Rattan resources and use in West and Central Africa

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The rattans of Africa, although less celebrated than their Asian relatives, have significant potential to contribute to both rural development and the global market.

Four genera of rattan palms, repre-sented by 20 species, occur in West and Central Africa. Like their Asian relatives, the rattans of Africa form an integral part of subsistence strategies for many rural populations and provide the basis of a thriving cottage industry.

A bridge made of rattan stems in Nyang, Cameroon - one example of the role of rattan in rural life in West and Central Africa

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African rattans have long been recognized by donor agencies and national governments as having a potential role on the world market as well as a great role within the regional non-wood forest products (NWFPs) sector. As increased interest is being shown in the potential role of high-value NWFPs to contribute to conservation and development, rattan is frequently mentioned as a product that could be developed and promoted in a useful way. However, the development of the rattan resource in Africa has until recently been hindered by a lack of basic knowledge about the exact species used, their ecological requirements and the social context of their utilization. Hence it has not been possible to design appropriate management strategies that might be implemented to ensure their sustainable and equitable exploitation. Recent research has concentrated on providing information on the taxonomy, ecology and utilization of these species. Now that this baseline information is available, rattan research in Africa is currently concentrating on the development and promotion of the rattan resource from both ecological and socio-economic perspectives.

TAXONOMY AND BIOLOGY OF AFRICAN RATTANS

Morphological distinctness from Asian rattans

The four genera of African rattan are relatively easy to differentiate, particularly through the morphology of their climbing organs. Calamoid palms climb with the aid of one of two organs: either a flagellum (a shoot arising directly from the sheath and regarded as a modified flower

[Baker *et al*., 1999]) or a cirrus (a whip-like extension before the leaf with short, curved thorns that often resemble a cat's claw [Tomlinson, 1990]). Flagella occur only in certain species of *Calamus*, including *C. deërratus*, the sole representative of *Calamus* in Africa.

The other Calamoideae, particularly those of Asian origin, climb with the aid of a cirrus. However, in the three rattan genera endemic to Africa, *Laccosperma*, *Eremospatha* and *Oncocalamus*, the cirrus has a form that is unique within the Calamoideae; it occurs as an extension between reduced, thorn-like leaflets termed anthophylls. This structure is also present in some members of unrelated genera present only in the New World (*Chamaedorea*, *Desmoncus*) (Uhl and Dransfield, 1987).

Leaf of* Laccosperma acutiflorum *showing the unique form of its cirrus with acanthophylls

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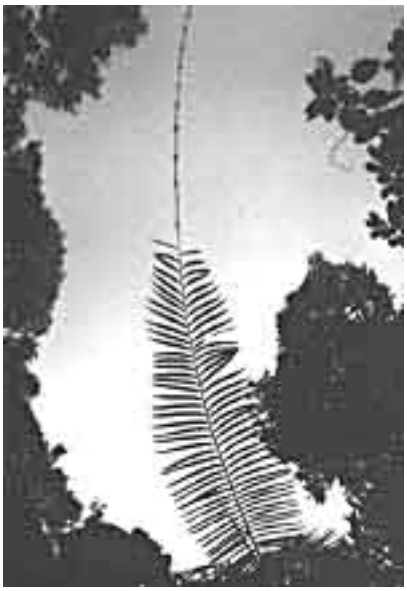

As have other members of the genus *Calamus*, *C. deërratus* has pairs of unisexual flowers (a common feature within the Calamoideae); however, the other endemic rattan genera of Africa are un-usual within the Calamoideae also for their flowers. For example, the genera *Eremospatha* and *Laccosperma* have pairs of hermaphroditic flowers, a feature unique within the Palmae (Uhl and Dransfield, 1987; Baker *et al*., 1999). (Less commonly, *Laccosperma* may also have triads of flowers.)

In addition, *Oncocalamus* species have a complex flower cluster that is distinctive among the Palmae (see Photo). The unusual flower cluster of the African taxa, and *Oncocalamus* in particular, suggests that a complex evolution of the Calamoideae has occurred in Africa with much extinction, caused by dramatic climatic upheaval, leaving only isolated lineages. This assertion is supported by the speciation patterns exhibited today by African palms, which have a distinct Guineo-Congolian centre of diversity, probably as a result of the maintenance and later speciation of forest refugia during periods of climatic change.

Cane anatomy and quality

The thickness of the fibre walls, the proportion of fibre tissues and the metaxylem vessel diameter, which appear to be the determinants of rattan quality, differ significantly among the African genera (Oteng-Amoako and Ebanyele, 2001; Wiener and Liese, 1994).

Laccosperma species have a relatively high proportion of thick-walled fibres and relatively narrow-diameter metaxylem vessels, and thus canes of greater density than those of the other genera. As a result, they have the best strength properties and are known for their durability.

C. deërratus and *Eremospatha* species have similar cane anatomies, with higher proportions of thinner-walled fibres and larger metaxylem vessels than those of *Laccosperma* species. These result in a greater amount of empty space in the stems, and consequently these two species also exhibit similar lower density and strength although, in utilization, *C. deërratus* is

usually considered of inferior quality relative to desired species of *Eremospatha*. Further anatomical studies, which are currently under way, might shed more light on this anomaly.

Oncocalamus has very thin fibre walls and very large metaxylem vessels and possesses the least desirable density and strength properties of any of the African rattans. These species are particularly weak and brittle and not valued as a source of cane (Profizi, 1986; Defo, 1997; Defo, 1999; Sunderland, 1999).

ECOLOGY AND DISTRIBUTION

***Complex flower structure of* Oncocalamus mannii**

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Rattans are widespread throughout West and Central Africa and are a common component of the forest flora. Some species have particularly large ranges; for example, *Laccosperma secundiflorum* and *Eremospatha macrocarpa* occur from Liberia to Angola, while *C. deërratus* occurs from the Gambia across to Kenya and southwards to Zambia. In terms of diversity, the greatest concentration of rattan species and the highest levels of endemism are found in the Guineo-Congolian forests of Central Africa. Eighteen of the 20 known African rattan species occur in Cameroon. The diversity of rattans in the upper Guinea forests, by comparison, is somewhat poor, with only seven species, none of which are endemic to that region.

Within this forest zone, rattans grow in a wide range of ecological conditions. Most species occur naturally in closed tropical forests and are early gap colonizers. Many require extremely high levels of light and respond well to a limited reduction in the forest canopy. Forest disturbance, for example through selective logging activity, encourages the regeneration of rattans, and these palms are often a common feature along logging roads and skid trails. Some species, such as certain species of *Oncocalamus*, because they demand so much light, are often the earliest colonizers of heavily disturbed areas. Other species of rattan, notably *C. deërratus*, grow in permanently or seasonally inundated forests or swamps, while yet other species, such as *Laccosperma opacum* and *Laccosperma laeve*, are highly shade-tolerant and prefer to grow under the forest canopy.

The seeds of most rattans in Africa are dispersed predominantly by hornbills (Whitney *et al*., 1998). However, primates, especially drills (*Mandrillus leucophaeus*), mandrills (*Mandrillus sphinx*), chimpanzees (*Pan troglodytes*) and gorillas (*Gorilla gorilla*), as well as elephants, are also key dispersal agents (White and Abernethy, 1997; Sunderland, 2000). The seeds are often scattered far from the mother plant. Some additional, although limited, dispersal results from predation and caching by rodents. Interestingly, significant germination also occurs near parent plants through natural fruit fall, particularly in areas where overhunting has led to a significant decline in animals to disperse the seeds.

Despite intensive fieldwork and herbarium collection, especially in the past several years, no obvious phenological pattern has been identified for flower development and seed production in most African species.

Conservation status of African rattans

It is reported that the demand for rattan is increasing, and much more cane is being processed in many areas of Africa today than five or ten years ago (Sunderland *et al*., 2001). The increased demand has led to a significant decline in wild stocks and considerable local scarcity, particularly around urban centres (Profizi, 1986; Morakinyo, 1995; Sunderland, 1998; Sunderland, 1999; Defo, 1999; Oteng-Amoako and Obiri-Darko, 2001). Nonetheless, the commercial rattan species are at present considered "not threatened" on a continent-wide basis (Table 1).

COMMERCIAL UTILIZATION AND TRADE

Although many of the African rattan species are used locally for multiple purposes, the commercial trade concentrates on the bulk harvest of only a few widespread and relatively common species (Sunderland, 2001). Table 2 presents the major commercial species of rattan utilized in each region.

During the colonial period there was a significant trade in cane and cane products in Africa. In particular, Cameroon and Gabon supplied France and its colonies (Hédin, 1929), and Ghana (formerly the Gold Coast) supplied a significant proportion of the large United Kingdom market during the period between the two World Wars (Gold Coast Forestry Department, 1934). In 1926 Cameroon exported 100 tonnes of raw rattan cane to France, valued at US$50 000. The export industry was not restricted to raw cane; in 1928 an additional US$50 000-worth of finished cane furniture was exported from Cameroon to Senegal for the expatriate community there (Hédin, 1929).

In the 1970s, the United Nations Industrial Development Organization (UNIDO) promoted an initiative in Senegal to exploit wild cane for large-scale production and export (Douglas, 1974), but this enterprise folded not long after its establishment because of problems in securing a regular supply of raw material.

TABLE 1.**Conservation status of African rattan species**

Species	**Geographical range *(million ha)***	**IUCN Category**
Calamus deërratus	804.9	Not threatened
Eremospatha barendii	Only 1 collection	Endangered
E. cabrae	191.8	Not threatened
E. cuspidata	189.1	Not threatened
E. haullevilleana	270.4	Not threatened
E. hookeri	110.2	Not threatened
E. laurentii	273.2	Not threatened
E. macrocarpa	426.0	Not threatened
E. quinquecostulata	0.9	Vulnerable
E. tessmanniana	0.6	Vulnerable
E. wendlandiana	60.4	Not threatened
Laccosperma acutiflorum	148.5	Not threatened
L. laeve	122.6	Not threatened
L. opacum	180.8	Not threatened
L. robustum	153.7	Not threatened
L. secundiflorum	319.5	Not threatened
Oncocalamus macrospathus	70.1	Not threatened
O. mannii	12.9	Not threatened
O. tuleyi	1.8	Vulnerable

O. wrightianus	0.3	Endangered
Note: Conservation status has been estimated mainly on the basis of the World Conservation Union (IUCN) criterion "extent of occurrence" (with other IUCN criteria also taken into account). Although approximate, this is the best estimate possible in the absence of data from large-scale population studies.		

Currently, large quantities of raw cane enter the urban centres of West and Central Africa each day. Table 3 summarizes the results of some attempts to quantify the trade in specific markets in recent years.

Very limited data are available on current or recent rattan exports from countries in Africa (Oteng-Amoako and Obiri-Darko, 2000). Komolafe (1992) reported a limited export of finished products from West Africa to Europe and raw rattans to Asia, including China and the Republic of Korea. There have been recent reports of export of raw cane from Ghana and Nigeria to Southeast Asia (Sunderland, 1999) and of a flourishing export trade from Nigeria to the Republic of Korea (Morakinyo, 1995).

TABLE 2. **Commercially important rattan species by region**

Region	**Primary commercial species**	**Other commercially used species**
West Africa (Senegal, Côte d'Ivoire, Ghana, Benin, western Nigeria)	*Laccosperma secundiflorum* *Eremospatha macrocarpa*	*Eremospatha hookeri* *Calamus deërratus*
West/Central Africa (eastern Nigeria, Cameroon, Congo, Gabon, eastern Guinea)	*Laccosperma robustum* *Eremospatha macrocarpa*	*Laccosperma secundiflorum*
Central Africa (Democratic Republic of the Congo, Central African Republic)	*Laccosperma robustum* *Eremospatha haullevilleana*	*Eremospatha macrocarpa*
Southern/East Africa (Zambia, Uganda, Kenya, United Republic of Tanzania)	*Calamus deërratus*	*Eremospatha haullevilleana*

Harvest and transport

The conditions and circumstances under which rattan is harvested and transported in Africa are remarkably consistent throughout its range. Most of the harvesting for commercial trading is undertaken as a secondary occupation by individuals, usually farmers, hunters or other rural people; rattan harvesting provides them with extra revenue, particularly to meet occasional needs such as medical expenses or annual school fees (Trefon and Defo, 1998; Sunderland, 1998). Many cash crop farmers also harvest rattan to obtain extra capital to purchase planting stock and other agricultural inputs.

In general, rattan harvesters tend to return to the same forest area each time they need to cut cane. If the harvester is not native to the area, the chief of the local village is paid a small retainer for providing access to the forest. Harvesters usually prefer to collect as close to a motorable road as possible in order to avoid carrying the bundled canes (which they bear on their heads) for long distances. However, local scarcity near many urban centres now forces many harvesters further into the forest (Sunderland, 1998; Defo, 1999; Profizi, 1999). The added carrying resulting from this increased range is slowly generating an increase in raw cane prices, which is being felt at the market level.

Village-based harvesters transport the harvested rattan to the urban markets themselves, or they may sell at the village to a local trader who then transports the cane for sale to urban artisans (see Falconer 1994; Oteng-Amoako and Obiri-Darko, 2001; Defo, 1999; Sunderland

et al., 2001) (see the Figure, on p. 23). Some urban-based artisans, if close enough to the wild resource, harvest rattan themselves.

The development of a wide network of logging roads through many forest areas in West and Central Africa has enabled greater access to otherwise inaccessible areas of forest and has resulted in increased rattan exploitation. Indeed, logging trucks often transport harvested rattan (Defo, 1997; Sunderland, 1998).

Long-term indigenous management systems for the rattan resource are unknown in Africa, despite recent optimistic reports of what appeared to be such (Sunderland, 1999). Throughout its range rattan is considered an "open-access" resource; there are very few, if any, customary laws regulating its harvest from the wild. Many national forestry codes still do not regulate the exploitation of NWFPs, and the overharvesting of many commercially important products, including rattan, continues unabated and uncontrolled. Even those states that require licences and permits for the extraction of forest products often do not adequately enforce the regulations or monitor the exploitation of the resources. However, these legislative and institutional constraints to sustainability are currently being addressed, particularly in Ghana, Nigeria and Cameroon, where the current paradigm shift to community-based forest management systems, with direct technical support from the state, is enabling the inclusion of high-value NWFPs such as rattan in forest management plans for the first time. A particular objective of the African Rattan Research Programme is to draw a direct relation between the ecology and utilization of rattan in Africa and the long-term policy interventions required to ensure its sustainability.

The harvesting techniques usually used in Africa also have an impact on the potential sustainability of rattan extraction, particularly for clustering species. To obtain access to the mature stems, harvesters often cut all the stems in a cluster, even those that are not yet mature enough for exploitation and sale. This occurs particularly where resource tenure is uncertain or weak. However, where those who harvest the rattan have more defined resource tenure, younger stems are not removed and are left to regenerate and provide a future source of cane, usually on a two- to three-year rotation. The current shift from state control of forest resource management to community-based management regimes may thus be a reason for optimism about the potential for long-term sustainable and equitable exploitation of the resource.

TABLE 3. **Scale and value of the African rattan trade in selected urban markets**

City	**Sample size *(no. of enterprises)***	**Estimated amount of cane used per month *(m)***	**Estimated mean annual value *(US$)***	**Reference**
Lagos, Nigeria	not known	180 000	1 141 180	Morakinyo, 1994
Accra, Ghana	27	not known	64 080	Falconer, 1994
Kumasi, Ghana	11	not known	95 475	Falconer, 1994
Ankasa, Ghana	12	4 300 (all species)	62 000	Holbech, 2000
Bata, Equatorial Guinea	15	20 550 (all species)	27 400	Sunderland, 1998
Douala, Cameroon	25	26 955 (large-diameter) 28 875 (small-diameter)	127 405	Sunderland *et al*., 2001
Yaounde, Cameroon	31	23 165 (large-diameter) 29 765	103 500	Sunderland *et al*., 2001

		(small-diameter)		
Kinshasa, Democratic Republic of the Congo	114	13 760 (large-diameter) 14 448 (small-diameter)	56 600	Minga, 2001

Processing and transformation

Processing of raw cane essentially entails the removal of the epidermis (skin) from the stem and the drying of the raw cane prior to its use. Throughout much of Africa raw cane is processed manually: the stems are scraped with kitchen knives to remove the skin, and drying is usually undertaken in the open air. This rudimentary means of processing is not only labour-intensive, but also results in inferior-quality cane and hence limits the value of the finished products. Inferior quality has led to speculation that the quality of cane in Africa is inherently poor (J. Dransfield, personal communication). However, this speculation has not been supported by thorough anatomical studies, and it is possible that, if processed and transformed more efficiently, cane from Africa could rival that of Asia in quality.

Improved methods of processing and transformation would also provide long-term conservation benefits. Most notably, a more durable and longer-lasting product would make it possible to harvest less cane from the wild. In addition, from the social perspective, the enhanced value of better-quality products produced by urban artisans could help enhance livelihoods.

Local rattan scarcity near many urban centres now forces many harvesters deep into the forest, where they shelter in temporary camps

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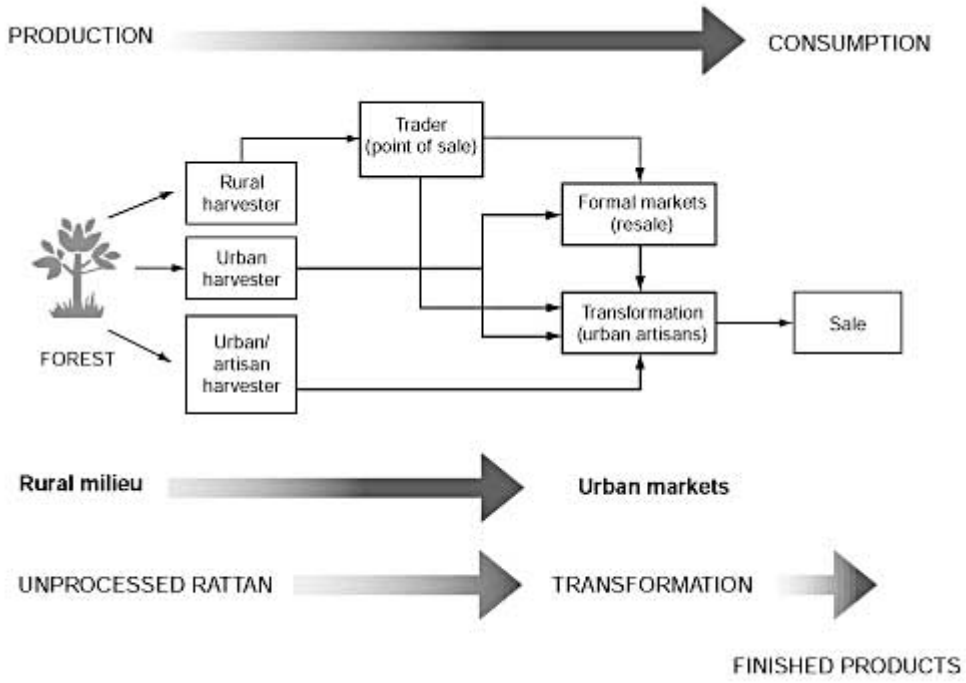
In this respect, there are initiatives to introduce appropriate processing and transformation technologies from Asia that are suitable for the African milieu (Sunderland and Nkefor, 1999). A model processing unit has recently been constructed in Limbe, Cameroon and will be used primarily as a training and demonstration unit. Similar units will be established in Ghana and Nigeria over the course of the next two years.

DISCUSSION: MANIFOLD ROUTES TO SUSTAINABILITY

Local scarcity and irregular supply of unprocessed rattan associated with increased demand are among the major constraints to the continued development of the industry. The

sustainable harvesting and management of the African rattan resource are primarily hindered by a paucity of sound information on stocking, growth, yield and harvest intensity. In addition, the lack of adequate land and resource tenure precludes many attempts at long-term and sustainable harvesting, and the fact that rattan is usually an open-access resource hinders the prospects for long-term sustainable management.

Generalized "production-to-consumption" system for rattan in Africa



However, the African Rattan Research Programme is currently developing research strategies to help address these constraints. These include the long-term study of mortality, recruitment and phenology in natural forests and the assessment of cane regrowth under a range of harvesting regimes. The results from these studies will help identify the most appropriate harvesting regime for each species based on a detailed understanding of its basic ecology. The determination of these regimes has significant policy implications and provides the basis for community-led management strategies now being implemented in target countries.

The African Rattan Research Programme in Limbe, Cameroon runs training courses for local farmers who have expressed an interest in planting rattan

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In addition, although African rattans are currently harvested exclusively from wild populations, the ecological and social factors prevalent in the region would be favourable to the development of a cultivated and managed rattan resource. The traditional rattan cultivation practices seen in some areas of Southeast Asia, e.g. cultivation in mixed gardens by sedentary cultivators or in recently burned forest by shifting cultivators (Godoy, 1992), are not known in West and Central Africa. However, the African Rattan Research Programme has recently undertaken research on aspects of seed storage and pre-treatments, and the planting material made available through this research has been used to establish an experimental silvicultural trial of *L. secundiflorum* planted beneath rubber trees that are no longer productive. Community-based trials concentrating on the introduction of rattans into agroforestry systems and enrichment planting of farm bush and secondary forest, within the legislative context of community forest management, have recently been established in Cameroon and will soon be followed by similar initiatives in Ghana and Nigeria. Annual growth rates as well as the economic viability of these cultivation systems are currently being monitored and assessed.

CONCLUSIONS

As essential biological, ecological and socio-economic information on the African rattan resource becomes available and suitable strategies to ensure sustainability are implemented, there is significant potential for the rattans of Africa to contribute, not only to regional development, but also to the global market. Through applied forest management regimes, and through the development of community-based management supported by appropriate legislatory frameworks, African rattans could provide an opportunity for the useful and sustainable development of rural areas as well as for forest conservation through extractive management. It is essential that baseline research contribute to the development and implementation of forest policy. The African Rattan Research Programme is working to provide the management guidelines necessary, within the context of national forest legislation, for sustainability strategies to be adopted and implemented adequately.

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