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*Full Length Research Paper*

# Evaluation of *Carpolobia* species (Hausa sticks) trade in the forest zones of South West Cameroon and Cross River State of Nigeria

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**Carpolobia trade evaluation was carried out between 2003 and June 2010 in the Ejagham Forest Reserve of South West Cameroon and the Cross River State of Nigeria, with the objective of examining the harvesting, marketing and the economic contributions of Carpolobia trade to the National and International economies of Nigeria and Cameroon. *Carpolobia* as a Non Timber Forest Product (NTFP) is the stem of an ever green shrub from the family *Polygalaceae* that is harvested from the forest ecosystem, processed into a cattle control and walking stick (locally known as Hausa sticks), and marketed in Cameroon and Nigeria. In order to achieve the set objectives of the study, the line transect was used to assess species level of abundance while questionnaire and a selection of Participatory Rural Appraisal (PRA) tools were employed to gather information on the species season of occurrence, harvesting and trade/marketing from *Carpolobia* species harvesters and other forest user groups in the study area. Analysis of collected data revealed that two species of *Carpolobia* are found in the study area (*Carpolobia lutea, and Carpolobia alba*). *C. lutea* was the most economically valued species for the *Carpolobia* species trade. The sourcing and processing of *C. lutea* for the market was found to be characterized by the use of locally made tools that destructively cut the plant below the ground level with little room for natural regeneration. Market prices for *C. lutea* were found to be determined by the contractors who acted as cartel. ANOVA and t-test analysis showed significant differences in product quantities within and between zones and the two seasons of the year at the $P<0.05$ level of significance. A total of 16,103,065.2 tons of *C. lutea* were produced and traded between 2003 and June 2010, valued at about 24,076,915 F CFA (US$ 48,153.83) as internally generated revenue (IGR) to the economies of Cameroon and Nigeria. The natural stock of *Carpolobia* species *in* the study area is on a sharp decline due to unsustainable harvesting.**

**Key words:** *Carpolobia,* harvesting, trade/marketing, non timber forest products (NTFPs), contractors.

## INTRODUCTION

The forest in addition to containing timber, also contain many useful goods and services of subsistence and commercial value referred to as NTFPs, that serve as a source of livelihood to rural people. On a broad base scale, it is only recently that greater attention has been paid to the ability of NTFPs to add significantly to the value of forests from the recognition of their true economic potentials for the forest dependent communities (Ndoye and Tieguhong, 2004; Ndoye et al., 1998). FAO (2001) defined Non-Timber Forest Products as goods of biological origin other than timber derived from the forest, other wooded lands and trees outside the forest ecosystem. On the other hand, Falconer (1990, 1992), Adeyoju (1975), and Ndoye et al. (1998), consider

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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 material, edible fungi, medicinal plants, forest fruits and nuts, sponges, walking sticks, fibres, gums and rattan canes, among others. *Carpolobia* species as an NTFP is the stem of an ever green shrub from the family *Polygalaceae.* These products are harvested from the study area forest ecosystem, processed into local cattle control and walking sticks (Hausa sticks), and marketed in Nigeria, Cameroon, Tchad, Niger Republic, Sudan and other African countries where Pastoral Cattle Fulani are found (Sunderland et al., 2004; Sunderland and Clark, 2004; Nkwatoh et al., 2010a). *Carpolobia* species constitutes raw material for the local cattle grazing industry and a cultural symbol for the Fulani traditional marriages and the Ejagham community of South West Cameroon (Duncan et al., 1989; FAO, 1998; Nkwatoh et al., 2010b).

Despite this product's contribution to the Fulani and the Ejagham culture, as well as the traditional cattle grazing industry, the product has not been a subject of present day research focus. Padoch and de Jong (1995) and Ndoye et al. (1997) maintain that, this neglect has been due to the lack of appropriate information on the occurrences, prevalence, socio-economic and cultural potentials of these products in the developing and the developed economies of the world. Vantomme (2003) further elucidated that statistical data on *Carpolobia* and the entire NTFPs sector in general are incomplete, scattered and to a large extent absent. This has failed to provide policy makers with a solid base for decision making at the national and international levels. It was from the back drop of these lapses and data gaps that the inspiration for this research work developed.

## Theoretical framework

Tropical forests ecosystem which is treasured as a great habitat for a multiplicity of NTFPs are however, being lost at an increasing rate in Africa and other parts of the world through timber exploitation, conversion into agricultural land and other developmental activities (Noubissie et al., 2008). The Humid Tropical Lowlands of Central and West Africa (HUTLCWA) that is at the moment facing increasing rate of depletion, still contains a wide Variety of NTFPs such as *Carpolobia*, whose occurrence and prevalence vary among component ecological sub-zones and habitat types (Comiskey et al., 2003). In the past three decades, these NTFPs have attracted greater attention of scientists in the sub-region. These eminent scientists include Okafor (1981, 1986) who focused his research work on improving the yield and quality of edible indigenous fruit plants such as *Irvingia gabonensis* and their importance in the rural economy of Nigeria. Egunjobi and Lawal (1993) studied the un-exploited plant resources of Nigeria and the importance of these plant resources to the conservation of the Nigerian biodiversity. Agbor (1986) and Ladipo (1995) worked on the collection methods for *I. gabonensis* and the need for the conservation of the genetic resources of *I. gabonensis* in view of its outstanding contribution to the rural and urban food baskets in West and Central Africa. Duncan and Mbenkum (1987), Nkwatoh (2000), Shiembo et al. (1996), in their individual investigations looked at the global abundance of NTFPs and the ethno botany of the Korup National Park and its adjoining Forest Reserves with the view of developing a holistic strategy for a collaborative management of the Korup National Park with the surrounding local communities and other stakeholders. Popoola and Oluwalana (1998), Ndoye et al. (1998), Omoluabi (1994a, b), Nkwatoh (2000), Ewane (2010), Ndumbe (2010) and Nkwatoh et al. (2010a, b) studied the marketing of NTFPs in Cameroon and Nigeria.

These researchers on their individual benches looked at market chains, channel and the distribution of benefits along the marketing chain to actors. The issue of trade and NTFPs ecological integrity was equally assessed. Despite all these research efforts, one of the major problems facing the NTFPs sector today in Cameroon, Central and West Africa at large, is the absence of any correlated research work that matches biological data with socio-economic activities on *Carpolobia* species (Ndoye, 1995; Nkwatoh, 1995, 2000; Nkwatoh and Yinda, 2007). As part of the national and international strive to source adequate information to close up the knowledge gaps on NTFPs in Cameroon, Central and West Africa, this study assessed the harvesting and marketing of *Carpolobia* species in Cameroon and Nigeria. To achieve this, the study examined the following specific objectives:

(1) Identify the species of *Carpolobia* in the study area that are sourced for the market and other end uses;
(2) Assess habitat types and *Carpolobia* species level of abundance per habitat;
(3) Evaluate the collection/harvesting and processing techniques for the identified species;
(4) Evaluate the marketing and distribution of benefits along the market;
(5) Assess the *Carpolobia* quantities involved in local and external trade and its contribution to National and International Economies of Cameroon and Nigeria.

## 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$^2$ (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).

## METHODOLOGY

The study employed biological and socio-economic assessment techniques. The socio-economic techniques made use of the random and purposive sampling for the selection of villages and the respondents for questionnaire administration. Along side theses sampling techniques, some selected participatory rural appraisal (PRA) tools such as focused group discussions, ranking, transect walk, seasonal calendar, historical time line, triangulation, visual assessments, and key informants, were employed for the collection of data on the seasons of occurrence, harvesting techniques, harvesting equipments and trade/marketing of *Carpolobia* species in the study area. Scale balances were employed for the weighing of Carpolobia species.

### Sampling procedure and questionnaire administration

#### *Site selection*

The study area for the purposes of data collection was divided into three zones A, B and C based on accessibility for data collection:

**Zone A:** This consisted of villages that were 100% accessible by motorable roads.
**Zone B:** This consisted of villages that were 40% accessible by motorable road
**Zone C:** This consisted of villages that were not accessible by motorable roads at all.

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. One set of Questionnaire divided into four sections A, B, C and D was administered to selected respondents in the study area. Section A and B captured data on demography, season of occurrence, harvesters, man hours spent on harvesting, harvesting points/ habitat, appreciation of level of abundance, processing, harvesting techniques and bundling of *Carpolobia* species.

On the other hand, sections C and D collected information on the harvesting fees, grading, transportation prices, actors along the trade chain (buyers, sellers, sex,) trade cycle, trade union, entry points and barriers, taxes and quantities of *Carpolobia* species in trade. Scale balances were used at the *Carpolobia* species bundles rearrangement and grading points for the weighing of a number of carpolobia bundles (557) to establish the average weight of a bundle of *Carpolobia* which was later used for the estimation of total quantity harvested and traded in the study area for the study period. After all the measurements were done in kilograms, this was then converted to tons by dividing the quantity in kilograms by 1000 kg to get the weight in tons.

#### *Selection of respondents*

The sections A and B of the questionnaire which was made up of open ended questions in conjunction with appropriate PRA tools, was administered to Village Chiefs, Village Traditional Council members, *Carpolobia* harvesters, hunters, farms and other forest users, as these groups of respondents were believed to provide the necessary information that these two sections of the questionnaire was out to collect. On the other hand, sections C and D which was made up of a mixture of open ended and close questions in conjunction with appropriate PRA tools, was administered to traders of NTFPs in general, *Carpolobia* species traders in particular, transporters of NTFPs and border post agricultural and forestry extension staff. These groups of respondents were targeted because they were deemed to treasure a monopoly of information about the marketing and quantities of *Carpolobia* species in trade. In cases where our respondents could not read and write, focused group discussions and semi-structured interviews were held with respondents using the questionnaire, while the note taker completed the questionnaire as the interview progressed to the end. In cases where respondents could read and write, the questionnaires were completed by the respondents.

#### *Biological assessment technique*

In order to complement the socio-economic data collected on the identified *Carpolobia* species in trade, the Line transects technique as described by Sunderland and Tchouto (1999), Burnham et al. (1993) and Buckland et al. (1993) was employed. In each of the selected villages in the three zones, 3 one 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 *Carpolobia* species stems cited was carried out. During the enumeration exercise, habitat types that had no *Carpolobia* individuals were tagged habitats of absent abundance. Those with *Carpolobia* individuals less than two per ha were considered zones of rare abundance. On the other hand, habitat types that recorded 3 to 7 *Carpolobia* individuals were considered zones of *Carpolobia* species abundance, while zones with eight individuals and above were tagged habitats of high abundance or highly abundance habitats.

#### *Analytical procedure*

Descriptive statistics such as frequency distribution and tabular analysis of the respondent's dispositions and attitudes was employed for consideration. Non-parametric statistics (ANOVA, T-test) were used for the establishment of significant differences in the quantities of *Carpolobia* species in trade, the seasons of occurrence as well as quantities harvested per zone. Trade margin analysis was employed to determine the distribution of benefits along the *Carpolobia* marketing chain. This was given by the

**Table 1.** Main sources of *Carpolobia* species in the study area.

| Ecosystem type | *Carpolobia* species | Degree of abundance |
|---|---|---|
| Primary forest | *C. lutea* | +++ |
| | *C. alba.* | +++ |
| Secondary Forest | *C. lutea* | ++ |
| | *C. alba.* | ++ |
| Fallow land | *C. lutea* | * |
| | *C. alba* | + |
| Farm land | *C. lutea* | * |
| | *C. alba* | * |

* Absent (no stem per ha), + rare (1 to 2 stems per ha), ++ Abundant (3 to 7 stems per ha), +++ highly abundant (8 stems and above per ha).

general model:

M = S–C

Where; M = market margin, S = Total sales; C = Total cost of production.

## RESULTS

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

Two species of *Carpolobia* occur in the study area (*Carpolobia lutea* and *Carpolobia alba) C. lutea* was found to be the species that are harvested from the study area and processed for the market.

### Sources of *Carpolobia* species and their degree of abundance

*C. lutea* 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 and level of habitat disturbance, determines the level of abundance of the product. *C. lutea* as a highly shade loving plant and sensitive to human disturbance was more prominent in the primary forest habitat and rare on farm lands where no shade and high human disturbance was absolute. Table 1 gives a summary of these analyses.

### Processing techniques for *C. lutea* (Hausa sticks)

The harvesting of *C. lutea* is carried out throughout the year, using a very sharp locally made axe. This equipment is used in cutting the plant below the ground level. This mode of harvesting, leaves behind an average stump height of 1 cm below ground level which impedes coppicing. In any ten harvested cases in the study area, 90% of plants harvested are cut below ground level. They are debranched and cut into a commercial height of 1.8 m sticks and tied into small bundles of about 20 to 30 stems per bundle. These small bundles are transported from the point of harvest to road sides or river sides which are points of bundle rearrangements and grading. The grading of harvested stock is based on the following parameters:

1) Size of the main stem (stick);
2) Size of the base of the stem (stick); and
3) Straightness of the stem (stick).

Sticks with very straight stem structure with middle diameter of stick ranging between 1 to 2 cm and basal diameter ranging between 1.5 to 5 cm are graded I, and these are bundled separately. Sticks that have undulations along their course, with same middle and basal diameters as in grade 1, are marketed as grade II, Sticks with diameters at the middle above 3 cm are tagged grade III, while very small ones with diameter at the middle falling below I cm are not graded and are simply classified as rejects.

The bundling of *Carpolobia* in grades has a lot to do with consumers' preference and price. During re-bundling, rejects and grade III were observed to be very few. This was because harvesting of the stock was observed to be associated with a very high level of selectivity by harvesters. In accordance with the spirit of high level selectivity, harvesters moved on average 5 km from start point from one part of the forest to another, in search of the species and secondly in search of stock of the best grade. Thirdly, bundle rearrangement was always accompanied with the straightening of the crooked sticks with the hands, head and knee caps so that they can fit into the most preferred grade bundles.

After grading, the sticks are tied into big bundles, each containing between 50 to70 stems. These big bundles are transported to Ikom in Cross River State, Nigeria by boat, if at a riverside or by lorry if at a road side.

**Uses**

*C. lutea* is used by the cattle Fulani tribe of Northern Cameroon and Nigeria, Niger Republic, Chad, Sudan and other countries for the guiding and control of cattle during grazing. The same tribe also treasures it for endurance test flogging of potential suitors during traditional marriages. On the other hand, the Ejagham tribe of South West Cameroon and the Cross River State of Nigeria use it as a traditional candle stick. This is because of the ability of the plant to burn unabatedly at the same time providing light (local lamp) which helps night movement from one village to the other in the absence of bush lamp or touch lamp.

**Marketing cycle and channels for *C. lutea* (Hausa sticks)**

*C. lutea* is harvested in the study area by local village based harvesters and a contractor with his team of harvesters. The contractor comes into the study area with a team of about 5 to 15 people per team from Plateau, Adamawa and Taraba States of Nigeria. The team leader who is the contractor, negotiates with the Village Traditional Council (VTC) on the amount he will pay as harvesting fees (60,000 CFA to 100,000 FCFA (120 to 200 US $) for harvesting in the village forest area for a period of two months. When this negotiation is concluded, the contractor is given the permission to go into the forest and establish a camp and commence harvesting. During the negotiated period, harvesting is done and harvested stock assembled and packed around the camp. Meanwhile, as harvesting is being done within the negotiated period, the team leader shuttles between the village and Ikom market centre to dispose of what has been harvested and get money in return for the payment of the hired harvesters and new negotiation fees. When the negotiated period is over, the contractor renegotiates, renew his mandate and continue harvesting or leaves the village for another village where a new contract is established.

At any time, the team would have harvested between 87 and 100 bundles, the contractor re-arranges and grades these sticks into about twenty big marketable bundles and transports them to the Ikom market centre where he with the help of the Carpolobia union supplies bulk buyers of the product from the Northern parts of Nigeria and Cameroon as well as other African countries. There exists a Union of *C. lutea* marketers on the Ikom market centre. The Union acts as a facilitator between the contractors and the bulk buyers. In some cases, contractors are pre-sponsored by the Union to undertake harvesting in the study area for eventual supply to the market. Villagers who undertake the harvesting of Carpolobia in the village forest area do it as hired labourers of the contractor, and subject to his supervision to ensure that the desired quality product is harvested. At the end of their harvesting exercise, they are paid for their labour.

**Market margins for *C. lutea***

The total cost of harvesting and paying Village Traditional Council levy and labour for harvesting and transporting to re-arrangement points was estimated to be 342,500 FCFA (US$ 285) for 370 bundles of *Carpolobia* for the contractor. These 370 bundles which was estimated to be the average harvest for the two months, were sold at an average price of about 1425 FCFA (US$ 2.85) per bundle to bulk buyers after all expenses (harvesting fees, labour, feeding, transportation to Ikom, forestry charges). This gave the contractors an estimated selling price for the 370 bundles of about 527,250 FCFA (US$ 1054.5) giving the contractor a margin of 184,750 CFA (US$ 369.5) with a corresponding return to investment of about 54% for all the three zones. On the bulk buyers bench, total cost of buying the products was estimated at 527,250 FCFA (US$ 1054.5). The bulk buyers after all other expenses (transportation, forestry charges, and feeding lodging, Union and market fees) sold the product in their towns and cities at 744,250F CFA (US$ 1488.5) on average, with a corresponding return to investment of 41%. From the aforestated analysis, contractors of *Carpolobi*a along the trade chain in the study area generated more benefits from the trade than the villagers and the bulk buyers of the products.

**Quantities of *Carpolobia* traded between 2003 and June 2010**

Quantities of *C. lutea* that was involved in the product trade in the study area from 2003 to June 2010 varied significantly from zone A to C at the P = 0.05 level of significance. T-test analysis, which compared the means of the products with respect to the two seasons, showed no variation at the P = 0.05 level of significance. As Figure 2 shows the quantity of *C. lutea* harvested and sold from the study area from 2003 to June 2010 has been on a steady decline.

**DISCUSSION**

**Habitat type and *Carpolobia species* level of abundance**

*Carpolobia* species (C. *lutea* and *C. alba*) are highly abundant in the primary forest moderately abundant in

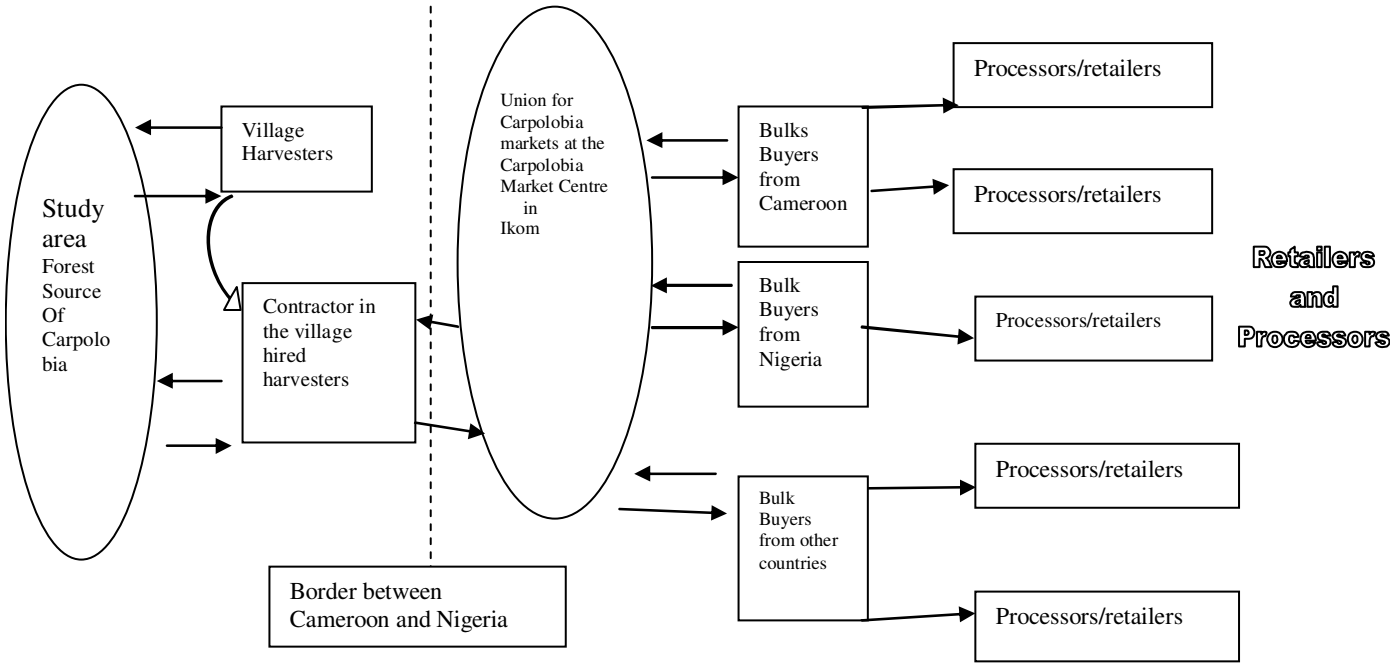


**Figure 1.** Schematic diagram for *Carpolobia* marketing cycle and channels.

the secondary forest ecosystems, rare in fallows and absent on farm lands of the study area. This as stated in Nkwatoh (1995, 2000), Nkwatoh et al. (2010b) and Bessong (1997), is not unconnected to the plant's high sensitivity to disturbed natural habitats. This explains why as disturbance increased from the primary forest to the secondary forest, fallow and farm lands as shown in Table 1, *Carpolobia* species level of abundance dropped accordingly with habitat change and degree of modification.

### *Carpolobia* species level of abundance and road accessibility

*C. lutea* was observed to be intensively 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), FAO (1998) who in their separate studies on 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 *Carpolobia* species stock sustainability

The stock of *Carpolobia species* as Figure 2 illustrates is on a decline from 2003 to 2010 in the study area. This according to Nkwatoh (1995, 2000), Nkwatoh and Yinda (2007), Besong (1997), and Adekunle (1971), is as a result of the fact that the harvesting of *C. lutea* products in the study area is ecosystem destructive. This unsustainable harvesting method has turn out to impede natural regeneration of *C. lutea*. In accordance with inventory result, out of every ten harvested *C. lutea* stems in the study area, nine 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; Sunderland, 2004; Ndoye et al., 1997; Nkwatoh, 1995, 2000; Nkwatoh and Yinda, 2007; Besong, 1997; Adekunle, 1971). Things might have been different if there existed 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 *C. lutea* 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, *C. lutea* harvesting could be done with improved harvesting equipment that should cut the stems at least 3 cm above ground level to encourage coppicing. This, as our findings revealed, will make the product loose its market value as the Fulani

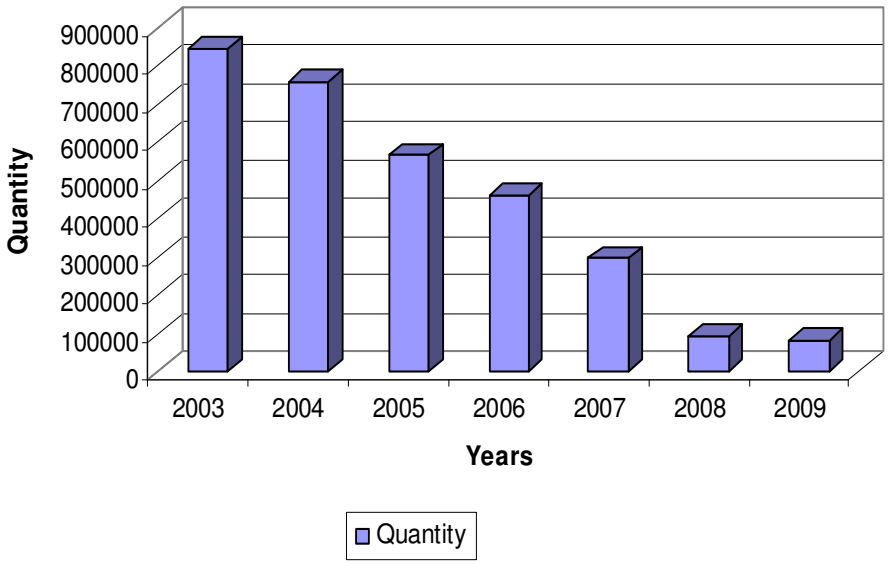


**Figure 2.** Traded quantities of *Carpolobia* species between 2003 to June 2010 in tons.

communities that are the end users of the product, value it for the basal nod for ease of gripping during its use as a walking and cattle control stick.

### Marketing and market margins for *C. lutea*

Producers of *C. lutea* (Village Traditional Councils) in general within the study area had a very low margin as harvesting fees cannot in any way constitute the production price of monthly quantities harvested. Contractors on a general scale enjoyed a higher trade margin than the bulk buyers of *C. lutea* along the trade chain. This was attributed to the fact that *C. lutea* cross border market information remained a monopolistic secret amongst the contractors. Thus as Vabi (1995), Ndumbe (2010) and Ndoye et al. (1997) state, it is very common with the buying and selling of NTFPs, whose market structure and organization is characterized by the cartel phenomenon. Secondly, the payment of additional inter state and inter country forestry and transportation charges by the bulk buyers contributed in the reduction of their margin of benefit. These bulk buyers incurred these costs in the course of the evacuation of their bought stock from the Ikom market centre in Cross River State of Nigeria, to the towns and cities of their States and Regions of origin. On the other hand, variation in margins with respect to zones was observed to be insignificant at the P= 0.05 level for producers. Thus as Nkwatoh (2000) and Omoluabi (1994b) examined in their separate works, it is not un-related to the low pricing of NTFPs at the country side or their point of origin (forest gates). Contractors variation in margins with respect to zones were observed to be significant at the P= 0.05 level in all the zones. This could be attributed to the fact that contractors 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 zones easy accessibility. This fall in transport cost compensated the high prices paid in zone A. Though the *C. lutea* sector is vital to the growth and development of local and national economies of Cameroon, this in the long run cannot be guaranteed, as a result of the unsustainable exploitation of the plant that is ecosystem destructive.

## Conclusion

The natural stock of *Carpolobia in* the study area has witnessed a sharp decline in quality as a result of the unsustainable methods that are used in the harvesting of the product by the contractors. Though the *C. lutea* trade is vital to the growth and development of the local economy, this is not sustainable as the products are poorly harvested and priced. Contractors of *Carpolobi*a in the study area generated more benefits from the *Carpolobia* trade than the bulk buyers of the products along the trade chain. The harvesting methods are poor, ecosystem destructive and unsustainable.

## RECOMMENDATION

*Carpolobia* harvesting should be done with improved harvesting equipment that should cut the stems at least 3 cm above ground level to encourage coppicing and sustainable development. Reforestation of degraded

areas should be carried out with *Carpolobia* saplings by the Forestry Department and villagers of the study area.

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