

Market Chain Analysis of *Garcinia manii* in the Frontier Forest Zones of South West Cameroon and the Cross River State of Nigeria

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Abstract

The forest as a main source of timber contains many other useful goods and services of subsistence and commercial value called Non Timber Forest Products (NTFPs) that supports rural people and their economies. NTFPs are defined as all forest goods and services, excluding commercial timber. *Garcinia manii* as part of the NTFPs family, are the stems (logs) of a perennial tall evergreen forest tree of about 3m to 9m tall, from the family Garciniaceae that are harvested from the South West of Cameroon and the cross River State of Nigeria forest ecosystem. The product when exploited is marketed in Nigeria for the production of traditional tooth brush commonly used by the Ibo tribe of Nigeria. In an attempt to realise set objectives, market chain analysis of *Garcinia manii* was carried out between 2005-2011 in the frontier Forest areas of Cameroon and Nigeria. The study had as a general objective to examine the exploitation/harvesting and marketing of *Garcinia manii* and its economic contributions to the National and International economies of Cameroon and Nigeria. The study used the line transects, questionnaires and a selection of Participatory Rural Appraisal (PRA) tools to source information from harvesters of *Garcinia manii* and other forest user groups on the occurrence, harvesting and marketing of *Garcinia manii* in the study area. Findings revealed that *Garcinia manii* trees were identified to be harvested and cut into 3m-5m logs for the market. Exploitation/harvesting and processing techniques for *Garcinia manii* was characterized by the use of crude local and semi industrial made tools. Market prices were found to be determined by the contractors/harvesters who acted as cartel. ANOVA and t-test analysis showed significant differences in product quantities within and between zones A and B as well as the dry and wet seasons at p<0.05 level of significance. A total of 12,882,073 metric tons of *Garcinia manii* was harvested and sold between 2005 and 2011. This was valued at about 38,646,220 F (CFA) equivalents to US\$ 77,292.4 internally generated revenue (IGR) to the economies of Cameroon and Nigeria.

Keywords: contractors/harvesters, marketing, *garcinia manii*, frontier forest, ntfps

1. Introduction

According to the Kaimowitz (2006), approximately 90 percent of the poorest people of the world rely on forests, semi woodlands, and grass fields for subsistence and income. FAO (2001) and Nkwatoh, et al (2010c, 2011b) noted that forest resources contribute to the overall economy of rural people in the areas of employment, income, energy, trade and societal services/investment in the forest sector. The harvesting, processing, supply and marketing of timber for example were in the past given more prominent consideration than other forest products, in almost all countries of the world. This was not unconnected to the fact that, revenue from timber constituted the lifeline of the economies of many countries with large forest cover. However the forests, apart from timber, contain many useful goods and services of subsistence and commercial value called Non-Timber Forest Products (NTFPs), which sustain rural people and rural economies. Adeyoju (1975), Ndoye et al. (1998), Falconer (1990, 1992, and 1995) define NTFPs as all forest goods and services excluding commercial timber that sustains rural and national economies of forest people. In the light of the above definition, Nkwatoh, (1995, 2000) and

Nkwatoh, et al (2010a, 2011a) affirm that the NTFPs package includes animal products (bush meat, fats and oil, fur, feathers, etc.), leaves, local building materials, edible fungi, medicinal plants, forest foods, sponges, chewing sticks, fibres, gums and rattan canes, among others. *Garcinia* species are perennial tall evergreen forest trees of about 3m to 7m tall that are sourced from the primary frontier forest of Cameroon and Nigeria (Nkwatoh, et al, 2010b, and 2011c). The NTFP of *Garcinia* species origin, are the stems (logs). The harvested logs constitute a local industrial raw material for the local chewing stick industry as well as a cultural symbol for local/traditional tooth brushing for the indigenous Ibo tribe of South Eastern Nigeria and other West African countries (Doncan et al., 1989; FAO, 1995, 1998; Nkwatoh, 1995, 2000).

Despite *Garcinia manii*'s use as a medicinal plant for the treatment of mouth odors and for the production of traditional tooth brushes (chewing sticks) for the traditional brushing of teeth by the Ibo tribe of South Eastern Nigeria and other West and Central African countries, the product's social and ecological value is yet to be established. Padoch and de Jong (1995), Ndoye et al. (1997), Ndoye and Nicodem (1994) and Nkwatoh et al. (2010a, 2011c) maintain that, the un-established base of this resource is not unconnected to the absence of appropriate information on the occurrences, prevalence, socio-economic and cultural potentials of these products in the Central and West Africa, where the resource is highly treasured for its economic and cultural values. In order to contribute to the national, regional and international strive to source adequate and appropriate information, on what constitutes the national and international stock of *Garcinia manii* and its socio-economic situation in the frontier forest of Cameroon and Nigeria, this study assessed the exploitation/harvesting and marketing of *Garcinia manii* in the study area as a contribution to this national and international struggle for the gathering of appropriate research data on NTFPs. In order to achieve planned activities for this research work, the study examined the following general and specific objectives.

1.1 Objectives of the Study

The general objective of the study was to assess the exploitation/harvesting and market chain analysis of *Garcinia manii* in the frontier forest areas of Cameroon and Nigeria and its support to rural livelihoods.

1.1.1 Specific Objective

- (1) Evaluate the exploitation/harvesting and processing techniques for *Garcinia manii*.
- (2) Evaluate the marketing and distribution of benefits along the market chain.
- (3) Assess the *Garcinia manii* quantities involved in local and external trade and its contribution to local, national and international economies.

1.2 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; FAO, 2001; Nkwatoh & Yinda, 2007).

In the Humid Lowlands of Central and West Africa (HULCWA), there are many of these products in used and their occurrence and prevalence varies among component ecological sub-zones and habitat types. In the just concluded decades, these NTFPs have attracted greater attention of scientist, research organisations, industries, economic operators and NGOs in the sub-region. Prominent scientists, Research organisations, Industries, economic operators, NGOs and many other interested constituted cores have carried out research on the prevalence, phonology, socio-economics, genetics and domestication of many of these species (FAO, 2001). Among these are studies by Okafor (1981, 1986, 1988) who focused mainly on edible indigenous fruit plants and their importance in rural economy of Nigeria. Egunjobi and Rawal (1973) studied the un-exploited plant resources of Nigeria. Agbor (1986) and Ladipo (1995), worked on the collection and conservation of the genetic resources of *Irvingia gabonensis* in West and Central Africa. Shiembo, et al (1996), Shiembo, (1994)), Doncan and Mbenkum (1987) and Nkwatoh, (2000), looked at the ethno botany of Korup National Park and its adjoining Forest Reserves, while Popoola and Oluwalana (1998), Ndoye et al. (1998), Omoluabi (1994), and Nkwatoh (1995,2000), Nkwatoh et al., 2009, 2010b, 2011c), studied the marketing of NTFPs in Cameroon and across the Nigerian boarder. Despite all these research efforts, one of the major problems facing the NTFPs sector today in Cameroon, the Central and West at large, is the lack of any correlated research that matches biological data with socio-economic activities (Ndoye, 1995; Vabi, 1995; Nkwatoh, 1995, 2000,).

2. Materials and Method

2.1 Study Area

2.1.1 Location

The study area (Frontier forest areas of Cameroon and Nigeria) is located in the South West Region of Cameroon and 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, and lies along the 95 km of Cameroon's western border with the Cross River State of Nigeria. The area has a humid tropical climate, characterized by a single short dry season (November- February) and a corresponding long wet season (March-October). The mean annual rainfall for the period of the study (2005 - 2011) was about 1168 mm with monthly peaks in July and August of every year Besongabang weather station (2005).

The mean monthly temperature ranged between 24°C and 27°C in February and January respectively and a maximum of 34°C at the beginning of March of every year (Gartland, 1974; Besongabang weather station 2005, 2007)

The area is flat, with an altitude of approximately 80m above sea level. The area is drained by Rivers Munaiya in the North, river Ndian in the South, centrally by River Awa, the Cross River as well as a number of small streams.

The vegetation of the area is a closed-canopy of moist evergreen lowland rain forest of the Guinea-Congolian type (Gartland, 1974; White, 1993).

2.2 Methodology

The study made use of biological and socio-economic assessment techniques.

Socio-economically, the study made use of the random sampling, questionnaires and some selected tools from the Participatory Rural Appraisal (PRA) tools box for the collection of data on the harvesting and the marketing of *Garcinia manii*. Participatory Rural Appraisal (PRA) describes a growing family of approaches and methods that enable local people to share enhance and analyze their knowledge of life and conditions for an effective planning and action (Robert, 1994). On the other hand, biological data collection was achieved by the use of line transects as described below.

2.2.1 Sampling Method

2.2.1.1 Site selection

The study area was divided in to two zones A and B based on ecotypes for data collection.

ZONE A: This consisted of the drier forest of the Ejagham, lower Takamanda and its adjoining forest areas.

ZONE B: This consisted of the humid coastal low land forest of Kurop Ndongore and the low land forest of the Rumpi Hills forest Reserve.

From each of the zones, 18 villages were selected purposefully for the administration of questionnaires. A total of 36 villages were selected for the study. In each of the 36 villages, 20 questionnaires were administered giving a total of about 360 questionnaires per zone and an over all total of 720 questionnaires for the study.

2.2.1.2 Selection of respondents

Respondents to the one set of questionnaire which was divided into four sections A, B, C and D. was drawn from Village Traditional Council (VTC) members, traders of NTFP, farmers, *Garcinia manii* exploiters/harvesters, transporters, hunters, Agricultural and Forestry Extension Staff and Forest Users Groups ((FUGs).

2.2.2 Transects Establishment

In order to complement the socio-economic data collected on *Garcinia manii* exploitation/harvesting, 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 18 selected villages per zone, three 1 km line transects were established at 50m apart in each habitat type. These transects were established at a predetermined compass bearing, perpendicular to the main access path from the village in to these habitat types and parallel to each other. Along each transect, within the range of 20m on both sides of the central line, a 100% search and recording of all the *Garcinia manii* cited was carried out. During the enumeration exercise, habitat types that had no *Garcinia manii* individuals were tagged habitats of absent abundance. Those with less than two *Garcinia manii* individuals per hectare were considered zones of rare abundance. On the other hand, habitat types that recorded three to seven

Garcinia individuals per hectare were considered zones of *Garcinia* species abundance while zones with eight individuals and above were tagged habitats of high abundance or highly abundance habitats.

2.2.3 Quantification

In order to capture the total quantity of *Garcinia manii* exploited/harvested, scale balances were permanently positioned at the various points of *Garcinia manii* assembly and transportations for the weighing of total quantities exploited/harvested and transported to the market canters on weekly, monthly and yearly bases from 2005 to 2011 by data collection personnel. This was in collaboration with the extension staff of the Ministry of Forestry and Wildlife, Agriculture, Municipal council control staff and the custom and quarantine service at the Cameroon Nigeria frontier posts.

2.2.4 Analytical Procedure

Descriptive statistics such a 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. Trade margin analysis was employed to determine the distribution of benefits along the *Garcinia manii* market chain.

3. Results

3.1 Occurrence of *Garcinia Manii* in the Study Area

Garcinia manii popularly known as "Ibo Chewing Stick" was identified to be harvested from the study area and processed for the market. Stocks that were mature for commercial harvesting were observed to have a diameter at breast height (DBH) of between 11 cm and 22 cm and above. Flowering was observed to start in May with fruits production between July and October. The tree was observed to produce fairly straight unbranched stems which are harvested and cut into *Garcinia* logs of between 3m-5m and transported to the market centers for the eventual production of traditional tooth brushes for use in Cameroon and South Eastern Nigeria.

3.1.1 Main Sources of *Garcinia Manii* in the Study Area

Garcinia manii in the study area as shown in table 1 was observed to be sourced from different ecotypes or habitats type. Each habitat type as a result of its basic characteristics such as the degree of shade for instance, determined the level of abundance of the species.

Table 1. Main Sources of *Garcinia manii* in the study area

Habitat type	Species	Level of abundance
Primary Forest	<i>Garcinia manii</i>	+++
Secondary Forest	<i>Garcinia manii</i>	++
Fallow land	<i>Garcinia manii</i>	*
Farm land	<i>Garcinia manii</i>	*

* Absent (no stem per hectare)

+ Rare (1-2 stems per hectare)

++ Abundant (3-7 stems per hectare)

+++ Highly abundant (8 stems and above per hectare)

3.1.2 Spatial Distribution of *Garcinia manii*

As shown in table 1, *Garcinia manii* (as a highly shade loving plant) was identified to be more prominent in the primary forest habitat and rare or barely absent on other habitat types such as farm and fallow lands, where shade was virtually absent in the study area.

3.2 Harvesting and Processing Techniques for *Garcinia manii* (Ibo Chewing Sticks)

The harvesting of *Garcinia manii* is carried out by a team of hired harvesters from the Cross River and other States of Nigeria who are exclusively men. Harvesters were observed to make use of industrially made and small locally made axes as well as small cross cut engine saws for the harvesting of the product. These implements are used to cut the tree between 10 cm to 18 cm above the ground level. When the trees are cut down, they are

debranched and cross cut into logs of about 3-5 m long and transported to the assembly and transportation points. At these points, the logs are loaded on to 12 tons Lorries or Canoes if at river side's and transported to the processing/market centers of Calabar, Aba, Onisha and others towns in the South Eastern parts of Nigeria. At the Calabar processing centre in Uyangha, Akamkpa Local Government area, the logs are further cross cut using a small one hand manipulated engine saw in to lengths of 10 cm, 15 cm, 20 cm and 30 cm respectively. After the cross cutting exercise, the logs are splitted in to small billets using locally made axes. The billets are further processed in to tooth brushes (Ibo chewing stick) for the market using locally made knives and small electric smoothening machines. Zone A, which happened to be about 76% accessible by motorable road, river transport and closest to the processing market centers of Uyangha and Aba, was observed to be heavily exploited. The zone was observed to have a spatial distribution of about 3 individuals per hectare. Zone B because of its in accessibility and its location very close to the Bakassi war zone which limited civilian's access, was less heavily exploited comparatively with an average spatial distribution of about 7 individuals per hectare.

3.3 Uses

Garcinia manii is used as a medicinal plant for the treatment of mouth odors and for the production of traditional tooth brushes (chewing sticks) for the traditional brushing of teeth by the Ibo tribe of South Eastern Nigeria most specifically, and other West and Central African countries.

3.4 Market Chain, Trade cycle and Channel for *Garcinia manii*

As schematically realized in Figure. 1, exploiters of *Garcinia manii* commonly referred to as contractor (s), who predominantly are Nigerians, come into the villages of the study area with a group of hired harvesters (5-10 persons) to undertake the exploitation/harvesting of *Garcinia manii* for the contractor (s). Before the commencement of exploitation/harvesting, the contractor first of all bargain/negotiates with the Village Traditional Council (VTC) in whose area of the forest exploitation/harvesting will be carried out, and pays a exploitation/harvesting fee to the VTC for the village. This fee is paid based on the length of time the contractor will stay in the forest for harvesting with his team and not on the quantity harvested. The value/amount of this fees was identified to vary from village to village within a price range of between 25000 FCFA to 95,000FCFA (50 to 190 US \$) for one month. The amount paid to a VTC, was identified to be a function of the VTC's ability to bargain/negotiate. At the end of each bargaining/negotiation exercise, the contractor pays the finally accepted exploitation/harvesting fees to the said VTC and he is given the permission for entry into the forest for exploitation/harvesting. After a successful harvest, the contractor pays for the head load transportation of the exploited/harvested logs to the point of assembly (roadside or riverside). At these points, the logs are first cross cut into marketable lengths of 3 m-5 m and arranged into huge pills for further transportation. When the exercise at the assembly point is over, the contractor moves across the border to either the nearby town of Ikom or Calabar Nigeria to arrange for transportation mean (a 12 tons Lorry or a Canoe). When the transportation mean is arranged, the contractor returns to the assembly point with the transportation vessel for the evacuation of the products to the processing centers of Calabar, Aba, Onisha and other towns in the South Eastern parts of Nigeria. At the processing centers, the products are supplied to wholesale buyers of *Garcinia manii* who at the same time are the processors. The processors in turn after processing supply their processed stocks to the bulk buyers. The bulk buyers as shown in Figure 1, after buying the processed stocks from the hands of processors, in turn supply the retailers. The retailers on their retail benches, make available the finished product (the traditional tooth brush commonly called Ibo chewing stick) to the consumers.

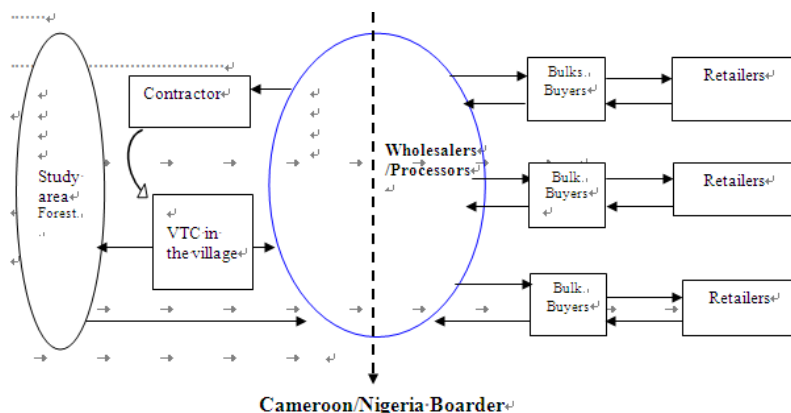


Figure 1. Schematic diagram for *Garcinia manii* market chain, cycle and channel

3.4.1 Market Margins for *Garcinia manii*

Producers (VTC) total average cost of production for the two zones (forest patrols, pouring of annual libations, spiritual follow of harvesters in the forest during harvesting and entertainment of local forestry administration) was estimated at 43500 FCFA (\$87USD). Producers selling price on average for each of the two zones was estimated at 72500 FCFA (\$145USD). The difference between the above presented cost and selling prices gave a margin of 29000 FCFA (\$ 58 US\$) for each of the zones respectively. This yielded a corresponding return to investment of about 66.3% for the producers. The contractors as a second group of actors total cost of production (harvesting fees, harvesters fees, head load transportation and loading on to the lorry, feeding, lorry transport, union and market fees) was estimated at 537,500 FCFA (\$1075 USD) Contractors at the market centers sold their stocks at 743,000 FCFA (\$ 1486 USD). The difference between the production cost and selling price of contractors gave them a margin of 205500 FCFA (\$ 411 USD) with a corresponding return to investment of about 38%.

3.5 Quantity of *Garcinia manii* Traded between 2005-2011

Garcinia manii quantities traded in the study area between 2005 and 2011 varied significantly from zone A to zone B 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 *Garcinia manii* showed significant variation in quantity harvested and sold in the two seasons at the P = 0.05 level of significance. As shown in table 2 and 3, the volume of *Garcinia manii* exploited/harvested and sold from the study area has been on the decline in zone A but fluctuating in zone B from 2005 to 2011.

Table 2. Total quantities of *Garcinia manii* obtained from zone A and B of the study area in both Seasons (dry and wet) from 2005–2011

	Zone A	Zone B
Years	Production of <i>Garcinia manii</i> in tons	Production of <i>Garcinia manii</i> in tons
2005	1934664.5	743689.4
2006	1798446.4	728748.6
2007	1277844.2	646839.4
2008	994678.7	661276.5
2009	884139.6	594589.1
2010	799898.2	625894.9
2011	640465.8	650895.7
Total	8,230,137.4	4,651,935.1

The quantity of *Garcinia manii* involved in the frontier trade in *Garcinia manii* between Nigeria and Cameroon from 2005- 2011, was about 12,882,073 tones contributing a total of about 38,646,220 CFA (USD\$.77,292.44) to the economies of Central and West Africa.

4. Discussion, Conclusion and Recommendation

4.1 Discussion

Garcinia manii abundance in the primary and the secondary forest ecosystems of the study area was very much a function of the low level of anthropogenic activities in this habitat type. This is a result of the fact that the slash and burnt farming practice which is the main degrader of plant resources in the area was absolutely low and absent in the two habitat types. With accordance to results obtained by Nkwatoh, (1995, 2000, 2007), Bessong, (1997) and Adekunle, (1971), the exploitation/harvesting of *Garcinia manii* in the study area was observed to be ecosystem conservative. Over 80% of exploited/harvested stocks were cut above the ground level with stump heights that encourages coppicing. Producers of *Garcinia manii* in general in the study area appeared to have a very low margin (29000 FCFA) while contractors of *Garcinia manii* seem to enjoy a higher margin (202500 FCFA) of benefits along the trade chain. This was attributed to the lack of Market information on the part of producers which the contractors along had access to and did treasure in the spirit of a monopolistic competition (Vabi, 1995). When a more discrete analysis on return to investments was carried out, producers (VTCs) were

observed to have a higher return to investments of 66% while contractors ended up with a return to investment of 38%. As analysis further elucidated, this was as a result of the fact that producer's levels of investments along the trade chain was very low comparatively. On the other hand, variation in margins was also observed for producers and contractors with respect to zones. Producers and contractors of zone B emerged with a lower margin than those of zone A. This as affirmed by Nkwatoh, (1995, 2000) and Nkwatoh et al, (2010, 2011) is not unconnected to the difficult access of the zone B for contractors. The few contractors, who manage to reach the zone, offered very low exploitation/harvesting fees and acted cartels. (Nkwatoh, 2000; Omoluabi, 1994).

Though the *Garcinia manii* sector is vital to the growth and development of local economy, its contribution could be more if the product is well priced at the point of harvest.

The quantity of *Garcinia manii* exploited/harvested in zone A within the study period was observed to be declining but still superior to zone B. In zone B, the overall trend showed a decline as compared to the 2005-2011 time periods.

This results suggest that the disparity in quantity exploited/harvested in the two zones might be explained by the fact that zone A is more accessible than zone B leading to more resources lifting. The presence of the Bakassi war zone in zone B which restricted civilian movements and their activities may also have contributed to low resource exploitation/harvesting in the zone.

4.2 Conclusion

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

Garcinia manii occurrence in the study area is highest in the primary forest habitat.

Garcinia manii harvesting method is sustainable as storm heights left encourages coppicing.

The structure of the *Garcinia manii* trade in the study area tends to benefit the contractors more than the producers.

4.3 Recommendation

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 *Garcinia manii* in the traditional dental industry.

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