

Full Length Research Paper

# Harvesting and marketing of *Massularia* species in Cameroon and Nigeria

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Accepted 4 May, 2011

The forest, besides timber, contains many useful goods and services of subsistence and commercial value called Non Timber Forest Products (NTFPs). Falconer defines NTFPs as all forest goods and services, excluding commercial timber, that sustain rural people and rural economies. *Massularia* species as an NTFP is the stem of an ever green perennial shrub from the family *Rubiaceae* (G. Don) Bullock ex Hoyle. It is harvested from the study area and processed into local tooth brushes (chewing sticks). In a strive to meet set objectives, questionnaires and a selection of some participatory rural appraisal (PRA) tools were used to source information from NTFPs harvesters and traders on the occurrence, marketing and market channels for *Masularia* species in the study area. One species of *Massularia* (*Masularia acuminata*) was identified to be sourced and processed for the market from the study area. Harvesting and processing techniques for *M. acuminata* were characterized by the use of crude tools associated with resource degradation. Market prices were determined by a few buyers who had a monopoly of the *M. acuminata* market information system. ANOVA and t-test analysis showed no significant differences in quantities harvested within and between zones and the two seasons at  $p < 0.05$  level. Between 2003 and 2010, a total of 10,677,661.5 metric tons of *M. acuminata* were harvested from the study area and marketed. This was valued at about 14,728,775 FCFA (US\$ 24241.65) internally generated revenue (IGR) to the economies of Cameroon and Nigeria. In conclusion, the natural stock of *M. acuminata* in the study area is on a sharp decline due to unsustainable harvesting and poor land use patterns.

**Key words:** *Massularia acuminata*, harvesting, marketing, NTFPs. forest, products.

## INTRODUCTION

The forest, besides timber, contains many useful goods and services of subsistence and commercial value called Non-Timber Forest Products (NTFPs), which sustain rural people and rural economies. Today 75% of poor people in the world living in rural forest areas depend on NTFPs for their subsistence and 80% of forest people in the developing countries use NTFPs daily (Noubissie et al., 2008). In Central Africa, 65 million people living in or

around the rain forests depend on natural forest resources for their feeding (Noubissie et al., 2008). Adeyoju (1975), Ndoye et al. (1998) and Falconer (1990, 1992) consider NTFPs to include all forest goods and services, excluding commercial timber. In this context, NTFPs include such diverse products like animal parts, leaves, sticks, local building materials, edible fungi, medicinal plants, forest foods, sponges, chewing sticks, fibres, gums and rattan canes, among others. *Massularia* species as part of the NTFPs family are the stems of a perennial evergreen shrub from the family Rubiaceae that are harvested from the forests ecosystem and processed

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into chewing stick for the traditional brushing of teeth in Southern Nigeria. These products constitute rural industrial raw materials for the native chewing sticks industry, and cultural symbol for the Yoruba traditional medicine (Duncan et al., 1989; FAO, 1996; Nkwatoh, 2000). Despite this product's huge contribution to the traditional African dental care, the product has been a subject of neglect. Paddock and de Jong (1995) and Ndoye et al. (1997) maintain that, this neglect has been due to lack of appropriate information on the occurrences, prevalence, socio-economic and cultural potentials of the product in the developing economies of Central and West Africa. As part of the national and international drive to source adequate and appropriate information, on what constitutes the National and international Stock of NTFPs and their socio-economic situation in Cameroon, the Central and West Africa, this study assessed the harvesting and marketing of *Massularia* species in the study area as a contribution to this national and international drive.

## Objectives

- (1) Identify the *Massularia* species in the study area that are sourced for the market and other end uses.
- (2) Evaluate the harvesting and processing techniques for the identified species.
- (3) Evaluate the marketing and distribution of benefits along the marketing chain.
- (4) Assess the *Massularia* product quantities involved in local and external trade and its contribution to National and International Economies.

## THEORETICAL BACKGROUND

The value of global NTFP trade has been estimated to be about US\$11 billion, and NTFPs account for as much as 25% of the income of close to one billion people around the globe (Cavendish, 2003). As this economic potential has become increasingly recognized, NTFPs have appeared on the world forestry agenda, particularly in relation to small forest-based enterprises development and conservation activities (Cavendish, 2003).

In the Humid Lowlands of Central and West Africa (HULCWA), there are many of these products in use and their occurrence and prevalence vary among component ecological sub-zones and habitat types. In the past three decades, these NTFPs have attracted greater attention of prominent scholars in the sub-region whose research focus has been on the prevalence, phenology, genetics, domestication and socio-economics, of many of these species. Some of these scholars include Okafor (1981, 1986) who studied the edible indigenous fruit plants of Nigeria and their importance in the rural economy of Nigeria.

Egunjobi and Lawal (1973) studied the un-exploited

plant resources of Nigeria. Abort (1986) and Ladipo (1995) worked on the collection and conservation of the genetic resources of *Irvingia gabonensis* in West and Central Africa. Duncan and Mbenkum (1987), Nkwatoh (2000) and Shiembo (1996), looked at the ethno botany of the Korup National Park and its adjoining Forest Reserves, Popoola and Oluwalana (1998), Ndoye et al. (1998), Omoluabi (1994a, 1994b), Nkwatoh et al. (2010a), Sunderland et al. (2002) Ewane (2010) and Njeh (2010) studied the marketing channels of NTFPs in Cameroon and Nigeria. Despite all these research efforts, one of those problems facing the NTFPs and the *Masularia* species sector in Cameroon the Central and West Africa at large, is the lack of adequate correlated research that matches biological data with socio-economic activities of these products (Ndoye, 1995; Nkwatoh, 1995, 2000; Ayeni et al., 2003; Nkwatoh and Yinda, 2007).

## MATERIALS AND METHODS

### Study area

The study area (Ejagham Forest Reserve in Cameroon and its adjoining cross-border forest in the Cross River State of Nigeria) is located in the South West Region of Cameroon and in the Cross River State of Nigeria. It extends from latitude 50° 10' to 50° 70' W and from longitude 80° 47' to 90° 11' S. It occupies an area of about 640 km<sup>2</sup> (MINIPAT, 1987; SOWEDA, 2000). The study area has a humid tropical climate, characterized by a single short dry season (November to March) and a corresponding long wet season (April to October) of every year. The mean annual rainfall for the period of the study (2003 to 2010) was about 1134 mm with monthly peaks in July and August of every year (Gartland, 1986; Besongabang Weather Station, 2007).

The mean monthly temperature ranged between 24 and 27°C in February and January respectively and a maximum of 33.9°C in March of every year (Gartland, 1986; Besongabang Weather Station, 2007). The area is flat, with an altitude of approximately 50 m above sea level. It is drained by River Munaya in the North, and centrally by River Awa, the Cross River and a number of small streams. The vegetation of the area is of a closed-canopy, moist evergreen lowland rain forest of the Guinea-Congolian type (White, 1993).

The study made use of Biological and socio-economic assessment techniques. The socio-economic techniques, made use of the random sampling methods, questionnaires administration and a selection of some PRA tools, for the collection of data on the harvesting and trade/marketing of *Massularia* species in the study area. The line transect was used to evaluate the standing stock and the number of *Massularia* species in the study area.

### Sampling procedure and questionnaires administration

#### Site selection

The study area for the purpose of data collection was divided into three zones A, B and C.

Zone A: This consisted of villages that were 100% accessible by motorable road.

Zone B: This consisted of villages that were 40% accessible by motorable road

**Table 1.** Main sources of *Massularia acuminata* in the study area.

Ecosystem type	<i>Massularia</i> species	Level of abundance
Primary forest	<i>Massularia acuminata</i>	+++
Secondary forest	<i>Massularia acuminata</i>	++
Fallow land	<i>Massularia acuminata</i>	+
Farm land	<i>Massularia acuminata</i>	*

\* Absent (no stem per hectare), + Rare (1-2 stems per hectare), ++ Abundant (3 to 7 stems per hectare), +++ Highly abundant (8 stems and above per hectare).

Zone C: This consisted of villages that were not at all accessible by motorable roads.

From each of the zones, six villages were selected randomly with a total of 18 villages in all for the study. In each of the 18 villages, 50 questionnaires were administered giving a total of about 300 questionnaires per zone and 900 questionnaires in all.

#### Selection of respondents

One set of questionnaire divided into four sections A, B, C and D was administered onto Village Chiefs, Village Traditional Council members, traders of NTFP, farmers, *Massularia* harvesters, hunters, Agricultural and Forestry Extension Staff and other Forest Users Groups (FUGs).

#### Biological assessment technique

In order to complement the socio-economic data collected on the identified *Massularia* species in use, the Line transects technique as described by Sunderland and Tchouto (1999), Burnham et al. (1980) and Buckland et al. (1993) was employed. In each of the selected villages in the three zones, three 1 km line transects were established at 50 m apart in each habitat type. These transects were established at a predetermined compass bearing, perpendicular to the main access path from the village into these habitat types and parallel to each other. Along each transect, within the range of 20 m on both sides of the central line a 100% search and recording of all the *Massularia* species cited was carried out. During the enumeration exercise, habitat types that had no *Masularia* individuals were tagged habitats of absent abundance. Those with *Massularia* individuals less than two per hectare were considered zones of rare abundance. On the other hand, habitat types that recorded three to seven *Massularia* individuals were considered zones of *Massularia* species abundance while zones with eight individuals and above were tagged habitats of high abundance or highly abundance habitats.

Descriptive statistics such as frequency distribution and tabular analysis of the respondent's dispositions and attitudes was employed for analysis. Non-parametric statistics (ANOVA, T-test) were used for the establishment of significant differences of *Massularia* quantities harvested between the zones and the seasons. Trade margin analysis was employed to determine the distribution of benefits along the *Massularia* trade chain.

## RESULT

### Occurrence of *Massularia* species in the study area

One species of *Massularia* (*Massularia acuminata*) commonly referred to as "kwako Yoruba or Yoruba

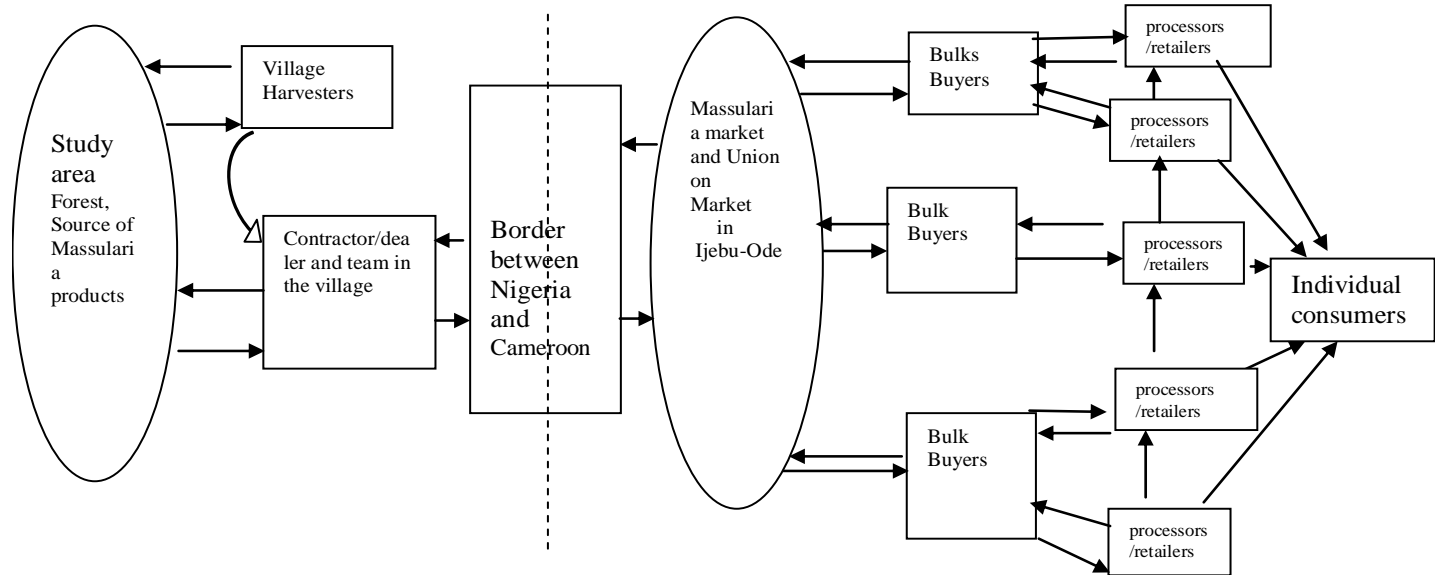
chewing stick" was identified to be harvested in the study area and processed for the market. It is a perennial evergreen shrub, belonging to the family Rubiaceae. The plant flowers in June followed by fruiting in October. It produces fairly straight unbranched stems which are harvested and processed into *Massularia* tooth brushes for use in Cameroon and Southern Nigeria.

### Main sources of *M. acuminata* in the study area

*M. acuminata* in the study area is sourced from different ecosystems or habitat type. Each ecosystem as a result of its basic characteristic such as the degree of shade, determines the level of abundance of the product. *M. acuminata* as a highly shade loving plant, was more prominent in the primary forest habitat and rare on farm lands where shade was virtually absent. Table 1 gives a summary of these analyses.

### Harvesting and processing techniques for *M. acuminata* (Yoruba chewing sticks)

Harvesting of *M. acuminata* is done using cutlasses and small locally made axes by a team of hired harvesters from the Cross River State of Nigeria and some local village based harvesters trained by the Nigerian harvesters. These harvesters use these crude implements in cutting *M. acuminata* stems between 1.5 and 0.5 cm above ground level. In most cases, *M. acuminata* stems are cut below ground level making it difficult for the parent plant to initiate effective coppicing, leading to resource degradation. This practice was observed to be going on in the study area unabated, without any checks either from the traditional village administration or the Forestry administration. When these stems are harvested, they are debranched and carried to bundling points. At these points, the harvested stems are cross cut into 1 m long sticks and tied into bundles of about 30 stems each. These bundles are transported to road sides or river sides (assembly points) by head load for further transportation either by boat or lorry to the Ijebu-Ode market centre. At the assembly point, the products are kept under shade or covered with vegetation to prevent them from losing too much moisture. When the product is



**Figure 1.** Schematic diagram for *M. acuminata* market cycle and channel.

allowed to lose much water with a corresponding drop in the moisture content, the market value is lost. When ever this happens, the dried out stock is normally abandoned at the point of value lost to rot away or used as fuel wood. Zones that were 100% accessible by motorable road were the most heavily exploited. This explains why heavy stock depletions were observed in zone A followed by zone B and zone C respectively. There exists no Civil Society Organization in the area for the sensitization of villagers, harvesters and other stakeholders on the best harvesting methods that are ecosystem protective and resource conservative.

## Uses

It is used as a medicinal plant for the treatment of mouth odors and for the production of tooth brushes (chewing sticks) for the traditional brushing of teeth by the Yoruba tribe in Nigeria and other West African countries.

## Marketing of *M. acuminata*

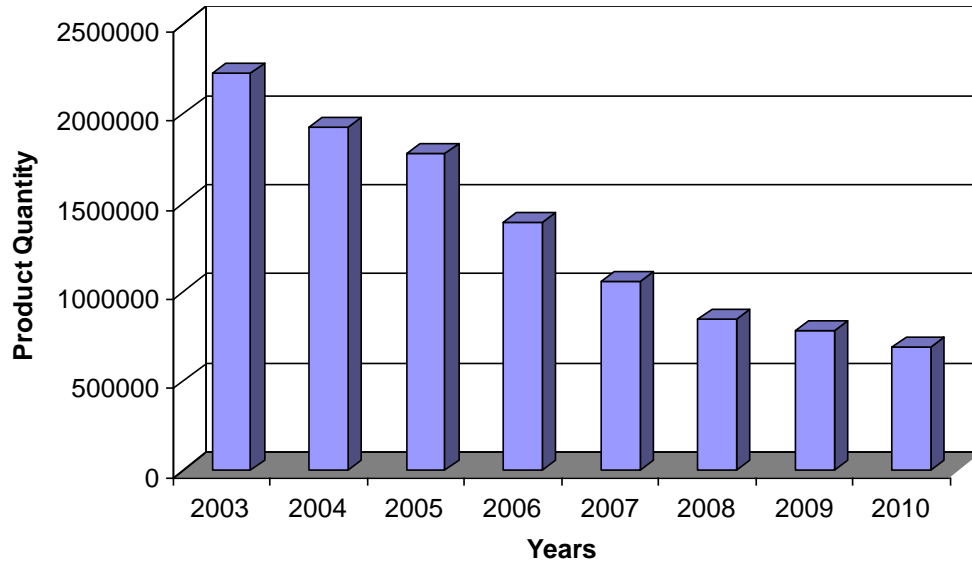
In the study area *M. acuminata* is harvested for commercial purposes by two groups of harvesters. One of the groups is a local village based group, while the other is a contractor/dealer with a team of hired harvesters from the Cross River State of Nigeria. The village based harvesters go to the forest, harvest *M. acuminata* stems and tie the harvested stock into bundles and transport them to the product assembly points (roadside or Riverside). At these points the harvested stock is sold to the *Massularia* contractor/dealer from the

Ijebu-Ode market centre. The contractor/dealer after buying from the harvesters re-bundles and transport the stock across the border to Ijebu-Ode in Western Nigeria, the biggest *M. acuminata* (Yoruba chewing stick) market centre in West and Central Africa.

On the other hand, the contractor/dealer from outside the village brings into the village groups of hired harvesters between 7 and 15 persons per group for the harvesting of *M. acuminata*. The contractor/dealer on arrival in the village with his team negotiates and pays for a harvesting fee to the Village Traditional Council (VTC) in whose forest area he will be carrying out harvesting. This harvesting fee is paid based on the length of time the contractor/dealer and his team will spend in the forest for the harvesting of *M. acuminata* and not on the quantity of product harvested. This amount varies from village to village and ranges between 5000 FCFA to 40,000 FCFA (10 to 80 US \$) per month.

## Trade cycle and market channel for *M. acuminata*

In the study area forest as Figure 1 puts it, local village-based harvesters, go to the forest and harvest *M. acuminata* and sell their harvest to the contractor/dealer at the point of bundle rearrangement in the forest. The contractor/dealer on the other hand, after paying for the harvesting fees, goes to the forest with his team of hired harvesters from outside the village to harvest *M. acuminata*. After every successful harvest and bundling, the contractor/dealer transports his stock across the border to the Ijebu-Ode market centre. At the Ijebu-Ode market, the union of *M. acuminata* facilitates the transfer of the stock from the hands of the contractor/dealer into



**Figure 2.** Quantities of *M. acuminata* traded between 2003 to 2010 in tons.

the hands of bulk buyers of *M. acuminata* who have come into the market from their individual towns and cities in Nigeria. The bulk buyers after buying the *M. acuminata* stocks transport their stocks to their individual towns and cities of origin. At their locations of origins, the bulk buyers supply *M. acuminata* to individual processors/retailers. The processors/retailers on their part, transform the bought stock into tooth brushes for sale to consumers. In some instances when some processors/retailers run out of *M. acuminata* stocks, they get supplementary small stocks from their fellow processors/retailers for immediate transformation and supply to their consumers.

The double arrows in Figure 1 indicate the directional movement of actors into and out of the forest ecosystem and marketing systems in Cameroon and in Nigeria respectively. It also indicates the interaction that exist between the actors along the *M. acuminata* market cycle and channel. The *M. acuminata* market cycle takes about two months for the cycle to be completed.

#### **Market margin for *M. acuminata* actors**

Producers (local village based harvesters) total cost was estimated at 49200 FCFA (\$ 98.4 US\$). Producers selling price on average for the three zones was estimated at 72000 FCFA (\$ 144 US\$). The difference between the aforementioned presented cost and selling prices gave a margin of 22800 FCFA (\$ 45.6 US\$) for each of the three zones respectively to the producers. This yielded a corresponding return to investment of about 46.3% for the producers. The contractors/dealers as a second group of actors total cost was estimated at 87,000 FCFA. On the Ijebu-Ode Market, contractors/dealers sold at 123,000 FCFA. The difference between

the estimated cost and selling price of contractors/dealers gave them a margin of 46,000 FCFA with a corresponding return to investment of about 53%.

#### **Quantities of *M. acuminata* traded between 2003 and 2010**

*Massularia* quantities traded in the study area between 2003 and 2010 varied significantly from zone A to zone C at the  $P = 0.05$  level of significance. T-test analysis, which compared the means of the product with respect to the two seasons, revealed that *M. acuminata* showed significant variation in quantity harvested and sold in the two seasons at the  $P = 0.05$  level of significance. As Figure 2 puts it, the quantity of *M. acuminata* harvested, processed and sold from the study area has been on the decline from 2003 to 2010.

The quantities of *M. acuminata* involved in the cross boarder trade in Masularia between Cameroon and Nigeria from 2003 to 2010 was about 10,677,661.5 metric tons contributing a total of about 14,728,775 FCFA (US\$ 24241.65) to the economies of Cameroon and Nigeria.

## **DISCUSSION**

### **Habitat type and *M. acuminata* level of abundance**

*M. acuminata* stock appeared to be highly abundant in the primary forest and relatively abundant in the secondary forest ecosystems of the study area. As Nkwatoh (1995, 2000), Nkwatoh et al. (2010b) and Bessong (1997) put it, this is not unconnected to the plant's high shade tolerant nature. This explained why as shade decreased from the primary forest to farm land as

shown in Table 1, *M. acuminata* level of abundance dropped accordingly with habitat change.

### ***M. acuminata* level of abundance and road accessibility**

*M. acuminata* stocks were observed to be vigorously exploited in zones of higher access than in zones of no access. This agrees with the work of Nkwatoh and Yinda (2007), Sunderland et al. (2002) and F A O (1996) who in their separate studies of NTFPs in Cameroon and Kenya, demonstrated that NTFPs were heavily harvested in areas close to human settlement than in areas far off these same settlements where road accessibility was 100%.

### **Impact of different harvesting methods on *M. acuminata* stock sustainability**

The stock of *M. acuminata* as Figure 2 illustrates is on a steady decline from 2003 to 2010 in the study area. This was attributed to the unsustainable harvesting methods that have turned out to impede natural regeneration of *M. acuminata*. In accordance with inventory result, out of every ten harvested *M. acuminata* stems in the study area, seven were observed to be cut below the ground level with stump heights that impeded coppicing and encouraged loss of natural stock. In addition to the aforementioned, the slash and burn farming practice and timber exploitation in the study area have emerged in recent years as the main degrader of the primary forest ecosystem and the species there in (Ewane, 2010; Ndoye et al., 1997; Nkwatoh, 1995, 2000; Nkwatoh and Yinda, 2007; Besong, 1997; Adekunle, 1971). Things might have been different if there exists a Civil Society Organization and trained manpower on the bench of the Forestry service in the area that has an acceptable capacity for the sensitization of villagers, harvesters and other stakeholders on the best harvesting methods for *M. acuminata* resource (Nkwatoh, 1995; Nkwatoh et al., 2010b).

In a way to reduce the rising trend of resource degradation, a monitoring system could be put in place by the forestry service and the villagers to check the unsustainable methods of harvesting that are ecosystem destructive. On the other hand, *M. acuminata* harvesting could be done with improved harvesting equipment that should cut the stems at least 3 cm above ground level to encourage coppicing as well as the reforestation of degraded areas with *M. acuminata* saplings.

### **Marketing and market margins for *M. acuminata***

Producers of *M. acuminata* in general within the study

area had a very low margin while contractors/dealer and bulk buyers of *M. acuminata* enjoyed a higher margin of benefits along the trade chain. This was attributed to the fact that *M. acuminata* market information remained a monopolistic secret amongst the contractors/dealers and bulk buyers. As Vabi (1995), Ndumbe (2010) and Ndoye et al. (1997) put it, this is very common with the buying and selling of NTFPs whose market structure and organization is characterized by the cartel phenomenon. On the other hand, variation in margins with respect to zones was observed to be insignificant at the  $P = 0.05$  level for producers. As Nkwatoh (2000) and Omoluabi (1994b) examined in their separate works, this is not unrelated to the low pricing of NTFPs at the country side or their point of origin (forest gates). Contractors/dealers, variation in margins with respect to zones were observed to be insignificant at the  $P = 0.05$  level in all the zones. This could be attributed to the fact that contractors/dealers of zone A who bought at a higher price than those of zones B and C respectively enjoyed a comfortable low transportation cost position because of the zone's easy accessibility. This fall in transport cost compensated the high prices paid in zone A. Though the *M. acuminata* sector is vital to the growth and development of local and national economies of Cameroon, its contribution could be more if the product is sustainably harvested and well priced.

### **Conclusion**

The natural stock of *M. acuminata* (Yoruba chewing sticks) in the area is on a steady decline in quantity and quality as a result of poor land use and harvesting methods.

The structure of the *M. acuminata* (Yoruba chewing sticks) trade in the study area tends to benefit the contractors/dealers more than the producers.

### **RECOMMENDATIONS**

Cameroon forest policy should be revised with a focus on selecting the best harvesting methods for NTFPs so as to ensure sustainability.

Further research should be carried out on the medicinal value of *M. acuminata* in the traditional dental industry.

### **ACKNOWLEDGEMENT**

We wish to thank the African Forestry Action Network (AFORNET) and the University of Buea for their financial assistance. We are equally very grateful to the VTCs, Village Chiefs, villagers and our data collectors for their wonderful cooperation with us during the conduct of this work.

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