying Squirrel species
HYSTRICIDAE				
Atherurus africanus	Ngom	Gombo/Ngumba	Ngom	African Brush-tailed Porcupine
CRICETIDAE				
Cricetomys gambianus	Koesi	Ko/Ku	Nkwi	Giant Ganbian Rat
THRYONOMYDAE				
Trhyonomys swinderianus	Mvep	Mvebe/Mveke	Mvep	Cane Rat
MACROSCELIDAE				
Lemniscomys sriatus?	Fo	Dungila?	Ze fo?	'Bush Mouse'
CARNIVORA				
MUSTELIDAE				
Aonyx congica	Abang	Leba'a	Abang	Congo Clawless Otter
Mellivora lepensis	Aka minjong	Kamena?	Akamena?	Ratel
VIVERRIDAE				
Bdeogale nigripes	Nke mvak	Nke mpa'a ?	Nki mvak	Black-footed Mongoose
Crossarchus obscurus	Nyameso'o	Misoki/Naminsoke	Abute	Cusimanse
Genetta servalina	Nsing	Nsion/Nsin?	Nsing	Servaline Civet
Herpestes paludinosus	Mvak	Mpa'a?	Mvak	Marsh Mongoose
Nandinia binonata	Mvae	Mbah	Mvia	Two-spotted Palm Civet
Viverra civetta	Zue	Guabo/Dyabo	Nzue	African Civet
FELIDAE				
Panthera pardus	Nkeu	Nze/Ndze	Nze	Leopard
PRIMATES				
LORISIDAE				
Galagous elegantulus	Nsae	Ledyoli	Nsae	Western Needle-clawed Galago
Galagoide alleni	Emam		Emam	
Perodicticus potto	Awung	Ndjendo	Awun	Potto

APPENDIX V Animal lexicon (cont'd)

Scientific name	Bulu	Bagyeli	Fang	English
PRIMATES (cont'd)				
CERCOPITHEDAE				
Cercocebus albigena	Eka afung	Nka'a/Nsa'a?	Eka afum	Grey-cheeked Mangabey
Cercocebus galeritius	Nsak	Nka'a	Kak	Crested Mangabey
Cercocebus torquatus	Kak	Nsa'a	Kak	Collared Mangabey
Cercopithecus cephus	Osok	So'o/Sue	Osok	Moustached Monkey
Cercopithecus neglectus	Fung	Pvwang?	Fum	de Brazza's Monkey
Cercopithecus nictitans	Avembe	Livembo	Avem	Greater White-noosed Monkey
Cercopithecus pogonias	Esuma	Punga/Punde	Esuma	Crowned guenon
Colobus guereza	Sosoo/Visya	Pfwong?	Visya?	Guereza Colobus
Colobus polykomos satanas	Mvon	Bonde?	Mvon	Wester Black-and-Wkite Colobus
Miopethecus talapoin	Ozem	Nzengi/Ndjinde	Ondzem	Talapoin
Papio sphinx	Seuk/Nzombo	Se'e/Sa'a/Ne'e?	Suek	Mandrill
PONGIDAE				
Gorilla gorilla	Nji	Guiye/Nzie	Ngui	Gorilla
Pan troglodytes	Wo'o	Wa'a	Wa'a	Chimpanzee
INSECTIVORA				
POTAMOGALIDAE				
Potamogale velox	Djes	Gye	Dzes?	Giant Otter Shrew
AMPHIBIENS				
BUFONIDAE				
Bufo sp.	Ba'abe	Tetege/	Ba'abe?	
Bufo supercialis	Mvong	Mpung?	Mvong?	
HYPEROLODAE				
Scotobleps gabonicus	Abep	Lebembo?	Abep	
RANIDAE				
Conroua goliath		Dza		Giant frog
REPTILES				
CHELONIA				
TESTUNIDAE				
Kinixys spp.	Ku/Kulu	Mfumi	Ku/Kulu	Hingeback tortoise

APPENDIX V Animal lexicon (cont'd)

Scientific name	Bulu	Bagyeli	Fang	English
REPTILES (cont'd)				
OPHIDIA				
BOIDAE				
Python sabae	Mvom	Mbwamo	Mvom	
COLUBRIDAE				
Boiga pulvurulensis	Vyet	Yile	Vyet	
Grayia smithi	Nsek	Nsek	Nsek	
Thrasops flagivularis	Otunjek			
ELAPIDAE				
Boulangerina annulata	Elom	Nsoa	Elom	
Dendroaspis jamesoni	Ayang	Lan	Ayang	Mamba
Naja melanoleuca	Evindi nyo	Toubo	Evindi nyo	
Naja nigricollis	Okung/Evindi nyo?	Tubo	Okung/ Evindi nyo?	Spitting cobra
VIPERIDAE				
Bitis gabonica	Akpwe	Yil	Akpwe	Gabon viper
Causus maculatus		Pfupfu'o		
TYPHLOPIDAE				
Typhlops punctatus	Abimete/Tue?	Tutuo	Ebomeso?	
SAURIA				
AGAMIDAE				
Agama agama	Ongoto	Abangora	Ongoro	
CHAMELEONIDAE				
Chamaeleon sp.	Ndjongo		Dzungo	Chameleon species
CROCODILIDAE				
Crocodylus cataphractus	Nkam	Nkande?	Nkam	
Osteolaemus tetrapis	Nkom	Nkumbi	Nkom	Dwarf crocodile
GECKONIDAE				
Gecko sp.	Afae	Mbomengale?	Afae	
SCINIDAE				
Lygosoma fernandi	Nso	Sembo?	Nso	
Lygosoma reichenoni	Ebom kokot	Mpyole?	Ebom kokot	

APPENDIX V Animal lexicon (cont'd)

Scientific name	Bulu	Bagyeli	Fang	English
REPTILES (cont'd)				
SAURIA (cont'd)				
VARANIDAE				
Varanus niloticus	Nka'a	Ngumbi	Nka'a	Nile monitor lizard
BIRDS				
ANATIDAE				
Pteronetta hartlaubii ?	Alloloke	Lelora	Elologo	Hartlaub's Duck
BUCEROTIDAE				
Bycanistes subcylindricus	Miam	Damo	Miam	Black-and White-casqued Hornbill
Ceratogymma atrat	Ongung	Duwo	Ongung	Black-casqued Hornbill
Tockus camurus	Okpwekpwai	Kpwania/Kpwakpwa	Okpwekpwai	Red-billed dwarf hornbill
Tockus erythrorynchus	Zanga miam	Damo lezanga	Zanga miam	Red-beaked Hornbill
Tropicanus albocristatus	Konjo	Bobeng	Konjo?	White-crested Hornbill
CAPITONIDAE				
Lybius sp.	Ekuku	Ngumo	Ngumo	Barbet species
COLUMBIDAE				
Streptotelia semitorquata	Zum	Zum	Dzum	Red-eyed Dove
Turtur brehmeri?	Ndjung	Nuo/Due	Ndjung	Blue-headed Dove
Turtur afer	Odu bikotok	Nuo/Due	Odu bikot	Red-billed Wood-Dove
Turtur tympanistria	Odu minjong	Nuo/Due	Odu minjong?	Tambourine dove
CORVIDAE				
Corvus albus	Engbang	Mbang	Nbang	Pied Crow
CUCULIDAE				
Centropus leucogaster	Du'u	Ndu'u	Dugu	Black-throated coucal
ACCIPITRIDAE				
Accipiter melanoleucus	Obam	Wole	Obam	Great sparrowhawk
Aquila walbergi	Ndoy	Mbele	Ndwi	Wahlberg's Eagle
HELIORNITHIDAE				
Podica senegalensis	Zosol oswe	Mbebele	Zosol oswe?	Finfoot
MUSOPHAGIDAE				
Corytheola cristatta	Kunduk	Kunu'u	Kunduk	Great blue touraco

APPENDIX V Animal lexicon (cont'd)

Scientific name	Bulu	Bagyeli	Fang	English
BIRDS (cont'd)				
NECTARINIIDAE				
Nectarinia spp.	Nso'so	Ze so/Sosoo	Ze so	Sunbirds
PHASANIDAE				
Agelastes niger	Kubakok			Black Guinea-fowl
Coturnix delegorguei	Obem	Bembo	Obem	Harlequin Quail
Francolinus squamatus	Okpwa/Mvem okpwa	Kole benda	Okpwa	Scaly Francolin
Guttera plumifera	Mvem	Mbole/Mvuli	Eko mvem	Plumed Guinea-fowl
Numida meleargis	Nkan	Nkan	Nkan	Grey-Breasted Helmet Guinea-fowl
PICIDAE				
indeterminata	Obo'o mikumba	-	-	Woodpecker species
PSITTACIDAE				
Psittacus erithacus	Kos	Kwi/Kose	Kos	Grey Parror
PYCNONOTIDAE				
Andropadus sp.	Otok	To'o	Otok	Bulbul species
RALLDAE				
Himantornis haematopus	Nkulengwi	Nkfumunge	Nkulengwi	Nkulenga rail
STRIGIDAE				
Bubo leucosfictus	Akung	Mabe	Akung	Owl species
Bubo poensis poensis	Nduk	Mabe	Nduk	Fraser's Eagle-Owl
STURNIDAE				
Onychognathus morio	Okpweng	Kpwa?	Kpweng	Starling species
FISHES				
AMPHILIDAE				
Phractura intermedia	Nsome ko'o			
ANABANTIDAE				
Ctenopoma sp.	Efila	Beepfila	Efila	
Ctenopoma sp.	Ewong	Beepfila	Duwo	
BAGRIDAE				
Auchenoglania ballayi	Mvong	Mpo'o	Mvong	
Parauchenoglanis guttatis	Ebu	Mbonde	Ebonde	

Scientific name	Bulu	Bagyeli	Fang	English
FISHES (cont'd)				
CHANNIDAE				
Parachanna obscura	Ezimba?	Nzima	Nzima	
CICHLIDA				
indeterminata			Efu/Efo	
Hemichromis fasciatus		Nso'o	Eso	Dundi
Nannochromis caudifsciatus	Eko'o	Ndwi	Mbele	
CLARIDAE				
Clariallabes longicauda	Mvas	Mpe'e	Mbe	
Claria camerunensis	Ngo'o/Ngol	Nlombo	Ngo	
Gymnallabes typus	Ndo	Ndwa'a	Ndong	
CYPRINIDAE				
Barbus batesi	Nkpwa	Nkwa	Nkpwa	
Barbus camptacanthus	Mva'a		Mva'a	Dundi
Barbus sp.	Nkpwa'a mva			
Labeo annectans	Esingi/Ezindi			
Raiamus bucholzi?	Esamba		Esamba	
CYPRINODONTIDAE				
Epiplatys sp.?	Mbong	Ntole?	Mbong	
MALAPTERURIDAE				
Malapterurus electricus?	Anyang		Anyang/Anyong	
MORMYRIDAE				
Marcusenius sp.		Lenene?	Anen	
Petrocephalus sp.	Fyatak	Mbengi?		
Pollimyrus kingsleyae	Entotom		Entotom	
Isichitis henryi?			Lutu/Lolo	
OSTEOGLOSSIDAE				
Heterotis nilicticus		Kanga	Akanga	
INDETERMINATA				
	Abio		Abu	
	Agyata			
	Angbang			
	Djo			
	Efaka			

APPENDIX V Animal lexicon (cont'd)

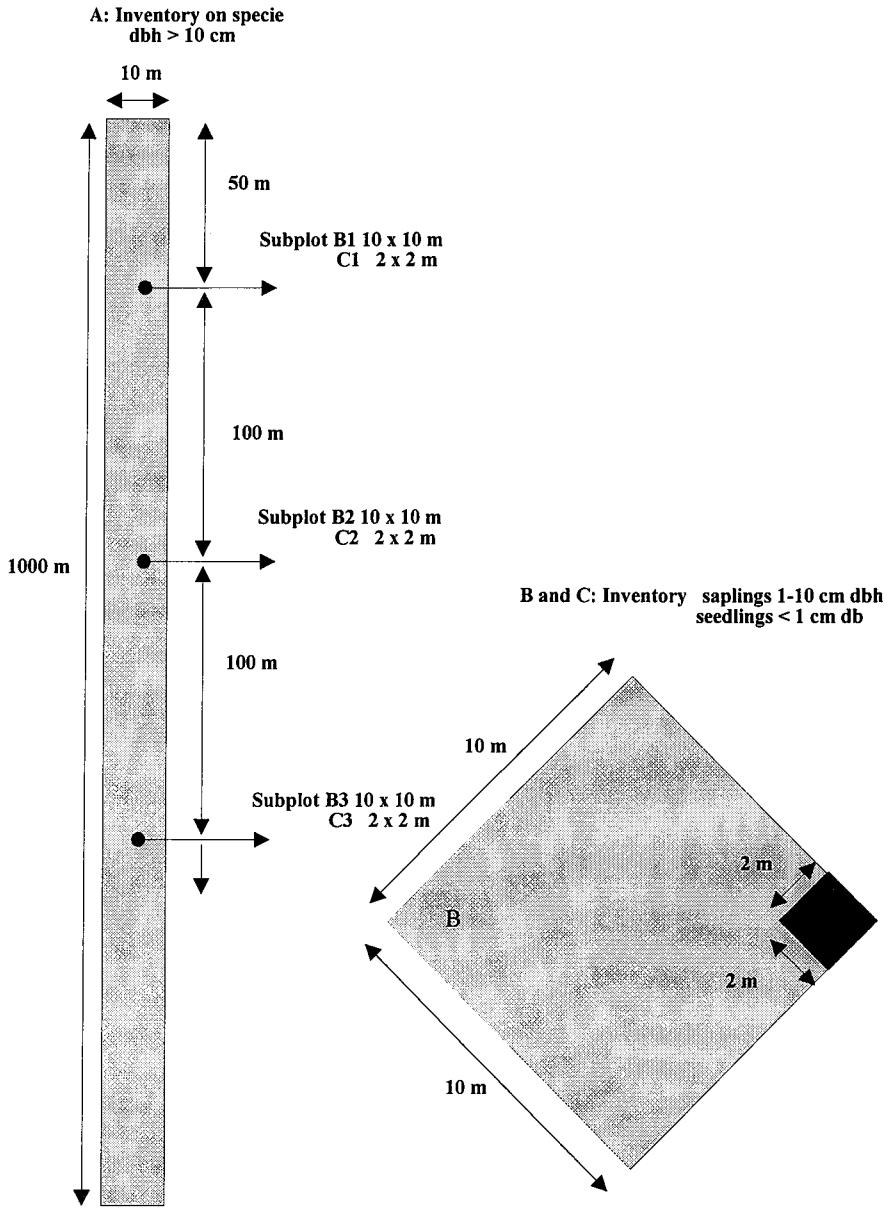
Scientific name	Bulu	Bagyeli	Fang	English
FISHES (cont'd)				
INDETERMINATA (cont'd)				
	Elele ebomo			
	Engon			
	Malongo			
	Mba			
	Mfo/Mfongo			
	Monokos			
	Nlom			
	Ntito			
	Siang			
	Tiang		Tiang	
			Adua	
			Agoka	
			Akinda	
			Akogolo	
			Akwa	
			Andiang	
			Apiera	
			Atoro	
			Avuga/Avogo	
			Avumba	
			Ayangang	
			Be	
			Bembe	
			Ebangele	
			Elolu	
			Esande	
			Esobo	
			Evoglemba	
			Ngyara	
			Ngangele	
			Nie	
			Nsaba/Saba	
			Nyanga	

Scientific name	Bulu	Bagyeli	Fang	English
CRUSTACEANS				
ALPHEIDAE				
Potamalpheops monodi	Sina	Sisa	Sina	
CRUSTACEANS				
CARCINIDAE				
Crabs (generic)	Kata		Kara	
PALEONIDAE				
Shrimps (generic)	Ngos	Nkyong	Ngos	
CHANNIDAE				
Parachanna obscura	Ezimba?	Nzima	Nzima	
INDETERMINATA				
			Obara	
	Mfungo			Dundi
			Njama	
			Kpwawas	
			Engema	
	Ba'amo			
	Enkongo		Kongkong	
MOLLUSCS				
ACHATINIDAE				
Achatina iostoma	Nsondo	Sondo	Nsondo	
Arachatina marginata	Ngon	Fae	Ngon	
Arachatina camerunensis	Ebos	Kyende		
Pseudaachatina sp.	Esoabong		Esoabong	
Indeterminata	Akuk		Akuk	
Potodoma freethii	Ebong		Ebong	
Aetheria sp.	Along		Along	
Aetheria sp.	Kumu			
INDETERMINATA				
	Engale		Ngegele	
	Otem		Otem	

APPENDIX V Animal lexicon (cont'd)

Scientific name	Bulu	Bagyeli	Fang	English
ARTHOPODES				
ACRIDOIDAE				
Indeterminata	Mba'asang		Mba'asane	
CUCULIIONIDAE				
Rhynchphorus phoenics	Fos	Poa	Fos	
DIPTERIDAE				
Caterpillars (generic)	Nkong		Nkong	
Indeterminata	Eso'o		Eso'o	
Indeterminata	Esop		Esop	
Indeterminata	Ayos	Bakambe	Ayos	
Indeterminata	Abing	Menvulu	Abing	
GRILLIDAE				
Indeterminata			Asileng	
INDETERMINATA				
	Bikwa			
	Ekum			
	Mesak			
	Misei			
	Obipja			
			Etom	
			Mvana	

APPENDIX VI Design of the sample plots



APPENDIX VII Characteristics of the transects

Code ES	Location				Direction	Length in m	Type/degree disturbance in %			Number of # species	Tot. number of specim.
	Name	Altitude	Longitude	Latitude			Undist.	Logged	Agric.		
33	Bingambili	< 180 m	3'06'07	10'29'62	200	1000	73	0	27	108	576
20	Ebimimbang 1a	< 180 m	3'03'20	10'26'26	210	1000	10	12	78	91	387
14	Ebimimbang 1b	< 180 m	3'03'20	10'26'26	210	1000	41	44	15	90	642
16	Ebimimbang 2	< 180 m	3'02'54	10'28'17	260	1000	22	32	58	84	459
32	Melen 1	< 180 m	3'02'80	10'31'64	30	430	0	0	100	58	278
32	Melen 2	< 180 m	3'02'80	10'31'64	340	1000	8	0	92	90	401
6	Abo'ntomba	180 - 340 m	3'04'11	10'35'68	155	1000	59	5	36	85	511
13	Adjap	180 - 340 m	2'55'84	10'34'11	75	1000	16	0	84	100	292
28	Assok	180 - 340 m	3'02'78	10'33'59	130	1000	18	42	40	100	559
7	Kalate aba'a	180 - 340 m	3'04'51	10'34'58	345	1000	40	10	50	88	575
5	Nkoutou	180 - 340 m	3'05'97	10'37'08	275	1000	29	0	71	78	352
4	Ebom 1	340 - 540 m	3'04'56	10'41'84	230	1000	33	1	66	80	438
8	Ebom 2	340 - 540 m	3'04'05	10'42'59	240	1000	0	0	100	62	300
11	Engomba	340 - 540 m	3'04'84	10'39'45	220	1000	27	44	29	90	517
1	Mekalat 1	340 - 540 m	3'05'25	10'40'26	0	1000	13	0	87	74	352
2	Mekalat 2	340 - 540 m	3'04'95	10'41'10	0	1000	50	0	50	88	552
27	Minkan a	340 - 540 m	3'00'73	10'39'75	80	1000	88	12	0	96	654
19	Minkan b	340 - 540 m	3'00'73	10'39'75	80	1000	71	29	0	102	655
25	Mvie 1	340 - 540 m	2'55'99	10'37'29	350	430	0	100	0	51	169
24	Mvie 2	340 - 540 m	2'55'63	10'37'79	170	515	21	79	0	75	264
3	Nkoekouk	340 - 540 m	3'03'46	10'43'70	20	1000	74	0	26	77	575
9	Nkoekouk-Minkan	340 - 540 m	3'00'65	10'42'47	315	1000	18	75	7	96	662
15 a	Bityili 1a	> 540 m	2'56'06	10'49'55	60	1000	100	0	0	119	775
15 b	Bityili 1b	> 540 m	2'56'06	10'49'55	60	675	100	0	0	104	471
17	Bityili 2	> 540 m	2'56'06	10'49'55	260	840	100	0	0	117	804
31	Doumsi	> 540 m	2'48'65	10'37'25	25	1000	83	13	4	123	767
10	Meka'a II 1	> 540 m	2'53'21	10'44'08	155	1000	18	36	46	82	383
18	Meka'a II 2a	> 540 m	2'58'11	10'44'08	100	1000	100	0	0	102	888
29	Meka'a II 2b	> 540 m	2'58'11	10'44'08	150	1000	82	13	5	83	540
21	Nko adjap a	> 540 m	2'57'09	10'49'87	45	1000	66	20	14	76	525
23	Nko adjap b	> 540 m	2'57'09	10'49'87	350	1000	100	0	0	108	715
12	Nyangong	> 540 m	2'58'11	10'45'27	330	1000	73	27	0	77	488
22	Yem 1	> 540 m	2'57'20	10'46'93	200	1000	59	0	41	71	275
26	Yem 2	> 540 m	2'57'20	10'46'93	290	1000	0	0	100	75	304

APPENDIX VIII The abundance and distribution of NTFP species with regard to the major habitat types

Column 1 Abbreviation scientific name of the plant family
Column 2 Scientific name of the species
Column 3 Bulu name of the species or species group
Column 4-11 Habitat types:

- Fhi : High altitude forest, > 540 m
- Fin : Intermediate altitude forest, 350-540 m
- Flo : Low altitude forest, < 350 m
- Swa : Swamp forest
- Slo : Secondary forest, logged-over
- Sag : Secondary forest, agriculture
- Cpl : Cocoa plantations
- Fal : Fallow lands

APPENDIX VIII The abundance and distribution of NTFP species with regard to the major habitat types

Fam.	Scientific name	Bulu	Fhi	Fin	Flo	Swa	Slo	Sec	Cpl	Fal	Aver.
AGAV	*Dracaena arborea*	Alen okpwe					0.3				0.0
ANAC	*Antrocaryon klaineanum*	Ozakong	0.9	0.9	1.2	0.7	2.4	3.3	3.3	0.3	1.8
ANAC	*Lannea welwitschii*	Eko		2.1	2.4			1.7	1.4		0.6
ANAC	*Mangifera indica*	Ando'o ntangan							1.4	0.6	0.1
ANAC	*Pseudospondias spp.*	Ofo	0.3		1.2		1.4	0.7	3.3		0.9
ANAC	*Trichoscypha acuminata*	Mvut/Abut	2.2	1.2	1.2	2.9	1.4	0.9	0.5		1.4
ANAC	*Trichoscypha arborea*	Engong	0.6		1.6		0.5		1.0	0.7	0.5
ANNO	*Anonidium floribundum*	Ebom afan	0.3	0.9							0.2
ANNO	*Cleistopholis glauca?*	Avom afan		0.3							0.0
ANNO	*Cleistopholis patens*	Avom	0.5	2.7	5.1		1.1	3.9	2.8	0.7	2.3
ANNO	*Enantia chlorantha*	Mfo	1.8	4.9	2.4	3.7	6.0	0.9	0.5	0.3	2.4
ANNO	*Greenwayodendron suaveolens*	Otunga	15.6	18.9	14.6	8.1	14.9	3.3	0.5		10.2
ANNO	*Hexalobus crispiflorus*	Owe	0.8	0.9	0.8		0.5	0.7	1.0		0.9
ANNO	*Isolona hexaloba*	Mbiabono	2.1	3.4	4.7	0.7	3.5	3.5		1.0	2.4
ANNO	*Monodora myristica*	Fio		2.4	1.6	0.7	0.5	1.3		0.3	1.3
ANNO	*Pachypodanthium staudtii*	Ntom	2.8	1.5	2.4	2.2	2.7	0.4	1.0		1.9
ANNO	*Xylopia aethiopica*	Nkala	1.0	0.6	1.6	0.7	3.8	5.7	3.3	3.3	3.0
ANNO	*Xylopia parviflora?*	Nkala afan		1.2							0.1
ANNO	*Xylopia quintasii*	Mvomba	2.4	1.2	4.3		0.3				1.0
ANNO	*Xylopia staudtii*	Odjobe	2.8	1.8	3.9	6.6	1.1	0.9	0.5		1.9
APOC	*Alstonia boonei*	Ekuk	2.0	1.5	2.0	1.5	0.5	3.1	5.2	1.3	2.2
APOC	*Funtumia elastica*	Etendamba	1.5	3.4	3.2	5.9	5.4	37.9	29.4	1.6	9.6
APOC	*Picralima nitida*	Ebam	1.5		2.8	0.7	1.4				0.9
APOC	*Rauvolfia caffra?*	Obaton afan	1.0	0.6			0.5				0.3
APOC	*Rauvolfia macrophylla*	Esombo	0.2	0.9	0.8	0.7	1.4	12.4	2.8	3.6	2.7
APOC	*Rauvolfia vomitoria*	Obaton	0.2	1.5			0.5	3.3	0.9	1.0	1.9
APOC	*Strophantus gratus*	Enay		0.6	0.4				1.4		0.2
APOC	*Tabernaemontana crassa*	Etoan	9.6	10.7	11.0	3.7	12.2	9.8	2.3	1.0	9.1
AREC	*Elaeis guineensis*	Alen			0.8	0.7	1.1	16.6	21.8	9.6	4.7
AREC	*Raphia montbuttorum*	Zam		0.3		16.5	0.3	2.4		0.3	1.3
AREC	*Raphia sp./Podococcus sp.*	Andim	4.1			1.5					1.1
BIGN	*Markhammia tomentosa?*	Angossa	1.3			2.2		0.4	1.4		0.6
BIGN	*Newbouldia laevis*	Mbikam	0.3	0.3	0.8					0.3	0.2
BIGN	*Spathodea campanulata*	Esusuk				0.7	0.3	1.5	1.9	2.2	0.7
BOMB	*Ceiba pentandra*	Dum	0.2		0.4	1.5	0.3	1.5	3.8	1.9	0.9
BORA	*Cordia aurantiaca*	Otolobat	0.2								0.0
BORA	*Cordia platythyrsa*	Ebae	0.6	0.3	0.4		0.3	0.9	1.4	0.7	0.6
BURS	*Canarium schweinfurthii*	Otu/"Abel"	0.6	1.2	2.0	1.5	1.4	3.9	4.2	1.9	2.2
BURS	*Dacryodes edulis*	Assa				0.7		0.4	3.8	0.7	0.4
BURS	*Dacryodes edulis*	Assa mingung	13.7	2.1	4.7	8.8	3.3	1.1	2.4	0.3	6.4

APPENDIX VIII The abundance and distribution of NTFP species with regard to the major habitat types

Fam.	Scientific name	Bulu	Fhi	Fin	Flo	Swa	Slo	Sec	Cpl	Fal	Aver.
BURS	*Dacryodes klaineana*	Tom afan	1,6	1,2	2,0	0,7	0,8	0,7		0,3	1,3
BURS	*Dacryodes macrophylla*	Tom		0,6	0,8	2,2		0,2	1,9		0,3
BURS	*Santiria trimera*	Ebaptom	11,0	2,7	4,3	4,4	1,9	0,9		0,3	4,3
CAES	?	Ekop mayo	6,9			0,7					1,7
CAES	?	Ekop mboa manga	0,3								0,1
CAES	*Afzelia bipindensis*	Eyen ngoe/Dusye	1,3	0,6	1,6	0,7	0,4	0,4	0,5		1,1
CAES	*Afzelia pachyloba*	Dusye bl./"Pachyloba"	1,9	0,3	0,8	0,7			0,5		0,6
CAES	*Afzelia pachyloba*	Esseng/"Pachyloba"	0,5	0,3				0,7			0,3
CAES	*Anthonotha ferrigunea/A. fragans*	Akungele	0,5	4,3			4,6				1,9
CAES	*Anthonotha macrophylla*	Enak	12,6	11,0	16,2	21,3	16,3	3,9	1,5	0,3	10,4
CAES	*Berlinia confusa*	Esabem	2,7	8,6	4,7	9,6	5,7	1,7	1,4		4,4
CAES	*Caesalpinaceae spp.*	Ekop	3,0	0,3	0,4	2,2	1,4	0,7		0,3	1,3
CAES	*Cynometra hankei*	Nganga	0,5		2,0		4,6	4,1		0,6	1,5
CAES	*Cynometra sp.*	Ababekwe	0,2		2,8	1,5	0,3				0,8
CAES	*Detarium macrocarpa*	Amuk	0,2								0,0
CAES	*Dialium spp.*	Mfang	10,6	18,0	16,6	2,1	12,2	2,6	1,4	0,3	8,7
CAES	*Didelotia sp.*	Ekop ngomba					0,3				0,1
CAES	*Distemonanthus benthamianus*	Eyen	1,3	2,7	1,6		1,9	6,3	1,9	1,3	2,3
CAES	*Erythrophloeum ivorense*	Elon	0,5	1,2	3,6	2,2	0,8	4,1		0,7	1,6
CAES	*Gilbertiodendron dewevrei*	Abem	1,6	0,9	9,1	5,9	1,1				2,6
CAES	*Gossweilodendron balsamiferum*	Tola	3,5								0,7
CAES	*Guibourtia tessmannii*	Oveng		1,2				0,2			0,3
CAES	*Hylodendron gabunense*	Alan	5,2	1,8	9,9	3,7	3,3	6,5	3,7	1,0	4,1
CAES	*Julbernardia seretii*	Ekop blanc	1,5			2,2	0,8				0,5
CAES	*Microberlinia sp.*	Zingana	0,8		0,4						0,2
CAES	*Monopetalanthus microfilus*	Andung	12,4	1,8	0,8	2,9		0,4			3,5
CAES	*Oxystigma bucholzii*	Amvim	1,3	1,5	8,7		1,4	0,2			1,8
CAES	*Oxystigma mannii*	Tchitola	0,5	1,2	1,2		1,4	0,2			0,6
CAES	*Plagiosyphon multijugus?*	Ekop I	1,1			2,2					0,4
CAES	*Scorodophloeus zenkeri*	Olon	28,2	0,6		5,9	7,9				6,6
CAES	*Tetraberlinia bifoliata*	"Tetraberlinia"	2,3	0,3	3,9	5,9	2,7				1,9
CAES	*Tetraberlinia bifoliata*	Ekop ekaba	2,7					0,4			0,7
CAES	*Toubaouate brevipaniculata*	Ekop zing	0,2	0,3	0,8						0,1
CAES	*Toubaouate brevipaniculata*	Evele ekop/Ekop rouge	6,6	3,4	1,6	15,4	6,0	0,2		0,3	4,1
CARI	*Carica papaya*	Fofo								4,9	0,5
CECR	*Myrianthus arboreus*	Angokom	0,2		0,8		1,1	7,6	3,8	2,9	2,2
COMB	*Terminalia superba*	Akom	0,2	1,8	6,7	2,9	0,3	8,0	14,2	4,9	4,1
COMP	*Vernonia conferta*	Abangak						1,3	0,9	1,3	0,3
EBEN	*Diospyros spp.*	Evindi afan/Mevini	22,7	25,7	48,5	19,1	34,7	5,5	0,5	0,6	18,6
ERYT	*Erythroxylum mannii*	Elon bikotok	0,3	1,2	1,2	0,7	3,5	5,0	0,5	0,3	1,7

APPENDIX VIII The abundance and distribution of NTFP species with regard to the major habitat types

Fam.	Scientific name	Bulu	Fhi	Fin	Flo	Swa	Slo	Sec	Cpl	Fal	Aver.
EUPH	*Alchornea cordifolia*	Aboe		0,3	0,4			0,7		0,3	0,1
EUPH	*Antidesma laciniatum*	Oyemze	1,6	0,6	2,0	1,5	1,1	0,9			1,0
EUPH	*Bridelia grandis* ·	Assas r/Ewolot	3,3	3,1	0,8	1,5	1,4	6,8	3,7	2,6	3,4
EUPH	*Cleistanthus polystachyus*	Tongso						0,2			0,0
EUPH	*Dichostema glaucescens*	Evivien	23,6	13,7	2,4	12,5	4,6	3,3		0,3	8,7
EUPH	*Discoglypremma caloneura*	Ata'a	0,2				1,1	1,1	3,8		0,5
EUPH	*Drypetes gossweileiri*	Olelang	7,4	1,8	0,4	4,4					2,3
EUPH	*Drypetes sp.*	Akota	9,0	4,3	0,8	4,4	1,4	0,2			3,2
EUPH	*indeterminata*	Asukong			1,2		0,3	1,3			0,3
EUPH	*indeterminata*	Nom ebebeng						0,4			0,1
EUPH	*Macaranga hurifolia*	Assas blanc	1,1	0,6	0,4	2,2	0,5	3,9	7,4	0,6	2,9
EUPH	*Macaranga spp./Bridelia spp.*	Assas		0,9	0,4			3,5	2,9	1,9	1,1
EUPH	*Mareyopsis longifolia*	Okekela/Nom sikong	11,7	3,1	2,8	3,6	0,5	0,6	0,5		3,7
EUPH	*Margaritaria discoidea*	Ebebeng	0,2	0,3	0,8	0,7	1,1	8,1	4,2	2,6	2,5
EUPH	*Phyllanthus muellerianus*	Awum						0,2			0,0
EUPH	*Plagiostyles africana*	Assokbekulu	25,2	29,7	31,2	25,0	30,4	14,0	1,4	1,3	20,6
EUPH	*Ricinodendron heudelotii*	Ezezang	0,5	1,5	1,2	0,7	3,0	4,1	3,3	2,2	2,1
EUPH	*Tetrorchidium didymostemon*	Dilik	0,5	0,6	0,8	0,7	4,1	3,5	3,3		2,4
EUPH	*Uapaca acuminata*	Djip	1,6		0,4	0,7	0,3				0,5
EUPH	*Uapaca spp.*	Assam	18,6	16,2	11,4	75,0	17,6	8,5	5,6	1,3	16,4
FLAC	*Caloncoba gilgiana*	Miamingomo blanc	3,0	0,9	0,4	3,7	3,5	3,1	1,4	0,3	2,8
FLAC	*Caloncoba spp.*	Miamingomo	0,3	1,2	3,2	2,2	0,5	4,4	1,9	0,3	2,2
FLAC	*Caloncoba welwitschii*	Miamingomo rouge	1,0	2,1	0,4	2,8	2,4	4,6	0,9		2,5
FLAC	*Homalium sp.*	Abemoto	1,3	0,9	0,8		0,5		0,5		0,6
GUTT	?	Nom anyoi	0,6								0,2
GUTT	*Allanblackia floribunda*	Anyoy	22,4	3,7	3,2	1,5	2,2	3,9	1,5		6,2
GUTT	*Garcinia kola*	Onyai	0,5	0,9			1,1				0,4
GUTT	*Garcinia lucida*	Esok	22,7			2,8			0,5		6,0
GUTT	*Garcinia mannii/G. staudtii*	Ndja bewo'o	7,6	9,8	2,4	2,9	3,5	0,4			3,9
GUTT	*Mammea africana*	Abotzok	1,0	0,6	1,2		1,1				0,7
GUTT	*Symphonia globulifera*	Nom oniay	2,1		1,2		0,3				0,4
HUAC	*Afrostyrax kamerunensis*	"Afrostyrax"	0,3		2,0		1,4	0,2			0,5
HUMI	*Sacoglottis gabonensis*	Bidu	0,2	1,5	1,2		0,5	0,4			0,5
HYPE	*Harungana madagascariensis*	Atondo			0,8			0,9		1,5	0,5
ICAN	*Lasianthera africana*	Nditip					0,3				0,1
IRVI	*Desbordesia glaucescens*	Omang	3,9	11,3	6,7	0,7	4,3	3,9	1,4	0,3	4,1
IRVI	*Irvingia gabonensis*	Ando'o	1,9	2,4	3,6	2,9	3,0	1,3	1,9	0,3	2,1
IRVI	*Klainedoxa gabonensis*	Ngon	2,2	1,5	2,0		0,3	0,9			1,5
IRVI	*Klainedoxa microphylla*	Ngon p.f	0,5								0,1
LAUR	*Beilschmiedia spp.*	Kanda	0,5	0,3		0,7					0,1

APPENDIX VIII The abundance and distribution of NTFP species with regard to the major habitat types

Fam.	Scientific name	Bulu	Fhi	Fin	Flo	Swa	Slo	Sec	Cpl	Fal	Aver.
LAUR	*Hypodaphnis zenkeri*	Fio afan	1,1	3,4	6,3	9,6	5,1	4,1	2,4		3,6
LAUR	*Persea americana*	Fio						0,2	1,9	0,6	0,1
LECY	*Petersianthus macrocarpus*	Abing	0,6	1,2	0,8		1,1	1,3	0,5	0,3	1,1
LOGA	*Anthocleista schweinfurthii*	Elelomzam				2,9	1,1	5,5	3,8	6,4	2,1
LOGA	*Strychnos asterantha*	Mfas		0,3	0,4						0,1
MELA	*Dissotis erecta*	Abelebongo			0,4	2,9		1,5		0,6	0,4
MELI	*Carapa procera*	Engang	4,7	9,8	7,9	2,9	3,3	2,0	2,3	0,7	4,8
MELI	*Carapa sp*	Engang bilobe		0,3		5,1	0,3				0,5
MELI	*Entandrophragma angolense*	Ebeba/"Tiama"	0,2								0,2
MELI	*Entandrophragma candollei*	Atom asie/"Kossipo""	0,3	0,6	0,4		1,1	0,7			0,3
MELI	*Entandrophragma cylindricum*	Asié/'Sapelli'	0,8	0,3			0,8	0,4			0,4
MELI	*Entandrophragma utile*	Asseng asie/"Sipo"	0,2	0,3							0,1
MELI	*Guarea cedrata*	"Bosse c"	2,2	1,8	1,2	2,2	2,7	2,0			1,9
MELI	*Guarea thompsonii*	"Bosse t"	4,3	2,4	2,0	4,4	0,8	0,4			2,1
MELI	*Khaya ivorensis*	Ngollon		0,9	0,4		0,3				0,2
MELI	*Lovoa trichilioides*	Bibolo	1,0	2,1	1,2	1,5	0,3	0,9			0,9
MELI	*Trichilia welwitschii*	Ebegbemva	5,8	3,4	1,6	22,8	0,5	1,7	1,4		2,7
MIMO	*Albizia adianthifolia*	Esak	1,3	1,5	0,4	2,2	0,8	2,6	9,4	1,0	2,5
MIMO	*Albizia ferruginea*	Sene esak						2,0	1,9	3,5	0,8
MIMO	*Calpocalyx dinklagei*	Minsii	0,6	2,4	4,7	4,4	2,4				1,6
MIMO	*Cylicodiscus gabunensis*	Adum	1,9	0,6	1,2	0,7	1,1		0,5		0,7
MIMO	*Entada gigas*	Mbasum		0,3	0,4		0,8				0,2
MIMO	*Parkia bicolor*	Esseng "small leaves"	2,1	0,3	0,8		0,3				0,6
MIMO	*Pentaclethra macophylla*	Ebay	4,6	4,3	3,2	2,1	6,0	4,8	6,1	1,6	4,5
MIMO	*Piptadeniastrum africanum*	Atui	2,8	5,5	3,6	2,9	4,3	3,7	1,0	2,3	3,4
MIMO	*Tetrapleura tetraptera*	Kpwa'sa		0,3			1,9	0,7		0,3	0,5
MONI	*Glossocalyx brevipes*	Mindjomngwoe		0,3	0,4			0,9	0,5		0,3
MORA	*Artocarpus communis*	Abok ntangan						0,2			0,0
MORA	*Ficus exasperata*	Ako	0,3		0,4		0,3	5,9	9,0	4,8	1,9
MORA	*Ficus mucuso*	Etotole			1,2	7,4		3,5	5,2	2,9	1,4
MORA	*Milicia excelsa*	Abang	0,2	0,3	0,4	1,5	0,5	2,0	2,8		0,8
MORA	*Musanga cecropioides*	Asseng	1,3	4,6	4,7	1,5	21,2	35,3	5,6	40,1	14,7
MORA	*Treculia africana*	Etui	0,8	1,2	0,4	2,2	2,2	0,9	0,5		1,0
MORA	*Treculia obovoidea*	Ebobolo	40,0	38,5	3,2	1,5	10,8	3,1	0,5		16,9
MYRI	*Coelocaryon preussi*	Ebukzo'o/Nom eteng	22,8	30,9	35,5	91,9	39,0	27,7	15,3	4,2	29,8
MYRI	*Pycnanthus angolensis*	Eteng	6,5	9,8	11,8	19,9	11,1	18,3	10,8	3,5	11,5
MYRI	*Scyphocephalum mannii*	Zole		1,8	1,6	7,4	3,0	1,3		0,3	1,3
MYRI	*Sinconum sp ?*	Ovos	0,8		0,4		0,3				0,3
MYRI	*Staudtia kamerunensis*	Mbonda	9,6	29,6	39,4	36,0	38,5	9,2	0,5	1,2	18,3
MYRT	*Syzygium guineense*	Ebobok	1,0			4,4	0,5				0,6

APPENDIX VIII The abundance and distribution of NTFP species with regard to the major habitat types

Fam.	Scientific name	Bulu	Fhi	Fin	Flo	Swa	Slo	Sec	Cpl	Fal	Aver.
OCHN	*Lophira alata*	Okwa/'Azobe'		0,6	1,2	0,7	1,4				0,5
OLAC	*Coula edulis*	Ewomen	10,1	7,6	6,3	0,7	4,6	1,1		0,3	4,7
OLAC	*Heisteria parvifolia*	Ewankang	1,5	1,8	0,4	1,1	3,5	3,7	1,4	0,7	2,1
OLAC	*Ongokea gore*	Anguek	0,2	0,3	2,0		0,8				0,3
OLAC	*Ptychopetalum petiolatum*	Ewai	1,1	0,3			0,8				0,3
OLAC	*Strombosia pistulata*	Mbazo'o/Efumele mbazo'o	1,8	0,9	5,5		4,1	0,2			1,9
OLAC	*Strombosia spp.*	Mbazo'o	19,1	29,7	22,9	42,6	35,0	10,0	4,7	0,6	19,3
OLAC	*Strombosiopsis tetandra*	Mbazo'o/Edip mbazo'o	5,3	0,3	2,8	2,9	1,1				2,0
PALM	?	Ongam					0,3				0,1
PAND	*Panda oleosa*	Afane	0,5	0,3	2,0	1,5	1,1	0,6			0,7
PAPI	*Baphia leptobotrys*	Elemtok	23,9	1,8	1,6	3,7	1,9				5,3
PAPI	*Pterocarpus soyauxii*	Mbe	1,6	2,7	1,2	8,8	4,1	4,1	1,9	0,3	2,7
PASS	*Barteria fistulosa*	Mekbenga	0,3	2,1	2,8	2,9	1,6	3,7	0,5	0,6	1,6
RHAM	*Maesopsis eminii*	Nkangele	0,3	1,8	0,4	0,7	2,7	2,2	1,0	0,9	1,3
RHIZ	*Anisophyllea polyneura*	Etatmbai	10,6	0,9	1,2	3,7	0,8				2,6
RHIZ	*Poga oleosa*	Angale	0,5	0,9	0,4		0,3	0,2			0,3
RUBI	*Coffea sp.*	Kofi afan					0,3				0,2
RUBI	*Corynanthe pachyceras*	Nom akela/Tchangya	0,8	0,3	0,8		1,1				0,5
RUBI	*Corynanthe pachyceras/Pausinystalia macroceras*	Tchangya	2,2	5,2	7,5	1,5	2,4				2,4
RUBI	*Heinsia crinita?*	Avem					0,3				0,1
RUBI	*Massularia acuminata*	Zo'o	0,2	1,2	0,4	1,4					0,3
RUBI	*Mitragyna stipulosa*	Afobezam		1,8		36,0	1,9	3,3			3,0
RUBI	*Morinda lucida*	Atjek	0,5			0,7		1,1	1,5	0,3	0,5
RUBI	*Nauclea diderrichii*	Akondok	0,6	0,3	1,2		0,8	1,7	1,9	0,2	0,9
RUBI	*Pausinystalia macroceras*	Efumele zo'o/Tchangya	0,7	1,3	0,8						0,4
RUBI	*Pausinystalia yohimbe*	Atjek afan			0,8			0,4			0,1
RUBI	*Pausinystalia yohimbe*	Editok		0,3	0,8	0,7	0,5		0,5		0,2
RUBI	*Psychotia sp.*	Anguek mven	0,6	0,6	0,8	2,9	1,6	0,9	0,5	1,3	0,8
RUBI	*Psychotria sp.?*	Mfim	0,3	0,3	0,4	0,7		0,4	0,5		0,2
RUBI	*Psydrax arnoldiana*	Ebukbong	1,0		0,4	1,5		0,7		0,3	0,6
RUBI	*Psydrax sp.*	Ndjenda	13,5	12,5	5,9	2,9	4,3	2,8			5,9
RUBI	*Stipularia africana*	Ngende			0,8		0,3				0,1
RUTA	*Afraegle asso*	Assol		0,9							0,1
RUTA	*Citrus sinensis*	Ofumbi							0,5		0,0
RUTA	*Zanthoxylum gilleti*	Bongo	0,8	2,7	4,7	0,7	3,5	10,9	3,8		4,2
RUTA	*Zanthoxylum heitzii*	Elelongo/Ngues	0,5	0,6	1,6		0,5	1,5	0,5	0,3	0,9
SAPI	*Eriocoelum macrocarpum/Blighia welwischii*	Awonog	10,7	2,1	2,4	0,7	0,5	0,7		0,3	3,4
SAPI	*Ganophyllum giganteum*	Engak	1,6	0,6	2,8	6,6	4,1	0,9			1,6
SAPO	*Aningeria robusta*	Abam longwi	1,1	0,6	1,6			0,2			0,7
SAPO	*Baillonella toxisperma*	Adjap	0,3	0,3				0,2			0,2

APPENDIX VIII The abundance and distribution of NTFP species with regard to the major habitat types

Fam.	Scientific name	Bulu	Fhi	Fin	Flo	Swa	Slo	Sec	Cpl	Fal	Aver.
SAPO	*Chrysophyllum spp.*	Abam	0.3		0.8		1.4				0.5
SAPO	*Omphalocarpum sp.*	Mbe mingon			0.4		0.8				0.1
SAPO	*Tieghemella africana*	Adjapzok			0.8		0.3				0.1
STER	*Cola acuminata/C. nitida*	Abu	2.0	3.1	1.2	1.5	4.1	2.0	1.4		2.4
STER	*Cola hypochrysea*	Efop		2.1					0.5		0.3
STER	*Cola ricinifolia*	Akom ngwoé	0.6	0.6	3.2	0.7	0.8	0.1			0.7
STER	*Cola rostrata*	Akpwai	5.3	6.4	2.4	2.2	4.3	1.5		0.3	3.2
STER	*Cola spp.*	Mvoi	2.6	15.6	18.9	6.6	1.9	0.2	1.0		4.7
STER	*Cola verticillata*	Abu afan	0.8	0.3	3.9				0.5		1.3
STER	*Eribroma oblonga*	Eyong	0.8	3.4	3.2	8.8	3.5	2.2	2.8	0.6	2.1
STER	*Pterygota macrocarpa*	Koto	7.4	14.7	5.5	14.0	11.4	1.7	0.5	0.3	6.6
STER	*Scaphopetalum sp.*	Kaka afan	9.9				0.3				3.6
STER	*Sterculia spp.*	Efok ayus	1.1		1.2	7.4				0.3	0.8
TILI	*Desplatsia dewevrei*	Mfendek								0.3	0.1
TILI	*Duboscia macrocarpa*	Akak	0.5	2.7	2.4	2.9	1.6	0.9	1.0		1.6
TILI	*Grewia coriacea*	Akena	1.0		0.8	2.9	0.5				0.4
ULMA	*Celtis spp.*	Ngo/Odu	1.1	3.1	6.7	6.6	4.1		2.4	1.0	3.5
ULMA	*Holoptelea grandis*	Avep					0.8				0.1
ULMA	*Trema guineense*	Eve'e					0.3	0.4		1.0	0.2
VERB	*Vitex sp.*	Kenkeliba/Evula/Chocokam	3.3	0.6	1.2	1.5	0.8	0.4	1.4		1.2
VIOL	*Rinorea dentata*	Ove	1.5	0.3							0.3
VIOL	*Rinorea kamerunensis*	Ezate	5.8	1.5	18.1	1.5	2.4	1.1			3.3
VITA	*Cissus sp.*	Fazo'o			1.2	0.7	0.3	0.2			0.2
?	?	Akung asse	0.3								0.1
?	?	Bek	0.5		0.4		0.8				0.2
?	?	Ekekang							0.5		0.0
?	?	Ele ngosso			0.4						0.1
?	?	Nsangala					0.3	0.2			0.0
Trees > 10 cm dbh: # different species/hectare			166	153	158	125	157	139	100	87	144.6
Trees > 10 cm dbh: stocking rate/hectare			637	551	570	734	543	470	287	151	517.7

APPENDIX IX List of abbreviations of the scientific names of plant families

ACAN	Acanthaceae	LEEA	Leeaceae
AGAV	Agavaceae	LOGA	Loganaceae
AMAR	Amaranthaceae	LORA	Loranthaceae
ANAC	Anacardiaceae	MALV	Malvaceae
ANNO	Annonaceae	MARA	Marantaceae
APOC	Apocynaceae	MELA	Melastomataceae
ARAC	Araceae	MELI	Meliaceae
BASE	Basellaceae	MENI	Menispermaceae
BIGN	Bignoniaceae	MIMO	Mimosaceae
BOMB	Bombacaceae	MONI	Monimiaceae
BORA	Boraginaceae	MORA	Moraceae
BROM	Bromeliaceae	MUSA	Musaceae
BURS	Bursereceae	MYRI	Myristicaceae
CAES	Caesalpiniaceae	MYRT	Myrtaceae
CANB	Cannabinaceae	OCHN	Ochnaceae
CANN	Cannaceae	OLAC	Olacaceae
CARI	Caricaceae	PALM	Palmae
CECR	Cecropiaceae	PAND	Pandaceae
CHRY	Chrysobalanaceae	PANN	Pandanaceae
COMB	Combretaceae	PAPI	Papiloniaceae
COMP	Compositae	PASS	Passifloraceae
CONN	Connaraceae	PIPE	Piperaceae
CONV	Convulvulaceae	POLY	Polygalaceae
CUCU	Cucurbitaceae	PORT	Portulacaceae
CYPE	Cyperaceae	PTER	Pterodofytae
DICH	Dichapetalaceae	RHAM	Rhamnaceae
DIOS	Dioscoriaceae	RHYZ	Rhyzophoraceae
EBEN	Ebenaceae	RUBI	Rubiaceae
ERYT	Erythroxylaceae	RUTA	Rutaceae
EUPH	Euphorbiaceae	SAMY	Samydaceae
FLAC	Flacourtaceae	SAPI	Sapindaceae
GENT	Gentianaceae	SAPO	Sapotaceae
GNET	Gnetaceae	SCRO	Scrophulariaceae
GRAM	Graminae	SCYT	Scytopetalaceae
GUTT	Guttiferae	SOLA	Solanaceae
HUAC	Huacaceae	STER	Sterculiaceae
HUMI	Humiricaceae	TILI	Tiliaceae
HYPE	Hypericaceae	ULMA	Ulmaceae
ICAN	Icanaceae	URTI	Urticaceae
IRVI	Irvingiaceae	VERB	Verbenaceae
LABI	Labiatae	VIOL	Violaceae
LAUR	Lauracea	VITA	Vitaceae
LECY	Lecythidceae	ZING	Zingiberaceae

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