



THE RAINFOREST FOUNDATION
SECURING LANDS, SUSTAINING LIVES

THE USE OF NON-TIMBER FOREST PRODUCTS IN THE CONGO BASIN:

Constraints and Opportunities

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SUMMARY FINDINGS AND RECOMMENDATIONS

- NTFPs are extremely important to forest communities in terms of basic livelihoods, providing a range of essential resources such as fuelwood, protein, raw materials for household items and medicines. However, much of this value and the livelihood security that NTFPs can provide is little researched and understood.

- NTFPs also have significant cultural and social values for forest communities that have not yet been well documented.

- In order to generate increased economic benefits for forest communities, the promotion and commercialisation of NTFPs presents many challenges. Expectations of economic benefits should not be raised too high: it would appear that NTFP promotion cannot, on its own, have a major economic impact on the management and conservation of forests the Congo Basin. However, consideration of NTFPs should be a central part of any sustainable development strategy within the region.

- Markets in NTFPs are often hampered by poor infrastructure and storage and by lack of market information. NTFP producers face challenges in the lack of organisation into viable trading entities, lack of credit and investment opportunities and they are often victims of many types of informal "taxes".

- In the case of some of the most valuable, (and often internationally traded), NTFPs, there are concerns about over-exploitation and the possible ecological and economic consequences of this. Cultivation and domestication outside of the forest may be the only means to increase economic returns and reduce pressure on wild resources.

- In other cases, management within the forest may present a viable option for farmers. There is a paucity of research on most NTFPs in terms of their potential for genetic improvement and cultivation.

- The management of NTFPs is often linked with the community management of forests and this has received far too little priority in the forest policies of Congo Basin countries. Much greater attention needs to be given by the relevant governments to community management of forests and to the management of NTFPs within them.

- There is a need for a fundamental shift in thinking within forest departments and among policy makers. Congo Basin countries are still in need of a comprehensive and well designed set of policies, aimed at supporting and promoting the NTFP sector. These should include: understanding of traditional management and control of NTFPs; measures to monitor NTFP exploitation and establish harvesting levels for threatened species; measures to control the impact of other forest uses on essential NTFPs; review of systems of taxation; credit for small producers and/or co-operatives; information provision on NTFP markets.

- Underpinning these is the need to clarify land tenure and resource rights and to ensure that rights to access and control of resources are properly recognised in the law.

INTRODUCTION

This report documents research and dataon the use of non-timber forest products (NTFPs) from the six countries of the Congo Basin: Cameroon, Central African Republic (CAR), Republic of Congo or Congo-Brazzaville (referred to in the report as Congo-B), Democratic Republic of Congo (DRC), Gabon, Equatorial Guinea. Those studies that focused exclusively on areas outside of the humid-tropical areas were not included – for example, northern Cameroon and southern DRC.

Most data is available on Cameroon – here there have been numerous research and development initiatives within the forestry sector over the last 20 years. Consequently, the report shows some bias towards this country. Certain sectors and products have also received more attention from researchers than others, and so this is reflected in the report. For example, rattans, bushmeat, certain fruit trees, the vegetable *Gnetum* and *Prunus africana*, have been the subject of a number of studies. However, there remain vast lacunae in knowledge. For example, there have been some studies into the trade and economic value of NTFPs. However, while many researchers cite statistics on these, it was found that often, the same figures from a few key studies are being repeated.

Regarding knowledge on the use of forest resources, this has been documented in the ethnobotanical, anthropological and conservation literature, and many studies provide species lists of the resources used. However, relatively little information is provided on the relative importance of these resources and their contribution to livelihoods. In particular, there is limited knowledge related to the use of wood and other materials for construction (of houses, tools, etc.) and on the scale of these activities. This is partly due to the fact that many of these activities fall within the informal economy, typically being supplied by small-scale artisanal sawmills, many of which operate illegally (CREF, 2006). It also perhaps reflects an assumption that the local timber market is not significant in comparison to industrial timber extraction for export markets. However, domestic consumption of timber and other construction materials is thought to be considerable (Auzel et al., 2001).

In this report, the various species documented have not been listed, as these amount to many hundreds, but the references to these will be cited. Separate sections have been written on a number of NTFPs, for which there was more information available – these are *Gnetum* leaves, edible insects, bushmeat, rattans and fuelwood. These are included at the end of the report as separate 'case-studies'.

Before beginning the description of the use of NTFPs in the region, the definition of this term needs to be considered since it is often difficult to define what is a forest product. Many resources grow in a range of habitats, including old-growth forest and various anthropogenic landscapes, such as old fallows, agroforestry systems, fields and roadsides. Traditional systems of forest management make use of this diversity of habitats (Laird, 1999; Ros-Tonen & Wiersum, 2005). Some forest trees and plants are brought into cultivation – they may be protected when a new field is cleared, or they may be planted. This is often done in response to a decline of the resource in the forest, as will be highlighted later in the report. Other species may grow spontaneously, but favour man-made habitats, such as gardens, roadsides and field margins. For example, *Gnetum* occurs naturally in forest openings, but is also found in secondary forest, fallow fields and sometimes, in mixed crop fields (Clark et al., 2004). Thus, there is a continuum from 'wild' or 'forest' resources to cultivated and domesticated ones.

This means that it is often difficult to decide whether a resource should be described as an NTFP or as an agricultural product. In this report NTFPs are taken to include all resources for which significant harvests are made from forest resources, even if in some

areas they are mainly cultivated. For example, data on *Dacryodes edulis* (safou fruit) and *Irvingia gabonensis* ('bush mango') have been included. These fruit trees grow in forest areas but are also widely cultivated, and in many areas, the majority of fruits are harvested from cultivated trees (Ayuk et al., 1999a & 1999b; Schreckenberg et al., 2006).

A final point about the focus of this study. This report describes the documented uses and economic values of NTFPs for populations in the region, and so focuses on the more tangible values of these resources. Not considered in depth here are the spiritual and cultural values of NTFPs and of forest resources in general. This is partly because these are less well reported, being difficult both to describe and document[1]. However, the significance of forest resources for people's culture must not be overlooked. They can play an important social role – the example of kola nut is most often cited in this respect (Guedje & Fankap, 2001; Ndoye et al., 1999) – and the use of many resources are closely linked with people's beliefs and identity.

THE ROLE OF NTFPs

NTFPs provide a wealth of resources for both rural and urban dwellers throughout Central Africa. These include foods, medicines, construction materials, fuelwood, as well as resources of spiritual and cultural significance. These are important in improving livelihood security. They may provide one of the main sources of food (for example, for Pygmy peoples when they are based in the forest (Ichikawa, 1993)), or they may provide a safety net in times of agricultural shortage (Ndoye & Tieguhong, 2004). The wealth of forest resources that are used as foods also provide a valuable source of nutrients, particularly for the poorest sectors of society and in times of shortage, for example, prior to the agricultural harvest. As a source of medicines, NTFPs provide the basis of healthcare for the vast majority of the region's population for whom western medicines are unavailable or too expensive (Facheux et al., 2004, Ndoye & Tieguhong, 2004). In addition, a large proportion of the population use forest resources to build houses, tools and other implements, and the majority of households use wood or charcoal for cooking.

As well as meeting subsistence needs, many of these resources are traded, and so provide a valuable source of income. For some people, the economic value of NTFPs may be more significant than their role in subsistence, as will be described further below. The trade in certain products extends across Central Africa, and for a few, as far as Europe and the US. These trade routes reflect in large part the movement of people, markets for these products having been created by members of the African diaspora, although a few products supply industry, for example, for pharmaceuticals.

One feature of NTFPs is that they are often collected and traded by women, and so help to increase their livelihood security and economic status (Sunderland et al., 2004; Tchatat et al., 2003). Women dominate the collection and trade of many products, such

[1] This comment is made largely with respect to the conservation and forestry literature – the anthropologocal literature was not examined in depth.

as *Gnetum* and caterpillars, while men are more involved in the harvest of higher value products, for example rattans, bushmeat and pharmaceutical products (as described below). However, in Cameroon it was found that increasing numbers of men had become involved in sectors traditionally the preserve of women in response to the economic crisis of the 1980's (Tchatat et al., 2003). One concern is that if NTFPs are promoted, for example, as part of efforts to promote sustainable development, then women could become marginalized from their production and marketing.

The role of NTFPs in development and for poverty reduction is an issue of some debate. NTFPs have been promoted as having great potential for rural development and sustainable forest management. This is based on the premise that their exploitation can raise incomes among rural communities and at the same time create incentives for forest conservation. This has prompted a wealth of research and interventions over the last 20 years or so. However, initial optimism that NTFPs could provide a ready solution to these problems has declined, and a more sceptical view (but perhaps a healthy scepticism) now prevails (Ambrose-Oji, 2003; Marshall et al., 2006; Ros-Tonen, 2000; Ros-Tonen & Wiersum, 2005).

NTFPs are often exploited because of the lack of other opportunities, and provide a means of subsisting rather than of lifting people out of poverty. For example, in northern DRC, it was reported that NTFPs do not generate much income for rural populations, and so make little contribution to poverty reduction (CREF, 2006). Often, when other economic opportunities arise, people follow these in preference to the exploitation of NTFPs (Ambrose-Oji, 2003). A further problem with this hypothesis is that often the very poorest sectors of a society are not able to exploit forest resources, and so it may be the wealthier households that derive most benefit from them (De Merode et al., 2004; Marshall et al., 2006).

However, as will be described in this report, some NTFPs do provide a valuable income for many and can, in certain circumstances, help to reduce poverty. Even where they do not enable people to get out of the poverty trap, they may be crucial as a safety net and to improve livelihood security.

SUBSISTENCE USES

It is difficult to determine which products are most important for subsistence or the contribution that they make to livelihoods, because of the 'informal' nature of their collection and the very fact that their use is at the household level. Some information is available from the ethnobotanical and anthropological literature[2]. As mentioned previously, these often give little indication of the quantities used or their relative importance. However, they do illustrate the diversity of resources that are used. For example:

- A study of NTFP use in Southern Cameroon identified about 200 animal species and 500 plant species, the latter accounting for 1200 different uses. About 300 species were used medicinally (Dijk, 1999; Dijk & Wiersum, 1999).
- An inventory of fruits and vegetables in the south-west of DRC (Bas-Congo) recorded the use of 45 non-cultivated species (Lubini et al., 1994).
- Kahindo et al. (2001) recorded 43 species of forest plant used by Mbuti communities in the Ituri forest of DRC for various construction purposes – houses, bridges, tools and musical instruments.
- Another researcher who worked with the Mbuti of Ituri forest recorded some 100 plant species used as food, 20 species of mushroom and over 200 animals – the latter included 29 species of insect and some 20 species of fish (Ichikawa, 1993).
- Research into the ethnobotany of the Mbuti and Efe Pygmies, once again in the Ituri forest, recorded the use of over 700 plant species, of which more than 200 species were used either as medicine or poison for hunting and fishing (Terashima & Ichikawa, 2003).
- Pagezy (1993) reported that a Ntomba community in DRC used 74 non-cultivated species, including 26 mushroom species, as food, as well as 118 animals and a variety of fish. The animals eaten included 44 species of invertebrate of which 31 were caterpillars.
- Research in the Zaire basin found that Ngandu communities recorded 69 edible wild plant species, and 109 animals, including 21 species of insect and 29 species of fish, while among the Boyela, 50 wild plants, 30 species of mushroom and 30 insects were eaten (Takeda, 1990; Takeda & Sato, 1993).
- A preliminary inventory of edible fruits in the surroundings of Kisangani, DRC, recorded 48 species (Mosango & Szafranski, 1985). Further research recorded 97 species of 'native' edible plants (Mosango & Isosi, 1998).
- In his work on the ethnoecology of the Aka Pygmies of CAR, Bahuchet (1985) recorded a wide variety of foods, including: 9 species of roots, 9 species of leaves, 19 species of seeds, 14 species of fruit and at least 22 species of mushroom (several had not been identified). Also noted were the use of a wide variety of plants as sources of fibre and construction materials.

There is also a wealth of literature documenting the use of NTFPs as medicines. For example:

- 300 species of NTFPs are used medicinally in the Southern Province of Cameroon (Dijk & Wiersum, 1999);
- 57 medicinal plants were documented, as used by the Bamileke of West Cameroon (Tchouamo & Njoukam, 2000)
- Chifundera (2001) reports the use of 170 medicinal species in South Kivu Province of DRC, also noting that 474 species of medicinal plant have previously been recorded from the area;
- A number of reports from Cameroon reported the use of 76 medicinal plants used to treat intestinal diseases (Noumi & Yomi, 2001), 43 species used to treat epilepsy (Noumi & Fozi, 2003) and 26 species for the treatment of hypertension (Noumi et al., 1999).
- Over 200 plant species were recorded as being used either as a medicine or poison by Mbuti and Efe Pygmies, in the Ituri Forest, DRC (Terashima & Ichikawa, 2003).

[2] A useful botanical reference is Burkill's five volumes on 'The Useful Plants of West Tropical Africa' (1984). Its geographical scope only extends to western Cameroon, but clearly, many plants are common to West and Central Africa.

These lists clearly demonstrate the wealth of NTFPs that are used in the region[3]. It should be noted that although a diversity of species can be utilised, many of these are only occasionally used, for example, in times of food shortage. Typically, people rely on a few species for the bulk of their resources – those which are most abundant or readily available, or they are the favourite species, for example, they provide the tastiest and sweetest fruits, or the most durable wood or the strongest fibre for construction. For example, Ichikawa (1993) found that although the Mbuti use some 100 species of edible plant species, 80% of the consumption of wild plant foods came from just 8 species.

The uses of NTFPs which are best documented are sources of food and medicine. Their importance as a source of fuelwood, and in particular, of construction materials, has received less attention. The fuelwood sector is described in case-study V.

FOREST FOODS

Many forest resources are an important source of nutrients. This may be true even where agricultural foods provide the bulk of the diet. For example, Pagezy (1993) reports that among a Ntomba community in DRC, agricultural products provided 92% of their energy needs and 53% of protein. Natural resources (bushmeat, fish and insects) provided just 7% of their energy, but 47% of their protein. Some NTFPs are rich in nutrients. This has been documented for *Gnetum* leaves, insect foods (see case-studies I & II) and mushrooms. Caterpillars in particular are a valuable source of protein for many people in the Congo Basin. Many of the fruit seeds are also very nutritious, for example, safou fruit (*Dacryodes edulis*) contains 50% fat and 10% protein. Honey, a very popular food, is high in calories, and when consumed together with the bee larvae and pollen, as it often is, is also high in protein and fat (Ichikawa, 1981). Many mushroom species are high in protein, typically containing between 20 and 30%, depending on the species, and contain a range of vitamins, minerals and amino acids (Degreef et al., 1997; Dijk et al., 2003). While their nutritional value is much lower than that of meat, for which they are often eaten as a replacement, they can still make a significant contribution to nutrition.

Even if wild foods are not a major component of the diet, they may be crucial during famine or in lean periods, such as prior to the agricultural harvest. For example, a study of an Azande community in Northeastern DRC found that wild foods were not a major component of the diet, except during the lean season (De Merode et al., 2004). During this period, consumption of agricultural produce declined by nearly 50%, while that of wild plants increased 200%, bushmeat by 75% and fish by 475%.

Bushmeat is perhaps the most significant NTFP, in terms of its contribution to people's diet, the volumes being harvested and its economic value. The issues related to bushmeat are outlined in case-study III.

MEDICINES & TRADITIONAL HEALTHCARE

Another area in which NTFPs make a crucial contribution to rural livelihoods is as a source of medicine. The majority of the population in Central Africa rely on herbal medicines and traditional healers for their healthcare. For example, the majority of the people of Rio Muni of Equatorial Guinea depend on traditional medicines and healers for their primary healthcare (Sunderland & Obama, 1999). A study around Cameroon's Mbalmayo forest reserve found that over 70% of the population depended on herbal medicines, and that these were 50-90% cheaper than pharmaceutical equivalents (Ndoye & Tieghuhong, 2004, citing Ndoye et al., 1999). In a survey in the Equateur and Bandundu provinces of DRC, 85 percent of households interviewed use medicinal plants to cure

[3] There are a number of other key references, which provide extensive information on medicinal practices and the use of NTFPs, including: Adjanahoun et al., 1984 & 1996; Ake Assi et al., 1980; Bouquet, 1969; Motte, 1981; Neuwinger, 1996.

common ailments (Ndoye & Awono, 2005), and another study from South Kivu province reported that 95% of the population used traditional medicines (Chifundera, 2001).

An increase in the use of traditional medicines has also been reported from Cameroon – apparently due to the high costs of 'western' medicines and the limited number of university trained doctors (Facheux et al., 2004; Tchouamo et al., 1998). The lack of availability of 'modern' medicines and healthcare is also an issue – for example, in the Bushi area of South Kivu, DRC, it was reported that there are nearly 8 times as many traditional healers as 'modern' physicians. There is 1 traditional healer for every 1854 inhabitants, compared to 1 'modern' physician for every 13,250 inhabitants (Chifundera, 2001).

Most traditional medicines are based on plants, and many of these come from forest areas. FAO (2001) estimated that 70% of medicinal plants are collected in forest areas – although they undoubtedly used a very broad definition of 'forest'. Many commonly-used medicinal plants are sourced from secondary forest and cultivated areas, but often, the species that are considered most powerful are harvested from old-growth forest (Laird, 1999).

TRADE

While most NTFPs are collected for subsistence purposes (Kimpouni, 1999; Tchatat et al., 2003), they can also be an important source of income for many people[4]. In fact, if markets become more accessible, for example, with the expansion of the road network, certain high-value NTFPs may become more important as trade items than for subsistence, as is often the case for bushmeat.

Two approaches have generally been taken in research on the economic value of NTFPs: household-based studies, looking at the contribution of NTFPs to income; and market-based research, investigating trade routes, market chains and the value of this trade. These data will be presented in turn below.

NTFPS AS A SOURCE OF HOUSEHOLD INCOME

As was highlighted earlier in this report, the role of NTFPs in reducing poverty has been questioned in recent years. In many situations, NTFPs do not generate much income for people, as recently noted in a report on community forestry in northern DRC (CREF, 2006). Often NTFPs are used only in times of hardship or as a supplement to other activities. Furthermore, it is often the middle-income rural households who utilise the most NTFPs, and so reap the greatest benefits. For example, poorer households may not have access to guns and nets enabling them to hunt and fish. This was the case in a community in Northeastern DRC, where the wealthier households were responsible for most of the harvesting and trade in fish and bushmeat (De Merode et al., 2004).

However, the role of NTFPs in peoples' livelihoods depends greatly on the local situation, and in certain circumstances, NTFPs can provide a valuable source of income, as the following data will illustrate. Thus, findings from research in Equateur province of DRC suggested that the exploitation of NTFPs enabled households to earn a higher

[4] It should be noted that many NTFPs are bartered, rather than sold for cash (e.g. Kitanishi, 1994).

income, in comparison to those that were not involved in this sector (Ndoye & Awono., 2005). A study of the harvesting of *Prunus africana* bark also found that this activity had contributed to improved livelihoods in one area of Cameroon where a harvesters' union had been established (Ndam & Marcelin, 2004).

Bushmeat and fish are often the most important NTFPs, in terms of income generated. In the research from Northeastern DRC mentioned above, 90% of the fish and bushmeat caught was sold. These accounted for 39% and 25% of household sales respectively, while wild plants accounted for just 2% (De Merode et al., 2004).

Similarly, research in southern Cameroon found that bushmeat represented 75% of the contribution of NTFPs to income for 11 Baygeli families and 19 Bantu families (Dijk, 1999). For these families, NTFPs provided over 40% of household income, the remainder coming from agriculture. The relative importance of these households' various activities are shown in table 1.

Another study of two Cameroonian villages found that bushmeat provided 51% of income, agriculture 32% and plant NTFPs 1.2%, while villages in the Odzala Park in Congo-B reportedly obtained most of their income from the sale of bushmeat (Tchatat et al., 2003, citing Joiris, 1996).

However, bushmeat and fish are by no means the only valuable NTFPs, and in other regions, other products predominate. Products that have been highlighted as being particularly important as a source of income for rural households are: palm wine, mushrooms, rattans, caterpillars, *Irvingia spp., Gnetum spp., Cola acuminata, Garcinia lucida, Garcinia kola, Strophantus gratus, Coula edulis, Ricinodendron heudelotii, Dacryodes edulis* and *D. macrophylla* (Clark & Sunderland, 2004; Dijk, 1999; Ndoye et al., 1999).

TABLE 1: Sources of household income for Bagyeli and Bantu households, southern Cameroon. (Dijk, 1999)

ACTIVITY	PERCENTAGE OF HOUSEHOLD INCOME
Bush meat	31.2
Fish	0.4
Honey	0.7
Basketry	1.3
Forest foods	3.3
Palm wine	6
Pharmaceutical inputs	1
TOTAL NTFPs	43.9
Cash crops	42.9
Food crops	12.6
Fruits / nuts	0.6
Animal husbandry	0
TOTAL AGRICULTURE	56.1

TABLE 2: Net monthly household revenue from the sale of NTFPs, Equateur province (Ndoye & Awono, 2005)

NTFP	REVENUE PER HOUSEHOLD	
	FC	US$
Marantacea	1,820	3.75
Caterpillars	12,397	25.6
Mushroom	3,770	7.8
Charcoal	6,180	12.7
Gnetum spp.	7,150	14.7
Palm wine	9,195	19.0

TABLE 3: Net monthly household revenue from the sale of NTFPs, Bandundu province (Ndoye & Awono, 2005)

NTFP	REVENUE PER HOUSEHOLD	
	FC	US$
Caterpillars	10,000	20.6
Mushroom	3,000	6.2
Ferns	1,185	2.4
Kola nut	4,175	8.6
Gnetum spp.	640	1.3
Palm wine	520	1.1

TABLE 4: Sale of NTFPs during Sept. 1997 – Jan. 1998 (Dijk, 1999)

SPECIES NAME	% OF HARVEST SOLD	TOTAL REVENUE IN CFA - 4 MONTHS
Coula edulis	5	15,000
Cola acuminata /nitida	30	2,500
Cola lepidota	30	3,850
Dacryodes edulis	10	11,000
Dacryodes macrophylla	10	2,000
Elaeis guineensis (fruit)	< 1	2,800
Garcinia lucida	10	400
Irvingia gabonensis	20	79,000
Ricinodendron heudelotii	100	5,800
Strophanthus gratus	100	32,500

From their research in DRC, Ndoye & Awono (2005) report that the NTFPs which generated most income for households in Equateur Province were caterpillars, palm wine, *Gnetum* spp. and charcoal. In Bandundu province, caterpillars were also the most important product, followed by kola nut and mushrooms. These data are summarised in tables 2 and 3.

Dijk's research in southern Cameroon (mentioned above (1999)) also documented the revenue earned from the sale of various plant species (see table 4). For most of these, a small percentage of the total harvest is sold, which led the authors to suggest that there is potential to develop the commercial extraction of these products.

Ayuk et al. (1999b & 1999c) assessed the value of three NTFPs to households in three areas in southern Cameroon. The products they researched were *Irvingia gabonensis, Garcinia kola* and *Ricinodendron heudelottii* (a tree known in Cameroon as *ndjansang*, which produces fruits with edible kernels). The most valuable of these was found to be I. *gabonensis*, with an average annual production valued at US$ 93 per household in one community. Their findings are summarized in table 5.

TABLE 5: Value of production of three species of fruit and seed in three Cameroonian regions (Ayuk et al., 1999b & 1999c)

NTFP	PRODUCTION VALUE OF FRUITS AND SEEDS PER HOUSEHOLD PER ANNUM (US$) IN DIVISIONS:		
	Mvila	Haut Nyong	Lekié
Irvingia gabonensis	93	32	28
Garcinia kola	23	60	13
Ricinodendron heudelottii	6	17	23

These figures included production both for household consumption and for sale. About half the harvest of I. *gabonensis* is sold in all three areas. For the other two products, the majority are for home consumption in Haut Nyong (64% and 70% for *R. heudelottii* and *G. kola* respectively), while in the other two areas most products are sold – about 60% of both species are sold in Lekié and over 70% in Mvila. It should be noted that all three species are found in a variety of habitats, including forest, fallows and fields. In those areas where the forest had been seriously degraded, most of the production of these species came from anthropogenic areas, including cultivated trees. No figures are given on the relative importance of forest-sourced rather than cultivated fruits, but data was collected on the numbers of farmers using forest resources, shown in table 6. As could be inferred from these figures, the most extensive forest resources were to be found in Haut Nyong, while in Lekié, much of the forest is degraded.

TABLE 6: Percentage of farmers collecting fruits from the forest rather than fields (Ayuk et al., 1999b & 1999c).

NTFP	% OF FARMERS COLLECTING FRUITS FROM THE FOREST IN DIVISIONS:		
	Mvila	Haut Nyong	Lekié
Irvingia gabonensis	21	45	13
Garcinia kola	13	83	25
Ricinodendron heudelottii	13	35	4

The value of some NTFPs for rural households can be higher than that of 'traditional' cash crops, such as cocoa and coffee. For example, in 1983 the income from kola nut was higher than that for coffee in southwest Cameroon, contributing between 5 and 37% of cash revenues (Ndoye et al., 1999, citing Laird et al., 1996). From the same region, Ndoye & Tieguhong (2004) reported that during 1996-99 the price per kg of *Irvingia spp.* and *Ricinodendron heudelottii* was over 200% higher than that of cocoa. The average prices of these three commodities were 1120, 1240 and 485 FCFA / kg respectively.

MARKET STUDIES

In some areas, the sale of NTFPs is largely restricted to the village level – this was the case in the Cameroonian villages studied by Dijk (1999) and many NTFPs are predominantly sold within communities and village markets (Ladipo, 1999). However, elsewhere there are good links with urban and regional markets, and some NTFPs have well-established national, regional and sometimes international markets. The trade of some of these NTFPs is highly valuable, as a number of studies have documented.

One study estimated that the total value of NTFPs in the North-West and South-West provinces of Cameroon was US$ 19 million in 1999, equivalent to 2.8% of the regional economy (timber revenues represented 5% of the economy) (Clark & Sunderland, 2004, citing Van Dorp et al., 2001). The volume of the trade in the fruit of *Dacryodes edulis* in Cameroon was estimated at 11,000 tonnes[5] in 1997, with an estimated value of US$ 7.5 million (Awono et al., 2002).

The species that have been recorded in markets are listed in Appendix I, but among the most commonly sold are: (Kimpouni, 1999; Ndoye & Awono, 2005; Ruiz-Perez et al., 1999)

- *Irvingia gabonensis* (bush mango)[6]
- *Cola acuminata* (kola nut)
- *Garcinia lucida* (essock)
- *Garcinia kola* (bitter kola)
- *Dacryodes edulis* (safou)
- *Gnetum spp.* (eru or fumbua)
- *Elaeis guineensis* (palm wine & nut)
- *Piper guineensis* (bush pepper)

[5] It should be noted that many NTFPs are bartered, rather than sold for cash (e.g. Kitanishi, 1994).
[6] The kernels of Irvingia gabonensis were reported to be the most widely sold of all forest products from market surveys conducted in Equatorial Guinea (Sunderland & Obama, 1999) and Gabon (Yembi, 1999).

- *Ricinodendron heudelotii* (njansang)
- *Xylopia aethiopica*
- *Aframomum spp.*
- Mushrooms
- Ferns
- Caterpillars
- Wrapping leaves (Marantaceae)
- Charcoal
- Thatching leaves
- Medicinals
- Bushmeat

Missing from this list are rattans – there is a considerable trade in rattan cane and products, but this often does not take place through the markets, but through specialist workshops (Kimpouni, 1999; Ruiz-Perez et al., 1999). Details of the rattan trade are given in case-study IV, while bushmeat and fuelwood (including charcoal) are described in case-studies III & V.

Medicinal products are a valuable trade item, but relatively little information was found on these in the market studies, which tended to focus on foods. However, the significance of this trade was mentioned by some researchers, for example, Kimpouni (1999) reported that medicinal plants are the most important NTFP in terms of use-value in the urban markets of Pointe-Noire. Lists of the medicinal plants being sold are also provided in many studies, and these are shown in Appendix I.

A study of the trade of 9 NTFPs in 28 markets in the high forest zone of Cameroon was undertaken in 1995 and 1996 (Ndoye et al., 1997/98; Ruiz-Perez et al., 1999). The half-year sales of these NTFPs were estimated to be worth about US$ 1.9 million. These products represent about 95% of the total trade in plant-based NTFPs in these markets. This figure is a conservative estimate, since it missed much of the season of *Dacryodes edulis,* one of the region's main products, and also a number of important markets were not surveyed. Other significant products not included in this study were medicinal products. It was also noted that there is a significant trade in bushmeat and other animal products in these markets.

Four products accounted for 86% of the total sales: *Dacryodes edulis, Irvingia spp., Cola acuminata* and *Ricinodendron heudelotii.* The sale of these products during the first half of 1995 was estimated at US$ 1.75 million. *D. edulis* was the most important of these, with an estimated 1,447 tonnes being sold during a period of 16 weeks, worth over US$ 600,000 (Ndoye et al., 1997/98) . Details of the volume and value of the trade of *Irvingia spp., Cola*

TABLE 7: Projected sales during 29 weeks in NTFPs markets in the humid forest zone of Cameroon. (Ndoye et al., 1999)

NTFP	QUANTITY (KG)		VALUE CFA		VALUE US$*	
	1995	1996	1995	1996	1995	1996
Irvingia spp.	111,000	107100	125,237,000	147,769,000	261,000	290,000
Cola acuminata	509,000	127,400	221,990,000	94,656,000	462,000	186,000
Garcinia lucida (bark)	40,600	27,300	10,360,000	9,867,000	22,000	19,000
Garcinia kola (bark)	16,200	9,900	3,971,000	2,110,000	8,000	4,000
TOTAL	676,800	271,700	361,558,000	254,402,000	753,000	499,000

* Conversion rates: 1995 - 480 FCFA= US$1; 1996 = 510 FCFA= US$1

TABLE 8: Volume and value of major NTFPs traded in Equateur and Bandundu Provinces (Ndoye et al., 2005)

MARKETS	NTFPS	VOLUME (KG)	VALUE OF NTFP TRADED*		NO. OF MONTHS**
			FC	US$	
Equateur Province					
Mbandaka	Cola nut	710 182,800	377	10	
	Palm wine	105,554	6,331,300	13,054	12
	Charcoal	79,512	3,647,913	7,521	12
	Thatching leaves	8,790	422,250	871	5
	Marantacea leaves	145,015	1,671,529	3,446	12
	Mushroom	1,512	125,995	260	6
	Caterpillars	2,112	172,790	355	6
	Gnetum spp.	47,200	10,623,600	21,904	12
Wendji Secli	Palm wine	14,712	1,064,728	2,195	5
	Charcoal	109,170	3,842,250	7,222	12
TOTAL			27,744,425	57,205	
Bandundu Province					
Idiofa	Charcoal	22,585	972,953	2,006	4
	Mushroom	918 224,893	464	3	
	Caterpillar	1,360	996,725	2,055	4
	Gnetum spp.	2,473	245,900	507	5
	Ferns	16,360	490,800	1,012	4
Central Kikwit	Charcoal	45,656	1,412,316	2,912	3
	Mushroom	1,197	1,077,040	2,221	6
	Caterpillar	14,194	8,700,351	17,939	8
	Gnetum spp.	20,970	6,903,497	14,234	4
	Garcinia kola	13	15,192	31	1
	Ferns	18,196	377,320	778	4
TOTAL		21,417,115	44,159		

* These figures are for the traders interviewed (57 in Equateur and 152 in Bandundu), and have not been extrapolated for all traders in these markets.
** The number of months refers to the period for which information was gathered for the specific NTFP.

acuminata and the bark of *Garcinia lucida* and *G.kola* are shown in table 7.

The average weekly profit per trader for the sales of all nine products was estimated to be 8,200 FCFA (US$ 16). This is above the minimum wage of urban workers, which was US$ 13 at the time of the study. However, it should be noted that just 19% of the traders accounted for 69% of the total profit traded – thus, the vast majority of traders were not making a large profit, and thus belonged to the "large group of rural poor" (Ruiz-Perez et al., 1999).

In DRC, research was done in 2005 into the market values of NTFPs in Equateur and Bandundu Provinces. This found that the total value of 8 NTFPs from just 57 traders in 2 markets in Equateur was US$ 57,000, while in Bandundu Province, the trade of 6 NTFPs by 152 traders in 2 markets was valued at US$ 44,000. Details of these data are shown in table 8.

Taking into account the costs incurred by traders (e.g. transport and - mainly informal - taxes), net monthly incomes of traders were

calculated for some of these products. Thus, in Wendji Secli market, traders were found to earn US$ 216 and US$ 166 per month from charcoal and palm wine respectively. In Mbandaka, the highest monthly revenues were from Gnetum and palm wine: US$ 131 and US$ 84 respectively. In Central Kikwit market, the highest incomes were from Gnetum (US$ 142) and charcoal (US$ 63), and in Idiofa market, charcoal (US$ 34) and mushrooms (US$ 17). In comparison, a secondary school teacher earns US$ 120-150 and a civil servant, US$ 80.

A study of 5 markets in Libreville, Gabon, estimated the average daily value of NTFPs sold at 280,000 CFA. 91% of this trade was accounted for by the sale of *Irvingia gabonensis.* Another valuable product is bushmeat, both in Gabon and throughout the region, and data on this trade are provided in case-study III.

INTERNATIONAL TRADE

Most NTFPs are harvested for smallholder subsistence consumption or for sale in local markets (Laird, 1999). However, there are some well-established regional markets for a number of products, and a few are exported more widely to Europe and the US. The products traded regionally include spices, medicines, rattans, fruits and vegetables, for example, *Irvingia gabonensis kernels, Gnetum leaves,* caterpillars and larvae, *Ricinodendron heudelottii* seeds, kola nuts (*Cola nitida*), bitter kola (*Garcinia kola)*, and the dried fruits of *Xylopia aethiopica* and *Tetrapleura tetraptera* (Clark & Sunderland, 2004; FAO, 2001; Ladipo, 1999; Laird, 1999; Tabuna, 1999 & 2000). In addition, there is a valuable trade in medicinal plants and extracts to Europe and the US for use in the pharmaceutical and herbal industries. This is described in more detail below.

International markets in NTFPs opened up in the 1960's and became significant in the 80's. Much of this trade has been generated by the African diaspora, and so the largest markets are found in those countries with the biggest African populations, for example, London and Paris, as will be described further below (Tabuna, 2000).

The volume and value of international trade tends to be underestimated by official statistics, as these are usually gathered on traditional agricultural products rather than NTFPs (Ruiz-Perez et al., 1999). In addition, much of the trade goes on through 'unofficial' routes, for example, in peoples' hand baggage on flights, or carried over land borders far from official border crossings, and so it is not registered by customs (Tabuna, 1999). However, from the available statistics, it is clear that the size and value of the trade is significant.

For example, it was estimated that the export of NTFPs from southern Cameroon in 1996 amounted to at least US$ 980,000 (Ruiz-Perez et al., 1999). Most data have been collected for particular products (see also the various 'case-studies'). For example, the value of bark exports of *Garcinia lucida* from Cameroon to Gabon during the first 6 months of 1995 was estimated to be 3.5 million FCFA (Guedje et al., 1999, citing Ndoye, 1995). The export of *Dacryodes edulis* from Central Africa and Nigeria to France, Belgium and the UK was estimated to be over 326 tonnes in 1999, worth over US$ 2 million (Awono et al., 2002).

There is a considerable trade in kola nuts – *Cola nitida* rather than *C. acuminata*, the latter not usually being traded internationally. Much of this trade is for the African market, but there are also significant exports to Europe and the US. An FAO report from 1982 estimated annual production for West and Central Africa at 180,000 tonnes[7] , of which 60,000 tonnes were exported to Europe and the US, for flavouring cola drinks and use in the pharmaceutical industry (Tachie-Obeng & Brown, 2004).

Various figures are available on the trade in kola nuts from Cameroon. In 1981, it was estimated that 20,000 tonnes were exported, while figures from 1980 suggest that 1,100 tonnes were exported to Nigeria and Chad, this worth about 183 million FCFA (Tachie-Obeng & Brown, 2004, citing Nkongmeneck, 1985). More recently, the trade to Nigeria and CAR from Cameroon in 1992 was estimated at 448 tonnes (Ndoye et al., 1997/98, citing AEERD, 1993).

Another valuable product is *Irvingia*. The total international value of the market in *Irvingia* products in 1975 was estimated to be US$ 50 million (Ladipo, 1999, citing ICRAF, 1975). Cameroon is a major producer of *Irvingia*, exporting to Gabon, Nigeria and Equatorial Guinea, and Equatorial Guinea in turn supplies Gabon (Aine & Brown, 2004; Ndoye et al., 1999). The cross-border trade of *I. gabonensis* from Cameroon to Gabon and Equatorial Guinea was valued at about US$ 87,000, representing over a quarter of the trade in this product in the humid forest zone of Cameroon (Ndoye & Tieguhong, 2004).

Some data are available on the trade of NTFPs to European markets, thanks to the research of Tabuna (1999 & 2000). An initial research project investigated the trade of NTFPs into France and Belgium This found that *Gnetum* and *Dacryodes edulis* were the two products most commonly imported. *Cola nitida, Garcinia kola* and various spices were also widely traded, but in much smaller quantities – these data are summarised in table 9. A number of animal products were also recorded – caterpillars (*Imbrasia spp.*), larvae (*Rynchophorus phoenicis)* and bushmeat (*Cephalophus sp.*).

Using the figures quoted for the price of these products in France, the value of their trade was equivalent to: 10 million FF (100 FF/kg) for *Gnetum* and 4.2 million FF (40 FF/kg) for *Dacryodes edulis.* (Tabuna, 1999) These figures are equivalent to about US$ 1.8 million and US$ 0.75 million respectively[8].

In a subsequent study, conducted in 1999/2000, a survey was undertaken of NTFP importers in the capitals of five countries – France, UK, Belgium, Spain and Portugal (Tabuna, 2000). This research found that an estimated 32,000 tonnes of NTFPs per annum, valued at over US$ 96 million – although it should be noted that these figures also included cultivated products, for example, cassava leaves and yams. The largest importer is the UK, importing products worth over US$ 75 million, followed by France, with imports valued at about US$ 19 million (see table 10). The value of the trade of some products which are harvested from non-cultivated sources (at least in part, since many of these species are also harvested from agroforestry systems) is shown in tables 11 and 12.

[7] Two-thirds of this volume were produced by Nigeria.
[8] This is based on the December 1998 exchange rate of French Francs / US$, which was approximately 5.6. (http://www.federalreserve.gov/Releases/H10/Hist/default1999.htm)

TABLE 9: Estimations of volumes imported into France, from survey with importers in 1998 (Tabuna, 1999).

PRODUCT	VOLUME	SOURCE COUNTRY
Gnetum	50 tonnes (dried) 50 tonnes (fresh)	DRC, Gabon, Congo-B, Cameroon
Dacryodes edulis	105 tonnes	Cameroon (100 tonnes) DRC (3 tonnes) Congo-B (2 tonnes)
Ricinodendron heudelotii	4 tonnes	Cameroon
Cola nitida & C. acuminata	2 tonnes	Cameroon
Garcinia kola	3 tonnes	Cameroon
Monodora myristica	5 tonnes	Cameroon
Xylopia aethiopica	1 tonne	Cameroon
Tetrapleura tetraptera	1 tonne	Cameroon
Irvingia gabonensis	5 tonnes	Cameroon
Palm wine (*Elaeis guineensis*)	10,000 bottles, of 65cl	Cameroon

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TABLE 10: Value of cultivated and non-cultivated NTFPs imported into Europe (Tabuna, 2000).

COUNTRY	VALUE (US $)
UK	75,446,800
France	19,221,667
Belguim	772,148
Portugal	835,667
Spain	147,969
TOTAL	96,424,251

TABLE 11: Estimated annual imports into France (Tabuna, 2000)

PRODUCT	VOLUME (TONNES)	VALUE (US$)
Gnetum	110	1,633,000
Dacryodes edulis	200	1,500,000
Cola nitida & C. acuminata	50	292,000
Irvingia gabonensis	52	433,000
Garcinia kola	12	70,000
Vernonia spp.	6	111,000

TABLE 12: Estimated annual imports into UK (Tabuna, 2000).

PRODUCT	VOLUME (TONNES)	VALUE (US$)
Gnetum	300	10,728,000
Dacryodes edulis	120	173,000
Irvingia gabonensis	200	7,152,000
Garcinia kola	20	336,000
Vernonia spp.	400	768,000

These various data show that there is a significant trade in a number of NTFPs, and that this is very valuable economically, both at the household level for rural and urban populations, and nationally – although the informal nature of much of this trade means that states are not capturing the full potential revenue from this trade. The regional and international markets remain relatively poorly developed in the Congo Basin. Some reasons that have been proposed for this are a lack of interest in economic integration in the region, poor communication routes between the countries, and political instability (Tchatat et al., 2003).

However, most predictions are that international trade will increase. Communication routes and infrastructure are improving in the region, and there are hopes of greater political stability. Increased trade in NTFPs, at the international level and also within these countries, could have a role in the sustainable development of the region. However, considerable caution is needed if increased trade is not to have a negative impact on forest ecology, an issue that will be considered further below.

INTERNATIONAL TRADE IN MEDICINAL PLANTS

Among some of the most valuable NTFPs in international trade are the medicinal plants that supply the pharmaceutical and herbal industries. Cameroon in particular is a major exporter of such products, and it is from this country that most data exists.

A number of species are exported from Cameroon, but most of the trade is in the following four species: *Prunus africana, Pausinystalia johimbe, Voacanga africana* and *Strophanthus gratus*. These species represented the bulk of the exports of the company Plantecam, which collected and processed medicinal plants in Cameroon up until 2000 (table 13), and they were also those for which most commercial licenses for exploitation were granted by the country's forestry department (table 14).

Most data is available on *Prunus africana,* the African cherry, and *Pausinystalia johimbe,* and this is presented below.

PAUSINYSTALIA JOHIMBE (YOHIMBE)

Pausinystalia johimbe is a tree native to the coastal forests of Central Africa. Its bark is widely used in Central Africa for a variety of medicinal purposes. It has been reportedly used as an: aphrodisiac, anaesthetic, mild stimulant, hallucinogen, to treat angina, hypertensive, general tonic, and to increase the resilience of hunting dogs (Sunderland et al., 1997). It is for its aphrodisiac properties that it is traded internationally, the bark and its extracts having been used for over 70 years in Europe and US to treat male impotence, with an increase in interest in yohimbe-based products in the 1970's due to the growth in the herbal market in Europe (Sunderland et al., 2004).

TABLE 13: species processed by Plantecam, SW Cameroon, 1985-1991 (Cunningham & Mbenkum, 1993).

SPECIES MASS	PART USED	TOTAL (1985-91) (TONS)
Prunus africana	Bark	9309.2
Voacanga africana	Seeds	900.6
Pausinstylia johimbe	Bark	285.9
Strophanthus gratus	Seeds	6.7

TABLE 14: Medicinal plants commercially licensed for exploitation, in tonnes, from Cameroon between 1988-91 (Sunderland et al., 1997, citing Besong, 1992).

SCIENTIFIC NAME	1988/98	1989/90	1990/91
Prunus africana	726	1,024	1,121
Voacanga africana	201	881	217
Pausinystalia johimbe	0	110	250
Strophanthus gratus	1	2,711	2,700
Cola nitida	0	5	0
Annickia chlorantha	0	0.8	2
Acacia senegal	0	5	4
Rauwolfia vomitoria	0	15	0

Most of the bark entering commercial trade comes from Cameroon, although there is interest in exploiting this species in Gabon and Equatorial Guinea (Sunderland et al., 2004). The available data suggest that the trade in this bark has increased over the last 2 decades. Thus, data from the company Plantecam indicate that they exported a total of 285.9 tonnes between 1985-1991 (Cunningham & Mbenkum, 1993), while in 1996 alone, they reportedly exported 120 tonnes (Sunderland et al., 1997, citing Simons, 1997). Similarly, data on the licensed harvesting of this species (shown in table 14 above) indicate an increase from 110 tonnes in 1989/90 to 250 tonnes in the following year. The most recent estimate for the export of yohimbe from Cameroon is from 1997/98, which was apparently a peak production year, when 715 tonnes were exported, worth over 382 million FCFA (about US$ 600,000) (Sunderland et al., 2004, citing MINEF, 1999). Trade for local use has also shown an increase in recent years (Sunderland et al., 1997).

All the harvest is currently from wild populations, and this is unsustainable (Sunderland et al., 2004). Traders and healers have reported that the bark has become scarcer, with supplies becoming more unreliable and expensive (Sunderland et al., 1997). Licenses are granted for exploitation of this species, but this is done without reference to baseline studies on stocking rates or sustainable yields. There are also many unlicensed harvesters (Sunderland et al., 2004). In Cameroon, much of the exploitation is linked to timber prospecting, with trees being identified during the inventories that precede logging. The trees are subsequently felled and the bark stripped, often by timber company employees or local people. In fact Plantecam estimated that probably 98% of trees were felled to harvest the bark (Sunderland et al., 2004).

PRUNUS AFRICANA (AFRICAN CHERRY)

The international trade in *Prunus africana* is relatively well documented, this species providing the largest volume of any African medicinal plant in international trade. The trade in this bark has taken place for nearly 30 years. It is used to produce at least 19 herbal preparations sold by 23 companies, mainly in Europe, but also in North and South America, where it is used to treat benign prostatic hypertrophy (Cunningham et al., 2002).

The species also has a number of local uses. The wood is used to make tools and as fuel, and the bark is used in traditional medicines, for which it is widely sold and traded in local markets (Sunderland & Obama, 1999). It is most commonly used for its anti-inflammatory and analgesic properties, and to treat malaria and other fevers, gastrointestinal problems, as an aphrodisiac and as a tonic for good health (Stewart, 2003).

Within Central Africa, *P. africana* bark is exported from Cameroon, DRC and Equatorial Guinea – exports from this latter country began in response to the decline in supplies from elsewhere (Sunderland & Obama, 1999). Cameroon is the largest exporter, supplying nearly two thirds of the bark in international trade (Cunningham and Mbenkum, 1993; Schröder, 2000).

The quantity of bark exported annually to Europe ranges between 3,200-4,900 tons (Cunningham et al., 2002), and the market value of this trade has been estimated at US$ 150 million per year (Cunningham & Mbenkum, 1993). This seems to be a conservative estimate. According to Ndoye & Awono (2005, citing CARPE, 2001), the commercial value of the trade in 1999 from Cameroon alone was estimated to be US$ 700,000 within the country, representing over US$ 200 million in sales for pharmaceutical companies. Similarly, sales of herbal products based on *P. africana* in Germany in 1994 were valued at US$ 150 million (Stewart, 2003, citing Gruenwald & Buttle, 1996).

The huge trade in this species has had significant impacts on the populations of this species. The scale of the problem is illustrated by the following statistics: between 1986 and 1991, an average of 1,923 tons of *Prunus africana* bark were processed in Cameroon, equivalent to 35,000 trees being debarked per year, thus affecting at least 6,300 hectares of afromontane forest each year (Cunningham & Mbenkum, 1993). Unsustainable harvesting practices, with felling of trees and complete debarking, have resulted in the depletion of this resource in many areas, and this was apparently one of the reasons why Plantecam ceased its operations in Cameroon in 2000 (Stewart, 2003).

FUTURE PROSPECTS

Both these plants, yohimbe and African cherry, illustrate the conservation threats that can result from high demand for a species. Even though both of these products could be sustainably harvested, generally, this has not been successfully implemented. This is in spite of the high awareness of the problem for the last decade, and the repeated calls for improved harvesting practices and wider cultivation (Cunningham & Mbenkum, 1993).

In the case of *Prunus africana,* local farmers have responded to the shortages through planting these trees on their own land. For example, it was reported in 2002 that 3,500 farmers were planting this species in the Northwest Province of Cameroon (Cunningham et al., 2002). However, these efforts have been too few and far between – for example, apparently just 9 hectares of *P. africana* plantation and 3 hectares of enrichment planting have been established on Mount Cameroon (Ndam & Marcelin, 2004).

Pausinystalia johimbe also has potential for incorporation into agroforestry systems.

ICRAF has implemented a tree domestication programme, which includes both of these species as well as *Annickia chlorantha,* another species used in the pharmaceutical industry (Facheux et al., 2004; ICRAF, 2005). However, greater efforts are needed, to expand the numbers of trees being cultivated and also to enforce sustainable harvesting practices. This will be essential if the demand for these barks continues to increase.

CASE STUDIES

CASE-STUDY I: *GNETUM*

The vegetable 'koko', also known as 'okok' and 'eru', is a popular food across Central Africa. It is widely traded both within and between these countries, and there is also some export trade to Europe. This vegetable comes from the leaves of two species of *Gnetum* – *G. africanum* and *G. buchholzianum* – lianas that grow in the forest understorey in West and Central Africa.

The leaves are highly nutritious, being rich in proteins, minerals and amino acids (Clark et al., 2004; Mialoundama, 1993; Ndam et al., 2001). They can be eaten raw or cooked, but most commonly are added to sauces. In many areas, dishes made with *Gnetum* are highly valued as traditional foods (Clark et al., 2004). The seeds and fruits can also be eaten, and the stems used for ropes and to make traps (Clark et al., 2004). Various medicinal uses have also been reported from across the region (Ndam et al., 2001; Nde-Shiembo, 1999). For example, in Cameroon the leaves are used as an antiseptic on wounds, and in Congo-Brazzaville, a tisane is drunk to ease childbirth (Clark et al., 2004). However, its main use is as a vegetable, and the leaves are an important component of the diet for many people. For example, a survey in southern Cameroon found that 86% of 200 households surveyed ate *Gnetum* more than 3 times a week (Clark et al., 2004, citing Gockowski & Ndumbe, 1997). In Congo-Brazzaville, daily consumption of this vegetable was estimated to be 2g per person for the country as a whole (Mialoundama, 1993).

TRADE

Gnetum is sold in rural and urban markets throughout the region. For example, it has been reported as being one of the most common NTFPs in the markets of Bioko, Equatorial Guinea (Sunderland & Obama, 1999); Pointe-Noire, Congo-B (Kimpouni, 1999), Kisangani & Beni, DRC (Bauma, 1999, Bola & Szafranski, 1991); Libreville, Gabon (Yembi, 1999).

The scale of the trade in this vegetable is apparent from a study of 25 markets in southern Cameroon conducted in 1995-96 (Ruiz-Perez et al., 1999). The estimated value of the sales of Gnetum in these markets was over FCFA 23 million (US$ 46,000) in 6 months.

The two species of *Gnetum* are often mixed, and it is difficult to determine which species is being used once it has been harvested and processed (the leaves usually being sliced for sale), but apparently *G. africanum* is more commonly sold than *G. buchholzianum* (Nde-Shiembo, 1999). The species are evergreen, and so they are traded throughout the year. However, less is collected during the rainy season, because of the difficulties of transport and because of competing economic activities (Clark et al., 2004, citing Sunderland, 2001).

Women dominate the trade of *Gnetum*, from gathering, transport through to its marketing, although men tend to predominate in the wholesale trade (Clark et al., 2004; Mialoundama, 1993; Ndoye & Awono, 2005). For example, of the more than 1,000 vendors of *Gnetum* in Kinshasa, 98% are women (Toirambe Bamoninga, 2002). Similarly, a study in 1980 of the *Gnetum* trade in the Koilou region of Congo-B found that all of the 400 people involved were women (Mialoundama, 1993).

It has been reported that men have become more involved in the trade of *Gnetum*, as well as that of other NTFPs, in response to economic problems in the region (Clark et al., 2004; Tchatat et al., 2003). However, it remains an important economic activity for women, and can be the primary source of income for some rural women (Clark et al., 2004, citing Henkemans, 1995).

Research in DRC found that *Gnetum* leaves are one of the most valuable NTFPs for rural households and market traders in Equateur and Bandundu provinces (Ndoye & Awono, 2005). At the household level, it was estimated that the net monthly revenue from the sale of *Gnetum* was 7,150 FCFA (US$ 14.7) in Equateur, while in Bandundu, the equivalent figure was 640 FCFA (US$ 1.3). This made *Gnetum* one of the most important NTFPs being sold, together with palm wine and caterpillars.

From a survey of market traders, this research found that over 47,000kg of *Gnetum* were sold by 57 traders in Mbandaka market during one year, valued at over 10 million FCFA (nearly US$ 22,000). The data from this and the other market surveys conducted are summarised in table 15. In Mbandaka, this equates to a monthly revenue of 63905 FCFA (US$ 131) per trader (taking into account marketing and transport costs), and in central Kikwit market, the revenue earned from *Gnetum* was 69025 FCFA (US$ 142). This is equivalent to the salary of a secondary school teacher (US$ 120-150), and is more than that earned by a civil servant (US$ 80) or agronomist (US$ 120). However, in Idiofa market, the traders earn just 5330 FCFA (US$ 11) from the sale of *Gnetum*[9].

The same study also interviewed a number of traders who exported *Gnetum* to Kinshasa. In the Equateur province, two traders exported 32 tons of *Gnetum* between October 2004 and March 2005. This was valued at nearly 9 million FCFA (US$ 18,497), earning them a monthly income of US$ 1,352. In Bandundu province, five traders exported around 11 tons during a period of 4 months, generating over 2.5 million FCFA (US$ 5,419), and a monthly revenue of US$ 270.

Another study in DRC reported that the average revenue earned by traders operating in Kinshasa was US$ 132 - over 5 times the salary of a public administrator (Toirambe

Bamoninga, 2002). This research also found that nearly 8,000kg of leaves were exported from Brazzaville to Kinshasa every week, and

[9] No reasons are given in the report for the smaller volume of the trade in Gnetum at this market.

TABLE 15: Volume and value of Gnetum leaves traded in DRC markets (Ndoye & Awono, 2005).

MARKET	NO. OF TRADERS SURVEYED*	VOLUME (KG)	VALUE FCFA (US$)	NO. MONTHS OF SURVEY
Mbandaka, Equateur	57	47,200	10,623,600 (21,904)	12
Idiofa, Bandundu Province	152 (total for both markets of Bandundu Province)	2,473	245,900 (507)	5
Central Kikwit, Bandundu Province		20,970	6,903,497 (14,234)	4

*The data are based on information from those traders surveyed, and were not extrapolated to include all traders of *Gnetum* in these markets. Therefore, the actual trade of this vegetable in the markets is even greater.

that the monthly value of the trade in *Gnetum* within the city was over US$ 7,000, some US$ 87,000 per annum.

The international trade in *Gnetum* is also very significant, both between the countries of Central and West Africa, and more widely, to Europe and the US (Clark et al., 2004; Toirambe Bamoninga, 2002). There are few statistics available on the scale of this trade, and undoubtedly, much of the trade does not pass through official channels, and so is not reported in statistics.

Some statistics are available from Cameroon, the Ministry of Environment reporting that 5,296 tons of *Gnetum* were exported between 1985 and 1994, equivalent to about 580 tons per year (cited in Ndam et al., 2001). Research in the Cameroonian port of Idenau estimated that 600 tonnes a year was being exported, mainly to Nigeria, with a local market value of 1800 million FCFA (Nde-Shiembo, 1999, citing Bokwe and Ngatoum, 1994). It was also reported that one trader in Idenau made as much as 450,000 FCFA / month in 1997 from the sale of this vegetable (Nde-Shiembo, 1999).

Much of the *Gnetum* exported to Europe comes from Cameroon and DRC (Tabuna, 1999), and most of the trade is to France and Belgium, but it has also been found on sale in Spain, UK and Portugal (Tabuna, 2000). In a period of a year (1997-1998), France and Belgium imported over 100 tonnes of *Gnetum*, a trade worth 2 billion FCFA (US$ 2.9 million) (Tabuna, 1999).

SUSTAINABILITY

The popularity of this vegetable, and strong urban demand has resulted in overharvesting of these plants. It has apparently disappeared from some parts of Congo-Brazzaville (Mialoundama, 1993) and is difficult to find in many of the forests of southern Cameroon, where it was previously abundant (Nde-Shiembo, 1999). In DRC as well, many traders have reported difficulties in obtaining *Gnetum*, and that people are having to travel increasing distances to harvest sufficient quantities (Ndoye & Awono, 2005).

Part of the problem is caused by unsustainable harvesting practices – the lianas are often cut, and the trees on which they grow sometimes felled. In addition, much of the forest in which the *Gnetum* occurs is being degraded or converted to other uses, resulting in a decline

in the resource base (Clark et al., 2004; Nde-Shiembo, 1999). At the same time, demand for this vegetable seems to be increasing, with reports that the volume of trade has increased in recent years (Mialoundama, 1993; Nde-Shiembo, 1999), and that more people are collecting it (Tchatat et al., 2003).

In response to this, researchers have begun experimenting with cultivation and domestication of these plants (Clark et al., 2004; Ndam et al., 2001; Tabuna, 2000) and there is apparently strong interest among farmers in incorporating this plant into their farming practices (Clark, et al., 2004).

CASE-STUDY II: EDIBLE INSECTS

Insects make a valuable contribution to both nutritional and economic security in Central Africa. A wide variety of insects are eaten, including crickets, locusts and termites, but the most popular are caterpillars and larvae[10]. These are regarded as a delicacy by many people, and are eaten and traded in large quantities throughout the region. Another important resource is honey – this resource is highly valued by local people and frequently traded (Bahuchet, 1985; Ichikawa, 1981; Latham, 2005).

Researchers have recorded many species of edible insects. For example, research with the Ngandu of DRC recorded 21 types edible insects (Takeda, 1990), and a study with the Boyela of DRC recorded 30 edible insects, including 22 different caterpillars (Takeda & Sato, 1993). Bahuchet (1985) from his work with the Aka Pygmies of CAR, recorded the use of at least 14 species of caterpillar, 9 species of larva, 10 species of cricket and locust and 4 species of termite.

A list of edible species, recorded in the literature is given in Appendix II[11]. It should be noted that this is by no means a comprehensive list, as it is based on only a selection of studies. Furthermore, many edible insects have not yet been identified[12] and are only known by their local names, and so these have not been included. However, this list gives an idea of the diversity of species used – at least 63 species of caterpillar and larva, 20 species of cricket and locust, 6 species of termite, 4 species of honey bee (whose larvae are often eaten together with the honey), and 5 species of cicada.

The caterpillars which have been mentioned as being the most popular are: *Imbrasia obscura, I. truncata, Pseudauthera discrepans and Anaphe spp*. in CAR (N'Gasse, 2003); *Cirina forda, Imbrasia epimethea* and *I. ertli* in DRC (Mapunzu, 2002); *Imbrasia spp.,* and *Coeliades libeon* in Congo-Brazzaville (Moussa, 2002). However, popular in all parts of the region is the *Nudaurelia oyemensis* caterpillar, found in sapelli trees (*Entandrophragma cylindricum*). (Lewis, 1998; Mapunzu, 2002; N'Gasse, 2003;). The beetle larva, *Rhynchophorus phoeonicius*, mostly collected from *Raphia* palms and to a lesser extent from oil palms, is also commonly eaten and traded (Dounias, 2003; N'Gasse, 2004).

Insects are usually collected by women and the elderly, as well as children, who often collect them while involved in other activities (Ndoye & Tieguhong, 2004; N'Gasse, 2004; Takeda, 1990). The exception to this are those larvae which are found within the stems of trees or palms, and so their collection may involve felling the plant, a task usually carried out by men. Balinga (2003) reports that over 80% of the collection of caterpillars is by women and children in southern Cameroon. Similarly, among the Aka (Bahuchet, 1985) and Mbendjele (Lewis, 1998) it is primarily the women, children and elderly who collect caterpillars. Women also predominate in the trade of insects, as is considered further below. Consequently, insect foods are particularly important in the diet of these sectors of society, as well as providing an important source of income for women.

[10] Caterpillars and larvae are often not distinguished between in the literature, but the term 'caterpillar' generally refers to the early life-stages of butterflies and moths (Lepidoptera), while 'larvae', sometimes called grubs, refer to the early life-stage of various types of insect including beetles, weevils, termites and bees.

IMPORTANCE IN THE DIET

As mentioned above, caterpillars and larvae are the most widely eaten insect foods, and most of the available data refer to these. A number of reports highlight the widespread consumption of caterpillars and larvae, and their important role in the diet. For example, it has been estimated that 85% of CAR's population (N'Gasse, 2004), and 70% of Kinshasa's population (Mapunzu, 2002) eat caterpillars. A survey in Brazzaville found that 60% of households eat caterpillars at least twice a week during the season (Moussa, 2002).

The nutritional value of insects, and in particular, of caterpillars and larvae, is often highlighted in the literature, and they are often described as an important substitute for meat. However, it should be noted that this is not usually why people choose to eat them – although insects can be an important famine food. Rather, many insects are regarded as a delicacy, and are valued in their own right (N'Gasse, 2004).

Having said that, the nutritional value of insects, and of caterpillars and larvae in particular, is high (Malaisse & Parent 1980; Moussa, 2002; N'Gasse, 2004). This is crucial in a region of high poverty and where it is often difficult to get sufficient protein – both as a result of the decimation of wildlife populations, and due to the high price of meat and fish (Latham, 2003).

Caterpillars are particularly rich in protein – an analysis of 22 species found that these contained, on average, over 60% protein (by dry weight) (N'Gasse, 2004, citing Malaisse, 1997). Thus, compared to meat or fish, caterpillars are higher in protein as well as fat, and provide more energy per unit. They are also a good source of various minerals and vitamins (this depending on the species) (De Foliart, n.d.; N'Gasse, 2004 citing De Foliart, 1992; Vantomme et al., 2004).

A number of studies have estimated the importance of caterpillars and larvae, as a source of protein in the diet. A study from the early 60's (Gomez et al., 1961, cited in N'Gasse, 2004) estimated that they provided 10% of the annual animal protein for Congo-Brazzaville's population, and in certain districts, more than 20%. More recently, research in Bangui (CAR), estimated that 29% of the total annual consumption of animal proteins came from caterpillars and larvae, and that during the harvesting period, they accounted for over half of the population's protein consumption (N'Gasse, 2003). Bahuchet (1972) recorded caterpillar consumption in a forest camp of the Aka Pygmies in CAR, and found that during the caterpillar season, they made up 75% of people's protein consumption.

In recognition of the nutritional value of these foods, they are often given to children and also to pregnant or breastfeeding women. Some species are also given to those suffering from anaemia. A number of insects also have a role in traditional medicine (Mapunzu, 2002; N'Gasse, 2004; Vantomme et al., 2004).

ECONOMIC IMPORTANCE

Trade in caterpillars and larvae is a significant seasonal income-generating activity in both rural and urban areas, especially for women (N'Gasse, 2004). The market for these foods is also thought to be growing and increasing numbers of people are becoming involved in the trade (Vantomme et al., 2004).

As mentioned earlier, women predominate in the sale of caterpillars and larvae – it is mainly women who are involved in their collection, transport to and sale in the markets, while men are typically more involved in the wholesale trade (N'Gasse, 2003 & 2004; Vantomme et al., 2004). For example, Moussa (2002) reports that 88% of market vendors in Brazzaville, Congo, are women.

Although there has not been extensive research to investigate the volume of insects

[11] A list of edible species from Central Africa is also available online at: http://www.food-insects.com/book7_31/The%20Human%20Use%20of%20Insects%20as%20a%20Food%20Resource.htm. This website also provides an overview of the literature, and information on ecology and nutritional content of many species.

[12] This is partly because of the difficulty of identifying juvenile forms of a species.

traded in the region, nor the economic value of this market, the limited data available indicate that the trade is considerable. For example, research in Kinshasa estimated that 9,600 tonnes of caterpillars were consumed in the city each year (Mapunzu, 2002).

Some indication of the value of the trade is available from recent market research in DRC (Ndoye & Awono, 2005). This estimated that in one market in Bandundu Province, 14,194kg of caterpillars were traded over an 8 month period, representing 8.7 million FCFA (nearly US$ 18,000). The data from this research are shown in table 16.

TABLE 16: Volume and value of the trade in caterpillars in DRC (Ndoye & Awono, 2005)

MARKET	VOLUME (kg)	VALUE (FCFA)	VALUE (US$)	TIME PERIOD
Central Kikwit market, Bandundu Province	14,194	8,700, 351	17,939	8 MTHS
Idiofa market, Bandundu Province	1,360	996, 725	2055	4 MTHS
Mbandaka market, Equateur Province	2,112	172, 790	355	6 MTHS

Within the region, a number of studies have reported on the economic value of caterpillars and larvae for local traders, these indicating that they can provide a valuable source of income. Indeed, the income from the sale of insects often exceeds those from other activities, such as cash crops or low waged jobs. These data are summarised in table 17.

It should be noted that the income from caterpillars is seasonal, the caterpillar season lasting some 3-6 months, but larvae are available all year round. In spite of the seasonality of the trade, these figures represent a very good income. For example, the income reported for CAR by N'Gasse (2003) is apparently higher than the salary of a civil servant. For Cameroon, the figures compare to a minimum salary of 30,000 FCFA (Balinga, 2003). Dounias (2003) compared his data with that reported by researchers for other activities. For example, monthly incomes from cocoa have ranged from 3,000 – 20,000 FCFA; coffee between 5,700 – 34,000 FCFA (the lows for these two crops corresponding to the country's economic crisis); from bushmeat - 30,000 FCFA, *Gnetum* leaves - 22,000 FCFA; and a non-specialised worker - 25,000 FCFA.

The trade in caterpillars and larvae is not only a local or national phenomenon, but also takes place internationally. However, data on the international trade is even more limited than that on the local and national levels. For example, Mapunzu (2002) commented that there was no data in the official documents consulted on the export of caterpillars from DRC. Similarly, in CAR precise export figures were found to be rarely recorded (N'Gasse, 2004).

From the available data, it seems that there is a significant trade between the countries of central Africa, and on a smaller scale to Sudan, Nigeria and Europe (Vantomme et al., 2004). N'Gasse (2003) reports that the biggest importers of caterpillars and larvae from CAR are Chad, Congo-Brazzaville, Nigeria and Sudan, with lesser amounts being exported to DRC, Cameroon, France and Belgium. A study of the European markets reported that France and Belgium import 5 and 3 tonnes each year respectively of dried Imbrasia spp. from DRC, with an estimated value of US$ 665,000 and US$ 41,500[13].

SUSTAINABILITY

The size of the trade in insects, and the volume of their consumption, raises concerns

[13] These figures indicate a remarkable difference in price, which suggests that there has been a mistake in calculating these – perhaps the former figure should be divided by 10?

TABLE 17: Economic value of caterpillars and larvae for vendors

REGION / COUNTRY	'TARGET' OF SURVEY	MONTHLY INCOME (FCFA)	REFERENCE
CAR	Wholesaler	117,000	N'Gasse, 2003
CAR	Market vendor	120,900	N'Gasse, 2003
Brazzaville (Congo-Brazzaville)	Market vendor	83,100	Moussa, 2002
Yaoundé area, Cameroon	Market vendor of caterpillars	15,000 – 20,000	Balinga, 2003
Yaoundé area, Cameroon	Market vendor of larvae	40,000 – 50,000	Balinga, 2003
Southern Cameroon	Rural vendor of *Rhynchophorus larvae* to urban markets	50,000	Dounias, 2003 & 2004
Southern Cameroon	Rural vendor of *Rhynchophorus larvae*, sold locally (in bars / roadsides)	35,000	Dounias, 2003 & 2004
Equateur Province, DRC	Village household	12,397 per household = 1579 per household member	Ndoye & Awono, 2005
Bandundu Province, DRC	Village household	10,000 per household = 1678 per household member	Ndoye & Awono, 2005
Mbandaka market, Equateur Province, DRC	Market vendor	20,980	Ndoye & Awono, 2005
Central Kikwit market,	Market vendor	5795	Ndoye & Awono, 2005
Bandundu Province, DRC			
Idiofa market, Bandundu Province, DRC	Market vendor	3695	Ndoye & Awono, 2005

about sustainability. Indeed, scarcity of this resource has been reported from some parts of the region. For example, caterpillars have become scarce in some parts of DRC (Latham, 2003; Mapunzu, 2002), and in many areas collectors are having to travel greater distances to find caterpillars (Vantomme et al, 2004).

The decline in this resource is partly a result of over-harvesting, and destructive harvesting practices – for example, felling of trees rather than collecting insects from the trees. Deforestation, due to land conversion and timber extraction are also having an impact. For example, in southern Cameroon raphia swamps are being converted to other land-uses, resulting in a decline in availability of *Rhynchophorus phoenicis* larvae, harvested from the *Raphia* palm.

Timber extraction has had a particularly heavy impact on one of the most popular of the caterpillars, *Nudaurelia oyemensis*. This caterpillar is found on the sapelli tree (*Entandrophragma cylindricum*), a highly valued timber species, and selective logging of this species has resulted in the decline of the caterpillar populations in certain areas (Lewis, 1998; SECO, 2004).

This situation is likely to worsen, with growing

human populations and a declining forest base. Consequently, there have been calls to explore the potential of rearing caterpillars and to promote this activity as a part of agroforestry systems (Latham, 2003; N'Gasse, 2004). This does already happen informally, for example, people may bring back young insects and rear them on trees near their home. Some farmers also allow the caterpillars to pupate so that the moths will lay their eggs on nearby trees (Latham, 2003). There have also been some research and development projects, for example, in Bas-Congo province of DRC, the host trees of caterpillars have been incorporated into reforestation activities (Mapunzu, 2002).

More intensive rearing could be a means of enhancing the value of forest fallows, while also helping to ensure the continued availability of insect foods. Studies from other parts of Africa have shown that the output from beekeeping and the production of edible caterpillars can exceed the value of the food crops for which forest was cut down (Latham, 2003, citing Munthali & Mughogho, 1992).

Further research is needed into rearing of caterpillars and larvae and into agroforestry practices. However, the supply of insects from the forest also needs to be ensured. Thus, greater priority needs to be given to their production and harvesting in forest management plans. This is an area in which some steps have been made, for example, in CAR loggers are required to leave 1 seed tree of sapelli every 10 hectares (Vantomme et al., 2004), and similar measures have been implemented in other countries. However, more could be done – for example, through reducing the allowable cut on this and other host trees, or simply banning their felling for timber altogether. Education and extension programmes could also have a role to play, both in promoting sustainable harvesting and in raising awareness of the value of this resource and the impact of deforestation on insect populations.

CASE-STUDY III: BUSHMEAT

Bushmeat is an important source of protein in Central Africa. For many rural populations, bushmeat and fish provide the main source of protein (Dijk & Wiersum, 1999; Tchatat et al., 2003). It has been estimated that bushmeat contributes between 30 and 80% of the protein intake of forest-based communities in the region (Wilkie, 2001). There is also a high demand for bushmeat among urban populations, and there is a thriving trade in bushmeat in the towns and cities of the region. Growing urbanization and expanding transport networks are contributing to the increasing trade in bushmeat (FAO, 2001). An indication of the scale of the trade is given by figures from Gabon, where it has been estimated that the sale of bushmeat is worth at least 880 million FCFA per year, and could be as high as 7,000 million FCFA (Tchatat et al., 2003).

This trade provides a valuable income for many, and in some communities, more bushmeat is sold than is eaten for subsistence. For example, De Merode et al. (2003 & 2004) found from their research in Northeastern DRC that 90% of the bushmeat and fish were sold at market, bushmeat contributing 25% to household sales and just 3% to household consumption. Research from southwestern CAR found that hunters could earn between US$ 400-700 per year, higher than the official minimum wage (Wilkie, 2001, citing Noss, 1998). Another study from the same region of CAR, in the Ngotto forest, estimated that commercial hunting could earn up to 1700 FCFA per day during the rainy season and 4000 FCFA at other times. Thus, it was estimated that 1.86 million FCFA was earned by the villages in the region (Dethier & Ghuirghi, 2000). In northern Congo-Brazzaville, it was reported that hunting contributed up to 40% of the income of logging concession employees (Wilkie, 2001, citing Wilkie et al., 2000). Data illustrating the contribution of bushmeat sales to household income were given earlier in this report.



Non-timber forest products provide a wealth of resources for both rural and urban dwellers throughout the Congo Basin. Medicine derived from essock (Garcinia lucida) [top], wine from the oil palm [centre] and the safou fruit (Dacryodes edulis) [bottom] are traded creating an important source of income for rural households.











Gnetum leaves [top] are a vital source of nutrients for Congolese peoples. Caterpillars – a delicacy rich in protein – are eaten and widely-traded throughout the Congo Basin region. The oil palm tree [bottom] Elaeis guineensis is valuable for food, wine, cosmetics, crafts and rituals.

Dr. Daniel L. Nickrent/Southern Illinois University

In brief, bushmeat provides the main source of protein for many people, and also a valuable source of income. However, this trade presents a severe threat to wildlife populations, as has been documented in the conservation literature (Bakarr et al., 2001; Robinson & Bennett, 2000). The challenge remains of how to meet local people's needs with concerns for the conservation of wildlife, particularly in the face of growing populations, declining forest areas and expanding road networks.

CASE-STUDY IV: RATTANS

Rattans are widespread through Central Africa and form an integral part of subsistence strategies for many rural populations. The trade in rattan cane and products is considerable, providing one of the main sources of revenue from NTFPs, rivalled only by bushmeat (Sunderland, 1999; Sunderland et al., 2004). A number of species are used by rural people, but just three are generally used commercially: *Laccosperma secundiflorum, Eremospatha macrocarpa, Laccosperma robustum* (Defo, 1999; FAO, 2001; Sunderland, 1999; Sunderland et al., 2004; Yembi, 1999).

Rattans are harvested almost exclusively from wild populations in Africa, and it is generally considered an open access resource. This is in contrast to Southeast Asia, where some well-established systems of rattan cultivation exist (Sunderland, 2001). The rattan sector as a whole in Africa is relatively undeveloped in comparison to that in Southeast Asia, and the industry is rudimentary in many areas. The highest quality products and best-developed industry are to be found in Cameroon (Minga, 2002; Oteng-Amoako & Obiri-Darko, 2001).

TRADE

The collection, trade and processing of rattan is mostly carried out by men (Defo, 1999; Sunderland et al., 2004), and much of the trade in rattans passes through specialised channels rather than through the marketplace. (Ruiz-Perez et al., 1999)

Rattan cane is traded across West and Central Africa, but there is limited data available on the amounts exported (Sunderland, 1999 & 2001). However, much of the trade occurs within these countries. For example, a study of Yaoundé's rattan sector found that this was almost exclusively supplying the domestic market (Defo, 1999).

Most data are available on the amounts of cane being traded in particular regions or markets, and these give an indication of the scale of the trade. For example, Sunderland (2001) presented a summary of the data on the use of cane from cities across the region (see table 18).

TABLE 18: the use of rattan cane in urban markets (Source: Sunderland, 2001).

CITY	AMOUNT OF CANE USED PER MONTH (M)	ESTIMATED MEAN VALUE (US$)	SOURCE OF INFO.
Bata, Equatorial Guinea	20,550	27,400	Sunderland, 1998
Douala, Cameroon	55,830	127,405	Sunderland et al., 2001
Yaounde, Cameroon	52,930	103,500	Sunderland et al., 2001
Kinshasa, DRC	28,208	56,600	Minga, 2001

A survey of markets in southern Cameroon estimated that the annual consumption of rattan was nearly 7 million metres of cane, with an estimated value of US$ 282,000. This excludes household use of rattans, and the value of the trade of finished products (Sunderland et al., 2002). Another survey of 195 rattan processors in Cameroon estimated that they processed nearly 100,000 stems of rattan per month, valued at nearly 10 million

FCFA (Dione et al., 2000). In Bata, Equatorial Guinea, it has been estimated that the monthly value of trade is 2,740,000 CFA (US$ 4,560) (Sunderland, 1999)

Researchers have also looked at the contribution of this product to rural livelihoods. One of the benefits of rattan as a source of income is that it is not seasonal. Consequently, it is always available (as long as it has not been over-harvested), and so it can provide a good means of meeting an immediate cash flow problem. This also means that it can readily be fitted around other activities, and many people focus on rattan collection during quiet agricultural periods (Defo, 2004).

Rattan can provide a substantial income. Sunderland (1999), on the basis of his research in southern Cameroon, estimated that a good harvester could earn 35,000 FCFA (US$ 58.50) per day – this compares with an average daily wage of just 1500 FCFA (US$ 2.50). Defo (1999 & 2004) also reported that rattan could provide a significant income. Their research in the Yaoundé area conducted from 1997-1998 found that rattan harvesting and processing was the second most important activity after agriculture. Within the seven villages surveyed, 35% of households were engaged in rattan exploitation and trade. For these households, rattan harvesting was estimated to provide 16% of their income – an average of 166,000 FCFA per month – and the processing of rattans provided 21% of household income – 216,000 FCFA per month. (Defo, 1999)

Further up the chain, higher incomes can be achieved. For example, Defo (2004) estimated that a rural harvester could earn US$ 288 p.a., a rural craftsman, US$ 377, and the owner of an urban processing unit, US$ 9,790. Sunderland et al. (2002) reported that most artisans in southern Cameroon could earn more than the average monthly income of a semi-skilled labourer – although they do note that there is considerable variation in monthly profits. (Sunderland, 2002)

SUSTAINABILITY

The market for rattan products is thought to be increasing, and an increase in the demand for and trade of rattan cane has been reported in the region (Defo, 1999, Sunderland, 2001). This has resulted in greater harvesting pressure on rattans, further exacerbated by population growth, urban development and the expansion of agricultural areas. Consequently, there has been over-harvesting of the resource, and rattans have become locally scarce in many areas. For example, in Equatorial Guinea, rattans are rare around Bata, and the lack of raw materials is now constraining the sector (Sunderland et al., 2004).

It should be possible to manage rattans sustainably. Many species, and all of those exploited commercially, are colonisers of forest gaps (Sunderland et al., 2004). This means that they are able to grow in disturbed forest, such as selectively logged forest and farm fallows, vegetation types which are expanding. However, one factor which hinders their sustainable management is the lack of resource tenure, since rattans tend to be considered an open access resource (Sunderland, 2001).

There is also potential for integrating rattans as part of agroforestry systems. Rattan cultivation and domestication is still at an early stage in the region, but sylvicultural and community-based trials of some species have been established in Cameroon (Defo & Trefon, 2002; Sonwa et al., 2002; Sunderland, 2001).

There is also the need for better regulation of harvesting of this resource. In Cameroon, theoretically a permit is required for the commercial harvest of NTFPs. However, these are rarely used for rattan, forestry officials instead applying 'informal taxes' on collectors. Consequently, harvesting is unregulated, and the benefits of the rattan trade are felt in the

informal rather than formal sector (Sunderland et al., 2002). Without apparent benefits, there is little incentive for forestry departments to support this sector.

Rattans have received greater attention in recent years, for example, with Cameroon's Ministry of Environment and Forests (MINEF) implementing a number of research activities on rattan (Defo & Trefon, 2002). However more is needed in order to fully explore the potential of this sector, for example, further research on the growth and yield of rattans to determine sustainable harvesting levels, improved processing and transformation methods, and the promotion and marketing of rattan products (Sunderland et al., 2002).

CASE-STUDY V: FUELWOOD

Firewood and charcoal provide fuel for the vast majority of Central Africa's population, and also provide an important source of income. In a 1996 report, Cameroon's Ministry of Environment estimated that 80% of Cameroon's population rely on fuelwood, using about 12 million m3 annually (Nkamleu et al., 2002). The provision of fuelwood is also a valuable source of income for many. For example, one study of a village near Yaoundé found that 80% of the community's income came from the sale of firewood (Tchatat et al., 2003).

In spite of the significance of this trade, and its crucial role in peoples' livelihoods, there have been relatively few studies of this sector from the humid tropics, most focusing on dryer regions. However, the few studies available do give some indication of the volume of wood that is being consumed.

Research in 1980 investigated the wood consumption of the city of Lubumbashi, both for construction purposes and to meet the fuel needs of households and industry (Malaisse et al., 1980). It was estimated that a total of 156,000 tonnes of wood were supplied to the city per year – 48,504 tonnes of charcoal, 82,344 tonnes of firewood and 25,149 tonnes of construction wood. This was thought to be resulting in annual deforestation of an area of 140 km^2, with a further 40 km2 being cleared of the best logs.

Research from Kinshasa, undertaken in 1990, found that charcoal and wood provide almost all the fuel for domestic use. Daily consumption was estimated to be equivalent to 2.76kg or (1.26 m3 by volume) of wood per person. With a population of some 4 million, this is equivalent to about 11,000 tonnes of wood. This demand for fuel has resulted in deforestation in the surrounding areas, and a fuelwood shortage within the city (Tshibangu, 1996).

A 1991 report on Congo-Brazzaville's forest resources estimated that the populations of Brazzaville and Pointe Noire used 1.25 tonnes of fuelwood per person per year, of which approximately 85% was wood and 15% charcoal (Jaffre & Otouba, 1991). Figures for these cities' wood consumption are shown in table 19.

TABLE 19: Estimated wood consumption by the populations of Brazzaville and Pointe Noire in 1991 (Jaffre & Otouba, 1991).

	POPULATION	WOOD (M_)	CHARCOAL (TONNES)
Brazzaville	760,000	940,000	18,000
Pointe Noire	390,000	485,000	9,000
TOTAL	1,150,000	1,425,000	27,000

A recent study of NTFP use in northern DRC reported that the demand for firewood and charcoal was one of the main human pressures on forest resources in the region (CREF, 2006). There was a significant trade in fuelwood and also in timber for construction from artisanal sawmills. Much of this latter trade was illegal – many businesses were found to be using these

small sawmills, rather than larger enterprises, in order to avoid taxes. In Maniema Province, of 50 timber traders, just 8 were found to be legal.

Another study from DRC, in which market surveys were undertaken in Equateur and Bandundu Provinces, found that charcoal was one of the most frequently traded products, and provided one of the most important sources of income for market traders. For example, traders in two of the markets surveyed earned on average US$ 216 and US$ 63 per month (Ndoye & Awono, 2005).

DISCUSSION AND CONCLUSIONS

As highlighted at the start of this report, the role of NTFPs in strategies to reduce poverty and for forest conservation has been questioned in recent years. Indeed, as this report has touched on, there are many potential pitfalls associated with attempts to promote this sector. For example, commercialization of NTFPs increases the risk of over-harvesting taking place. There may also be social implications – traditional tenure systems may break down or the social systems associated with the production of a resource may change, as considered further below.

Although the promotion of NTFPs does present many such challenges, this does not mean that they should not have a role to play in efforts to promote sustainable development, but simply that expectations should not be raised too high. The data presented in this report illustrate the important role that NTFPs have had, and continue to play, in the lives of the people of the Congo Basin, increasing both livelihood and economic security. Undoubtedly, NTFPs will continue to be important for many people's livelihoods in the region, and so must be central to any strategy for sustainable development.

Turning to the initiatives that have been taken to promote NTFPs, these have either targeted the production of resources (i.e. harvesting and management) or the processing and marketing of the product.

Considering first those interventions related to production, these entail the improvement of harvesting methods and implementation of sustainable management of resources within forest areas, or alternatively, the promotion of their cultivation and domestication in anthropogenic landscapes. Many researchers have suggested that the best approach to the commercialisation of NTFPs is to increase intensification of production through cultivation and domestication of the resource. NTFPs often occur at low densities in forest ecosystems. This reduces the economic viability of these

products because of the time involved in harvesting them, and also means that sustainable levels of harvesting will probably be very low.

Cultivation provides a means to increase economic returns and reduce pressure on wild resources. Domestication of NTFPs is an additional strategy – this involving genetic changes in the species, for example, to enhance yield or improve the flavour or some other quality of the resource. (These activities are, of course, undertaken by farmers themselves – this having been the basis of farming practices over the centuries.) There have also been various research and development initiatives in this area.

As highlighted in this report, research and field trials have been undertaken on the cultivation of *Gnetum, Prunus africana, rattans,* and many fruit trees. Two fruit species that have been the subject of much research are *Dacryodes edulis* and *Irvingia gabonensis*, with efforts focusing on their domestication (Schreckenberg et al., 2002 & 2006). Such activities are a priority for ICRAF (2005), which has been involved in efforts to develop new agroforestry crops, including these and other fruit trees, as well as the medicinal trees, *Prunus africana, Pausinystalia johimbe* and *Annickia chlorantha*. There have also been some initiatives promoting the rearing of caterpillars and apiculture (Latham, 2003).

Cultivation does seem to be the best solution to address the sustainable use of some NTFPs. Many resources are already under high pressure, for example, rattans, *Gnetum*, and bushmeat, and this is likely to increase, with growing populations and declining forests. Therefore, there is a need to intensify production of many resources, to ensure continued food security for example.

However, there are a number of potential problems with focusing on the cultivation of NTFPs. One issue is that the link between the resource and the forest is lost. The suggestion that the exploitation of NTFPs can promote forest conservation is based on the assumption that this will increase incentives for local people, and also policy makers, to conserve the forest by increasing its value. However, this direct incentive is lost if the resource can be cultivated – although of course forest resources should still be valued as a source of genetic diversity. There is also the risk that cultivation will not reduce pressure on forest resources. Over-harvesting of these may continue, even if the species is being cultivated, simply because forest resources are freely available. Finally, shifting to cultivation of a resource may have social implications. For example, women may become side-lined from a sector in which they have traditionally predominated if production methods change. This is an issue of concern for the vegetable *Gnetum* – women currently dominate the harvesting and trade of this species, but this could change if it becomes widely cultivated as a crop, since it is men who traditionally manage cash-crops (Clark et al., 2004).

Clearly, cultivation and domestication are not the only solutions that should be explored, but they should be combined with efforts to implement sustainable management of resources *in situ*. Most efforts in this area have been undertaken in Cameroon through the development of community forestry management. Although this approach has had mixed results (Brown & Schreckenberg, 2001) it does reflect an important shift in priorities, since it allows for the inclusion of NTFPs in forest management plans (Sunderland, 2001). Also in Cameroon, as well as some other countries of the region, NTFPs are now given some consideration in the forest management plans of timber concessions, for example, with provisions for the management of valuable NTFPs, such as sapelli or moabi.

However, these provisions do not go far enough, and NTFPs are still not given a high enough priority. Part of the reason for this is

that there is often no policy to promote NTFPs (Defo, 2004). Few resources are given to researching or monitoring NTFP exploitation, and most national forest codes do not regulate this. Even where licenses or permits are required, there is often little enforcement. Since no taxes or licence fees are paid for harvesting or trading in NTFPs, not only do they not bring in any revenue for forestry departments, but there is little information collected on the scale of their utilisation. Consequently, the significance of NTFPs for people's livelihoods and in local economies remains overlooked.

This lack of priority extends to the promotion and marketing of NTFPs[14]. Little information was found on initiatives aimed at promoting the trade of NTFPs. However, many researchers did highlight the problems encountered by producers and traders in marketing NTFPs (CREF, 2006; N'Gasse, 2004; Ndoye & Awono, 2005; Ruiz-Perez et al., 1999; Sunderland et al., 2002 & 2004; Toirambe Bamoninga, 2002). The main issues highlighted were:

- The lack of infrastructure in many parts of the region, limiting access to markets for rural communities;
- Poor market information, for example, means that producers can not respond to market demand, nor benefit from increases in price, while traders and sellers often have erratic supplies;

Poor market conditions, for example, limited storage areas and handling facilities for products;

A lack of organisation of harvesters, traders and processors (e.g. producer co-operatives or unions for artisans);

- Widespread use of informal 'taxes' (*tracasserie*), from forestry officials, police and military groups;
- A lack of credit, hindering investment, for example in processing machinery;
- A decline in availability of many resources.

[14] This is perhaps a reflection of the type of resources that were accessed for this report. Most time was spent researching the academic literature, focusing on forestry, conservation and ecology. This reflects the fact that such material is widely available. In contrast, reports on projects and practical interventions, where they exist, are much harder to obtain.

RECOMMENDATIONS

Although greater priority has been given to NTFPs within the forestry sector, this has not gone far enough. At present, timber is still given precedence over alternative uses of the forest, and multiple-use forest management has not been fully explored or implemented. Such a strategy should include: extraction of NTFPs, beekeeping, cultivation of medicinal plants, agroforestry, insect rearing, and bioprospecting.

This requires a more fundamental shift in thinking within forestry departments and among policy makers. These countries are still in need of a comprehensive, well-designed set of policies, aimed at promoting and supporting this sector. These should incorporate measures to:

- Monitor NTFP exploitation;
- Establish harvesting levels for threatened species, and on this basis, implement a system for allocating harvesting licenses;
- Review systems of taxation for the trade in NTFPs;
- Enforce systems of fees and licenses, and ensure that the revenue raised is reinvested in the sector, for example, to provide credit to small-producers or support for co-operatives, and resource monitoring programmes;

- Provide information on NTFP markets, both national and international;
- Develop schemes for the certification of NTFPs, perhaps in concert with timber certification;
- Promote the research and development of indigenous crops;
- Clarify land tenure and resource rights;
- Develop national access and benefit-sharing legislation for genetic resources, in order to exploit potential bioprospecting opportunities;
- Implement education and extension programmes, particularly among forestry professionals, to raise awareness of the value of NTFPs.

With these goals in mind, the following recommendations are made for future research and project activities:

- A review of national policies and legislation related to NTFPs in the countries of the Congo Basin, including national forest policies, agricultural policies (for NTFPs brought into cultivation), and legislation related to: protection of biodiversity; taxes & licenses (for harvesting and trading); rights to resources; access and benefit-sharing; *et al.* This would enable the identification of any gaps in policy and areas where reform is needed.

- Community-based research to gather further evidence of the value of NTFPs to forest-based communities. As this report illustrates, there remain many gaps in knowledge in this area. Such information would be a valuable lobbying tool, to raise awareness of the crucial role of NTFPs for people's livelihoods and in local economies. Particular attention should be paid to the importance of NTFPs for marginalized sectors of society, such as Pygmy communities and women.

- Participatory research, to investigate the value chains of particular NTFPs that are currently commercialised (an approach undertaken in Boliva and Mexico (Marshall et al., 2006). Case-studies should include different product types (e.g. medicinals, food, crafts) and those which are sold in different markets (local, national and international). An analysis of the value chain (which incorporates harvesting and production, processing, and marketing), would enable identification of those features that are beneficial for commercialisation as well as any hindrances (for example, land tenure issues, transport, taxation…). Such research would enable identification of areas for policy reform, as well as enabling the design of practical initiatives to support NTFP commercialisation.

APPENDIX I: NTFPs OBSERVED IN CENTRAL AFRICAN MARKETS

SPECIES	USE / PRODUCT	COUNTRY	REFERENCE
Aframomum spp	Edible fruits	DRC	Bauma, 1999
	Condiment (seed)	Gabon	Yembi, 1999
Afrostyrax spp.	Condiment (seed & bark)	Equatorial Guinea	Sunderland & Obama, 1999
Antrocaryon micraster	Ritual (seeds)	Congo-B	Kimpouni, 1999
Autranella sp.	Ritual (seeds)	Congo-B	Kimpouni, 1999
Baillonella toxisperma	Oil	Cameroon	Dijk, 1999; Plender-leith & Brown, 2004;
Brenania breyeri	Fish poison & ritual (fruit)	Congo-B	Kimpouni, 1999
Canarium schweinfurthii	Ritual (seeds)	Congo-B	Kimpouni, 1999
	Edible fruit		Laird, 1999
Carapa procera	Ritual (seeds)	Congo-B	Kimpouni, 1999
Cleistopholis patens	Ritual (seeds)	Congo-B	Kimpouni, 1999
Cola spp.	Stimulant (fruit)	Gabon	Yembi, 1999
	Stimulant (fruit)	Cameroon	Ruiz-Perez et al., 1999
Cola acuminata	Stimulant (seed)	Cameroon	Dijk, 1999
	Stimulant (seed)	Equatorial Guinea	Sunderland & Obama, 1999
	Stimulant & medicinal (seeds & bark)	Congo-B	Kimpouni, 1999
Cola lepidota		Cameroon	Dijk, 1999
Cola nitida	Stimulant (seed)	Cameroon	Dijk, 1999
	Stimulant (seed)	Equatorial Guinea	Sunderland & Obama, 1999
	Stimulant & medicinal (seeds & bark)	Congo-B	Kimpouni, 1999
Coula edulis		Cameroon	Dijk, 1999
	Edible (seeds)	Congo-B	Kimpouni, 1999
Crytosperma sengalensis	Wrapping leaves	Congo-B	Kimpouni, 1999
Dacryodes edulis	Edible fruit	Cameroon	Dijk, 1999
	Edible fruit	Equatorial Guinea	Sunderland & Obama, 1999
	Edible fruit	Cameroon	Ruiz-Perez et al., 1999
Dacryodes macrophylla		Cameroon	Dijk, 1999
Dialium sp.	Edible fruit	Congo-B	Kimpouni, 1999
Dioclea reflexa	Ritual (seeds)	Congo-B	Kimpouni, 1999
Elaeis guineensis		Cameroon	Dijk, 1999
	Palm wine, cosmetic, edible, artisanal, ritual (Fruit, seeds,	Congo-B	Kimpouni, 1999
	rachis & sap) Oil & palm wine (nuts & sap)	DRC	Bauma, 1999
	Oil, wine, food (Fruit, sap, heart)	Gabon	Yembi, 1999
	Food, palm wine (sap)	Cameroon	Ruiz-Perez et al., 1999

SPECIES	USE / PRODUCT	COUNTRY	REFERENCE
Eremospatha spp	Artisanal (stem)	Congo-B	Kimpouni, 1999
Erythrophloeum suaveolens	Ritual (bark)	Congo-B	Kimpouni, 1999
Garcinia buchholzianum	Vegetable (leaves)	Congo-B	Kimpouni, 1999
Garcinia klainiana	Palm wine additive (bark)	Gabon	Yembi, 1999
Garcinia kola	Stimulant / medicine (seed)	Equatorial Guinea	Sunderland & Obama, 1999
	Stimulant, aphrodisiac, palm wine additive (bark & seeds)	Congo-B	Kimpouni, 1999
	Palm wine (bark); Stimulant (fruit)	Cameroon	Ruiz-Perez et al., 1999
Garcinia lucida		Cameroon	Dijk, 1999
	Chewstick / medicine (bark fruit)	Equatorial Guinea	Sunderland & Obama, 1999
	Palm wine (bark)	Cameroon	Ruiz-Perez et al., 1999
Gardenia tenuifolia	Ritual (stem & fruit)	Congo-B	Kimpouni, 1999
Gnetum spp.	Vegetable (leaves)	Cameroon	Ruiz-Perez et al., 1999
Gnetum africanum	Leaf vegetable	Equatorial Guinea	Sunderland & Obama, 1999
	Vegetable (leaves)	Congo-B	Kimpouni, 1999
	Vegetable (leaves)	DRC	Bauma, 1999
	Vegetable (leaves)	Gabon	Yembi, 1999
	Vegetable (leaves)	DRC	Bola & Szafranski, 1991
Irvingia spp.	Condiment	Cameroon	Ruiz-Perez et al., 1999
Irvingia gabonensis	Edible kernel	Cameroon	Dijk, 1999
	Condiment (kernel)	Equatorial Guinea	Sunderland & Obama, 1999
	Condiment (kernel)	Gabon	Yembi, 1999
Laccosperma secundiflorum	Artisanal (stem)	Congo-B	Kimpouni, 1999
Landolphia owariensis	Edible fruit	Congo-B	Kimpouni, 1999
Marantochloa sp.	Wrapping leaves	Congo-B	Kimpouni, 1999
Megaphrynium sp.	Wrapping leaves	Congo-B	Kimpouni, 1999
Megaphrynium macrostachyum	Wrapping leaves	Gabon	Yembi, 1999
Monodora myristica	Condiment (seed)	Equatorial Guinea	Sunderland & Obama, 1999
	Ritual (seeds)	Congo-B	Kimpouni, 1999
Palisota sp	Wrapping leaves	Congo-B	Kimpouni, 1999
Panda oleosa		Cameroon	Dijk, 1999
	Ritual (seeds)	Congo-B	Kimpouni, 1999
Pentaclethra macrophylla	Ritual (bark & seeds)	Congo-B	Kimpouni, 1999

SPECIES	USE / PRODUCT	COUNTRY	REFERENCE
Piper guineensis	Condiment (seed)	Equatorial Guinea	Sunderland & Obama, 1999
	Condiment & medicine (fruit)	Congo-B	Kimpouni, 1999
	Condiment & medicine (fruit)	DRC	Bauma, 1999
Poga oleosa	Edible fruit	Cameroon	Dijk, 1999
Pseudospondias longifolia	Edible fruit	Congo-B	Kimpouni, 1999
Pterocarpus soyauxii	Cosmetic (wood)	Congo-B	Kimpouni, 1999
Raphia montbuttorum		Cameroon	Dijk, 1999
Raphia spp.	Palm wine (sap)	DRC	Bauma, 1999
	Palm wine & artisanal (sap, leaf fibre)	Congo-B	Kimpouni, 1999
Ricinodendron heudelotii		Cameroon	Dijk, 1999
	Condiment & ritual (bark, root, seeds)	Gabon	Yembi, 1999
	Condiment	Cameroon	Ruiz-Perez et al., 1999
	Condiment (seed)	Equatorial Guinea	Sunderland & Obama, 1999
Sarcophrynium sp.	Wrapping leaves	Congo-B	Kimpouni, 1999
Scorodophloeus zenkeri		Cameroon	Dijk, 1999
	Bark (condiment)	DRC	Bauma, 1999
	Condiment (seed & bark)	Gabon	Yembi, 1999
Tetrapleura tetraptera	Condiment (fruit)	Equatorial Guinea	Sunderland &
			Obama, 1999
Thaumatococcus danielii	Wrapping leaves & thatching	DRC	Bauma, 1999
Trilipisium madagascariensis	Vegetable (leaves)	Congo-B	Kimpouni, 1999
Xylopia aethiopica	Condiment (seed)	Equatorial Guinea	Sunderland & Obama, 1999
	Condiment / medicinal (fruit)	Congo-B	Kimpouni, 1999

MEDICINALS			
SPECIES	PART USED	COUNTRY	REFERENCE
Aframomum c.f. hanburyi	Seeds	Equatorial Guinea	Sunderland & Obama, 1999
Aframomum spp	Seeds	DRC	Bauma, 1999
	Seeds	Gabon	Yembi, 1999
Aframomum melegueta	Seeds	Equatorial Guinea	Sunderland & Obama, 1999
	Fruit	Congo-B	Kimpouni, 1999
		Cameroon	Betti, 2002
Alstonia boonei		Cameroon	Betti, 2002
Anchomanes difformis	Rhizome	Congo-B	Kimpouni, 1999
Angokea gore	Bark	Equatorial Guinea	Sunderland & Obama, 1999

SPECIES	PART USED	COUNTRY	REFERENCE
Annickia chlorantha (syn. *Enantia chlorantha*)	Bark	Equatorial Guinea	Sunderland & Obama, 1999
	Bark	Equatorial Guinea	Sunderland & Obama, 1999
	Bark	Congo-B	Kimpouni, 1999
	Bark	Gabon	Yembi, 1999
		Cameroon	Betti, 2002
	Bark	Cameroon	Facheux et al., 2004
Anonidium mannii		Cameroon	Betti, 2002
Antrocaryon klaineanum		Cameroon	Betti, 2002
Baillonella toxisperma	Seeds	Equatorial Guinea	Sunderland & Obama, 1999
		Cameroon	Betti, 2002
	Bark	Cameroon	Facheux et al., 2004
Bucholzia coriacea	Seeds	Congo-B	Kimpouni, 1999
Bucholzia macrophylla	Seeds	Congo-B	Kimpouni, 1999
Ceiba pentandra		Cameroon	Betti, 2002
Cissus dinklagei	Sap	Equatorial Guinea	Sunderland & Obama, 1999
Cola spp.	Fruit	Cameroon	Ruiz-Perez et al., 1999
Cola acuminata	Seeds	DRC	Bauma, 1999
Curcuma longa	Roots	Cameroon	Facheux et al., 2004
Cylicodiscus gabonensis		Cameroon	Betti, 2002
Dorstenia scabra	Roots	Congo-B	Kimpouni, 1999
Drypetes gossweileri		Cameroon	Betti, 2002
Duboscia macrocarpa	Fruit	Gabon	Yembi, 1999
Elaeis guineensis		Cameroon	Betti, 2002
Entada gigas	Fruit	Equatorial Guinea	Sunderland & Obama, 1999
Erythrina sp.	Bark	Congo-B	Kimpouni, 1999
Erythrophleum suaveolens		Cameroon	Betti, 2002
Fagara heitzii	Bark	Equatorial Guinea	Sunderland & Obama, 1999
Garcinia kola	Seeds	DRC	Bauma, 1999
	Bark & fruit	Cameroon	Ruiz-Perez et al., 1999
		Cameroon	Betti, 2002
Garcinia lucida	Bark	Cameroon	Ruiz-Perez et al., 1999
Glyphaea brevis	Fruit	Congo-B	Kimpouni, 1999
Gnetum africanum		Cameroon	Betti, 2002
Guarea thompsonii		Cameroon	Betti, 2002
Guibourtia tesmannii		Cameroon	Betti, 2002
	Bark	Equatorial Guinea	Sunderland & Obama, 1999

SPECIES	PART USED	COUNTRY	REFERENCE
Hexalobus crispiflorus		Cameroon	Betti, 2002
Irvingia gabonensis		Cameroon	Betti, 2002
Isolona hexaloba		Cameroon	Betti, 2002
Klainedoxa gabonensis		Cameroon	Betti, 2002
Momordica charantia	Whole plant	Congo-B	Kimpouni, 1999
Mostuea hirsute	Roots	Congo-B	Kimpouni, 1999
Nauclea diderrichii		Cameroon	Betti, 2002
Nauclea latifolia	Roots & fruit	Congo-B	Kimpouni, 1999
Nauclea pobeguinii	Bark	Cameroon	Facheux et al., 2004
Okoumea klaineana	Bark	Equatorial Guinea	Sunderland & Obama, 1999
Oldfieldia africana		Cameroon	Betti, 2002
Pachyelasma tessmannii		Cameroon	Betti, 2002
Pachypodianthum staudtii	Bark	Equatorial Guinea	Sunderland & Obama, 1999
Pausinystalia johimbe	Bark	Cameroon	Facheux et al., 2004
Penianthus longifolia	Roots	Congo-B	Kimpouni, 1999
Pentachlethra macrophylla		Cameroon	Betti, 2002
Pentadiplandra brazzeana	Roots	Congo-B	Kimpouni, 1999
	Roots	DRC	Bauma, 1999
Picralima nitida		Cameroon	Betti, 2002
	Fruit	Cameroon	Facheux et al., 2004
Piptadeniastrum africanum		Cameroon	Betti, 2002
Pollia condensate	Fruits & seeds	Congo-B	Kimpouni, 1999
Prunus africana	Bark	Equatorial Guinea	Sunderland &
			Obama, 1999
	Bark	Cameroon	Facheux et al., 2004
Pycnanthus angolensis		Cameroon	Betti, 2002
Quassia africana	Roots	Congo-B	Kimpouni, 1999
Raphia mombutiorum		Cameroon	Betti, 2002
Ricinodendron heudelotii		Cameroon	Betti, 2002
Sacoglottis gabonensis		Cameroon	Betti, 2002
Sarcocephalus latifolius	Bark	Cameroon	Facheux et al., 2004
Staudtia kamerunensis		Cameroon	Betti, 2002
Strombosiopsis tetandra	Bark	Equatorial Guinea	Sunderland & Obama, 1999
Strophanthus gratus		Cameroon - Southern	Dijk, 1999
Tetrapleura tetraptera	Pod	Congo-B	Kimpouni, 1999
		Cameroon	Betti, 2002
Thonningia sanguinea	Whole plant	Congo-B	Kimpouni, 1999
Urera sp.	Stem	Equatorial Guinea	Sunderland & Obama, 1999
Vernonia conferta		Equatorial Guinea	Sunderland & Obama, 1999
Zanthoxylum gillettii		Cameroon	Facheux et al., 2004
Zanthoxylum heitzii		Cameroon	Betti, 2002

APPENDIX II: EDIBLE INSECT SPECIES

CATERPILLARS & LARVAE					
SPECIES	LOCAL NAMES	COMMON NAME	ETHNIC GROUP /LANGUAGE	COUNTRY /REGION	REFERENCE
Acherontia atropos	Munsona sona		Kikongo	DRC	Latham, 2003
Analeptes trifasciata	.Póse		Aka	CAR	Bahuchet, 1985
Anaphe spp.	Taku		Lingala	DRC	Mapunzu, 2002
	Ihumbo		Ngandu	DRC	Takeda, 1990
	Nkankiti		Kikongo	DRC	Latham, 2003
	.lóndá .tàkú		Aka	CAR	Bahuchet,1985
Anaphe infracta	.ndòsì Ilanga		Aka Ngandu	CAR DRC	Bahuchet, 1985 Takeda, 1990
Anaphe panda				DRC	Mapunzu, 2002
Anaphe venata	.ndòsì		Aka	CAR	Bahuchet, 1985
	Mboyo-Kondi / Toukoussou		Issongo	CAR	N'Gasse, 2003
Antheua insignata	Nsanga		Kikongo	DRC	Latham, 2003
				DRC	Mapunzu, 2002
Antheua spp.	Malomba loka		Kikongo	DRC	Latham, 2003
	Mfundi		Kikongo	DRC	Latham, 2003
	Nsindi		Kikongo	DRC	Latham, 2003
Athletes gigas				DRC	Mapunzu, 2002
Athletes semialba				DRC	Mapunzu, 2002
Augosoma centaurus	Makokolo	Scarab beetle		DRC	Mapunzu, 2002
				Congo-B	Moussa, 2002
Bunaea alcinoe	Makedi kedi		Kikongo	DRC	Latham, 2003
	Makedi kedi		Kikongo	DRC	Mapunzu, 2002
	.ngúángùà		Aka	CAR	Bahuchet, 1985
Bunaeopsis sp.	Mukoko		Kikongo	DRC	Latham, 2003
Bunaeopsis aurantiaca				DRC	Mapunzu, 2002
Celtis spp.	.Póse		Aka	CAR	Bahuchet, 1985
Cinabra huperbrus				DRC	Mapunzu, 2002
Cirina forda	.ndíngízá		Aka	CAR	Bahuchet, 1985
	Ngala		Kikongo	DRC	Latham, 2003
	N'gala Mikwati / mingolo Ngbanda-ngbanda Mukoso		Kikongo Bandundu Lingala Kibemba	DRC	Mapunzu, 2002

SPECIES	LOCAL NAMES	COMMON NAME ENGLISH /FRENCH	ETHNIC GROUP /LANGUAGE	COUNTRY /REGION	REFERENCE
Coeliades libeon				Congo-B	Moussa, 2002
Cymothe aranus	Mokolili		Issongo	CAR	N'Gasse, 2003
Cymothoe caenis	Moboto		Issongo	CAR	N'Gasse, 2003
	Nsani		Kikongo	DRC	Latham, 2003
Drapetides uniformis				DRC	Mapunzu, 2002
Elaphrodes lactea	Masela / nluti		Kikongo	DRC	Mapunzu, 2002
	Masela / Nluti		Kikongo	DRC	Latham, 2003
Goliathus sp.	Lèálèá		Aka	CAR	Bahuchet,1985
Gonimbrasa sp.	Minsendi		Kikongo	DRC	Latham, 2003
Gonimbrasia hecate				DRC	Mapunzu, 2002
Gonimbrasia rechelmanni				DRC	Mapunzu, 2002
Gonimbrasia zambesina				DRC	Mapunzu, 2002
Goodia kuntzei				DRC	Mapunzu, 2002
Gynanisa ata				DRC	Mapunzu, 2002
Imbrasia spp.				Congo-B	Moussa, 2002
Imbrasia alopia	Minsongo		Kikongo	DRC	Latham, 2003
Imbrasia anthina	Minsuka		Kikongo	DRC	Latham, 2003
Imbrasia dione				DRC	Mapunzu, 2002
Imbrasia epimethea	.ngúlúpá		Aka	CAR	Bahuchet,1985
	Mvinsu		Kikongo	DRC	Latham, 2003
				DRC	Mapunzu, 2002
	Mopoko		Issongo	CAR	N'Gasse, 2003
Imbrasia ertli	1. Mbinzo / Sö / Mvinzu 2. Misa / Misamisa / Misati 3. Miasakelende		1. Lingala 2. Bandundu 3. Tshiluba	DRC	Mapunzu, 2002
Imbrasia macrothyris	Kwesu			DRC – Bas Congo	Latham, 2003
	Kwesu		Kikongo	DRC	Latham, 2003
	Kwesu Ligegele		Kikongo Lingala	DRC	Mapunzu, 2002
Imbrasia melanops?	Minsendi		Kikongo	DRC	Latham, 2003

SPECIES	LOCAL NAMES	COMMON NAME ENGLISH /FRENCH	ETHNIC GROUP /LANGUAGE	COUNTRY /REGION	REFERENCE
Imbrasia obscura	.kɛnàkɛnɛ		Aka	CAR	Bahuchet, 1985
	Minsendi		Kikongo	DRC	Latham, 2003
				CAR	N'Gasse, 2003
Imbrasia petiveri	Bisu			DRC – Bas Congo	Latham, 2003
	Bisu		Kikongo	DRC	Latham, 2003
Imbrasia rhodinia				DRC	Mapunzu, 2002
Imbrasia rubra				DRC	Mapunzu, 2002
Imbrasia truncata	Likoto		Lingala	DRC	Mapunzu, 2002
	Mbanga		Issongo	CAR	N'Gasse, 2003
	mbábángá		Aka	CAR	Bahuchet, 1985
Imbrasia wahlbergia gp.	Minsendi noir		Kikongo	DRC	Latham, 2003
Lobobunaea goodi	lingonju		Ngandu	DRC	Takeda, 1990
Lobobunaea phaedusa			Kaba	DRC – Bas Congo	Latham, 2003
	Kaba		Kikongo	DRC	Latham, 2003
	Kaba		Kikongo	DRC	Mapunzu, 2002
Lobobunaea saturnus				DRC	Mapunzu, 2002
Macrotoma sp.	.Póse		Aka	CAR	Bahuchet, 1985
Mecinorrhyna sp.	Lèálèá		Aka	CAR	Bahuchet, 1985
Melanocara parva				DRC	Mapunzu, 2002
Melanocera nereis				DRC	Mapunzu, 2002
Microgone parva				DRC	Mapunzu, 2002
Nuaurelia authina				DRC	Mapunzu, 2002
Nudaurelia dione	Lilangachike		Ngandu	DRC	Takeda, 1990
Nudaurelia oyemensis (Synonym = *Imbrasia oyemensis*)	.bòyó		Aka	CAR	Bahuchet, 1985
	1. Tumpekete 2. Makangu 3. Mboyo / Mbö 4. Bisu		1. Tshiluba 2. Bandundu 3. Ngombe 4. Kikongo	DRC	Mapunzu, 2002
	Mboyo (Lingala, Issongo)	Sapelli larva		CAR	N'Gasse, 2003
	Boyo (Mbendjele)	Sapelli larva		Congo-B	Lewis, 1998
Nyodes prasinodes				DRC	Mapunzu, 2002
Oryctes boas				Congo-B	Moussa, 2002
Oryctes owariensis				Congo-B	Moussa, 2002
Petrognatha gigas	.Pós_		Aka	CAR	Bahuchet, 1985
Platygenia barbata	.ngbòtó		Aka	CAR	Bahuchet, 1985
Platysphinx sp.	Munsona		Kikongo	DRC	Latham, 2003

SPECIES	LOCAL NAMES	COMMON NAME ENGLISH /FRENCH	ETHNIC GROUP /LANGUAGE	COUNTRY /REGION	REFERENCE
Pseudantherea discrepans	Kanga		Issongo	CAR	N'Gasse, 2003
	.kèsó		Aka	CAR	Bahuchet, 1985
	Boona		Ngandu	DRC	Takeda, 1990
Pseudathera anobita	Mbona		Lingala	DRC	Mapunzu, 2002
Rhenea mediate				DRC	Mapunzu, 2002
Rhynchophorus sp.	Mpose			DRC	Mapunzu, 2002
Rhynchophorus phoenicis	.sòkò		Aka	CAR	Bahuchet, 1985
	Lohose		Ngandu	DRC	Takeda, 1990
	Nsombé			Congo-B	Moussa, 2002
Rhypopteryx poecilanthes	Nsongi		Kikongo	DRC	Latham, 2003
Saturnia sp.	Lihakala		Ngandu	DRC	Takeda, 1990
Stenodontes sp.	.Póse		Aka	CAR	Bahuchet, 1985
Tangorapsis flavinata				DRC	Mapunzu, 2002
Urota sinope				DRC	Mapunzu, 2002
Usta terpsichore				DRC	Mapunzu, 2002

CRICKETS, GRASSHOPPERS & LOCUSTS

SPECIES	LOCAL NAMES	COMMON NAME ENGLISH /FRENCH	ETHNIC GROUP /LANGUAGE	COUNTRY /REGION	REFERENCE
Acanthacris ruficornis				Congo-B	Moussa, 2002
Acantharis ruficornis			Aka	CAR	Bahuchet, 1985
Afroxyrrhops procera				Congo-B	Moussa, 2002
Anoedopoda erosa			Aka	CAR	Bahuchet, 1985
Brachytrypes membranaceus	Nzɛnzɛ		Aka	CAR	Bahuchet, 1985
Brachytrypes membranaceus				Congo-B	Moussa, 2002
Cantatops spissus				Congo-B	Moussa, 2002
Catantops quadratus			Aka	CAR	Bahuchet, 1985
Chirista compta				Congo-B	Moussa, 2002
Conocephalus spp.			Aka	CAR	Bahuchet, 1985
Gastrimargus africanus				Congo-B	Moussa, 2002
Gryllacris africana	Nzúbé		Aka	CAR	Bahuchet, 1985
Gryllodes sp.	Nzɛnzɛ		Aka	CAR	Bahuchet, 1985
Heteracris coerulescens			Aka	CAR	Bahuchet, 1985

SPECIES	LOCAL NAMES	COMMON NAME ENGLISH /FRENCH	ETHNIC GROUP /LANGUAGE	COUNTRY /REGION	REFERENCE
Heterocris guineensis				Congo-B	Moussa, 2002
Locusta migratoria				Congo-B	Moussa, 2002
Oxycantatops congoensis				Congo-B	Moussa, 2002
Pyrgomorpha vignaudi	Nzúbé		Aka	CAR	Bahuchet, 1985
Roduniella insipida			Aka	CAR	Bahuchet, 1985
Tettigonia spp.	Mignégné			Congo-B	Moussa, 2002

TERMITES					
SPECIES	LOCAL NAMES	COMMON NAME ENGLISH /FRENCH	ETHNIC GROUP /LANGUAGE	COUNTRY /REGION	REFERENCE
Apicotermes sp. (probably)	.bòmò		Aka	CAR	Bahuchet, 1985
Bellicositermes sp.	.sémbá		Aka	CAR	Bahuchet, 1985
Bellicositermes natalensis	.kàè / .samba-. kàè		Aka	CAR	Bahuchet, 1985
Cubitermes spp.				Congo-B	Moussa, 2002
Macrotermes sp.	Likalolo		Ngandu	DRC	Takeda, 1990; Takeda & Sato, 1993
Macrotermes bellicosus				Congo-B	Moussa, 2002
Oecephylla sp.	Manteketa	Red ant		Congo-B	Moussa, 2002
Protermes sp. (?)	kòmbɛlɛ		Aka	CAR	Bahuchet, 1985

HONEY BEES					
SPECIES	LOCAL NAMES	COMMON NAME ENGLISH /FRENCH	ETHNIC GROUP /LANGUAGE	COUNTRY /REGION	REFERENCE
Apis mellifera adansonii	Lounjue		Ngandu	DRC	Takeda, 1990
Dactyfurina standingeri	Luchu		Ngandu	DRC	Takeda, 1990
Trigona sp.	Elungu		Ngandu	DRC	Takeda, 1990
Trigona gribodoi	Mbolo		Ngandu	DRC	Takeda, 1990

OTHER INSECTS					
SPECIES	LOCAL NAMES	COMMON NAME ENGLISH /FRENCH	ETHNIC GROUP /LANGUAGE	COUNTRY /REGION	REFERENCE
Afgeliada sp.		Cicada		Congo-B	Moussa, 2002
Bellostoma sp		Water bug		Congo-B	Moussa, 2002
Platypleura adouna		Cicada		Congo-B	Moussa, 2002
Ugada giovannina		Cicada		Congo-B	Moussa, 2002
Ugada limbata		Cicada		Congo-B	Moussa, 2002
Ugada limbimaculata		Cicada		Congo-B	Moussa, 2002

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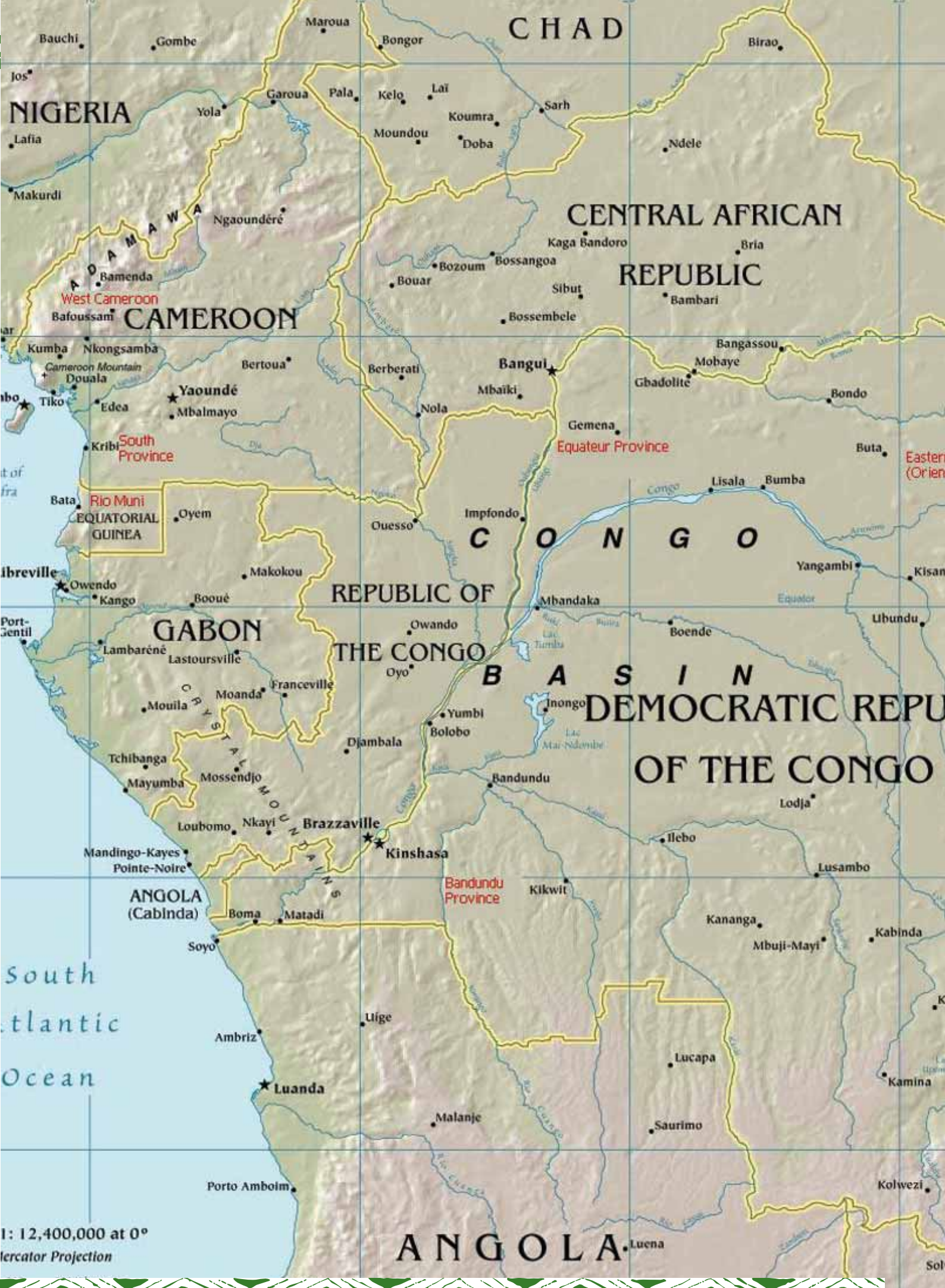
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Alison Hoare, the author of this report, is a Research Consultant and Associate Fellow at Chatham House with expertise in natural resource use and forest management.


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GABON
CONGO BASIN
DEMOCRATIC REPUBLIC OF THE CONGO
CRYSTAL MOUNTAINS
Bandundu Province
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