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Marketing of *Prosopsis africana* (Guill, Perrott and Rich) and Issues on Product Sustainability in Benue State, Nigeria

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Abstract: The study assessed the marketing network of *Prosopsis africana* in Benue state, Nigeria with the view to developing sustainable management strategies for the tree species. Stratified random sampling technique was used for the selection of the respondents in six of the twenty three local government areas of the state, and these include Otukpo, Ohimini, Buruku, Gboko, Okpokwu, and Gwer. Three hundred abd sixty (360) marketers of *P. africana* products were sampled. Market surveys were carried out in local markets where products of *P. africana* were sold for four weeks. Availability of *P. africana* for the past ten years has witnessed a steady decline. Majority of the respondents in urban (45.8%) and peri-urban (50%) sourced the *P. africana* from their personal farm but 81.7% in rural area sourced from the wild. On the mode of sale, the channel of distribution for *P. africana* seeds collectors is slightly different from that of the stem dealers. Processed (fermented) seeds of *P. africana* ranked on top of the marketing form of the products, while the trade of mortar and pestle was the most lucrative but with serious implication on sustainability of the tree species as well as the ecological problem in terms of stock depletion. Government should device effective means of controlling the current rate of exploitation of prosopsis to sustain the availability and production of the tree species. There is also need for awareness creation on the current decline rate of the tree species and development of more comprehensive management strategy that will involve the local communities, this is imperative so as to guide against over exploitation of the tree species.

Key words: *Prosopis africana,* Mortal and pestle, Fermentation, Seed collectors, Firewood

INTRODUCTION

Sustainable forest management is the process of managing forests to achieve one or more clearly specified objectives of management with regard to the production of a continuous flow of desired forest products and services, without undue reduction of its inherent values and future productivity and without effects on the physical and social environment [1]. The concept of sustainable development recognizes that utilization will change natural ecosystems, but that conservation is also important for achieving social goals, such as poverty alleviation.

Forest foods are very vital to the sustenance of the rural people and they provide substantial employment opportunities in both rural and semi urban areas [2,3]. However, due to overexploitation during the past few decades, tropical forests have been reduced quite substantially, both in sizes and species composition. This has been more pronounced in the less developed countries of Africa and Asian regions [4]. Non-timber forest products (NTFPs) consist of goods of biological origin other than timber that are extracted from forests [5,6]. Marketable NTFPs provide the opportunity to supplement household income, as well as providing a relief source in terms of seasonal food and cash shortages [7]. Siebert and Belsky [8] revealed that 73% of the households in the lowland villages in the Philippines cannot generate enough food or cash income from agriculture to meet basic needs. Rather, more than half of the household depended on rattan collection and for that reason conclude that the labour intensive nature and decentralized trade structure of rattan and other non-timber product gathering activities provide more benefits to local economies compared with the timber industry.

P. africana tree is a small to large tree (4-20 m), with an open canopy and drooping foliage, resembling *Tamarindus indica.* The tree has good ability for

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coppicing, but fairly slow growth. The bark of the tree is very dark and scaly, slash orange to red-brown with white streaks. Branches and twigs thornless. Leaves altJuly 18, 2009ernate, bipinnate, leaflets in 9-16 pairs, oblong lanceolate 12-30 mm., shortly pubescent. A typical gland lies between pairs of pinnae and leaflets. Rachis 10-15 cm long. Flowers green-whitish to yellowish, fragrant in dense 6-8 cm axillary spikes. Flowering occurs shortly before the onset of the rains. Pods are dark red, cylindrical, hard and shiny up to 15 x 3 cm compartmented with wood cells. Seeds mature in Feb.- March containing some 10 loose rattling seeds per pod and 7,500-8,000 seeds per kg. The wood is hard, of medium density to heavy, with a fine grain, resistant to termites. Sapwood is yellow, heartwood is red-brown, becoming wine-red after drying [9]

Among the many NTFPs in Benue state, Nigeria, *P. africana* tree occupies a centre stage in view of the various uses it is being put into. It is one of the lesser-known legume crops used as food condiments in Nigeria. The fermented mesquite seeds are popular in parts of the middle belt and eastern states of Nigeria. The fermented seeds add variety and flavour to the already known traditional diet. It serves not only as a seasoning agent, but also as a low cost meat substitute for poor traditional families [10]. As a leguminous plant, *P. africana* tree also fixes nitrogen in the soil, thereby improving the soil nutrient status [11]. Although the wood of *P. africana* is hard to work as it blunts the tools, cannot be nailed without previous pre-drilling, but durable and easy to carve, turn and glue, sought for art and craft. The bark contains some 18 % tannins, young leaves, shoots and pods are much sought after as fodder in the second part of the dry season, and branches are often broken down or lopped for the easy access of stock. Seeds are fermented and used as seasoning as those of *Parkia biglobosa*. Pounded dry fruit is used as a fish poison, again like those of *Parkia*. Virtually all parts of the tree are used for some medicinal care, as for *Parkia* [9]

Multipurpose tree may become extinct as a result of current rate of exploitation without adequate sustainable management strategy. The scarcity and high cost of *P. africana* seeds is already compounding problems for the rural dwellers as most of the women who trade in these products are witnessing high product prices. The consequence of this is that if nothing is done fast to ensure their conservation, *P. africana* trees may become extinct. It is in order to generate such information and stimulate people's interest on the specie that this study becomes imperative. The general objective of the study was to assess the marketing networks of *P. africana* in Benue state with the view to developing sustainable management strategies for the tree species.

MATERIALS AND METHODS

This study was conducted in six of the twenty three local government areas of Benue state, Nigeria. The state is located between latitude 6° 30′ N and 8° 10′ N, and longitude 8° 29′ E and 10° 0° E. The state shares borders with Nasarawa state to the north, Kogi state in the west, Taraba in the east, Cross-River, Enugu and Ebonyi states in the south and southwest and the Republic of Cameroon in the southeast.

The vegetation of the state has been significantly altered from the original derived guinea savanna, largely due to human activities such as farming and unplanned forest harvesting. The area occupied by natural forests decreased from 13.5% of the state's total land area to 10%. Presently, intensive agriculture is the main land-use type accounting for 2,267,183 ha (73.3%) of the states land area.

Sampling Technique and Population: Stratified Random sampling technique was used for the selection of the respondents. Out of the twenty three (23) local government areas (LGA) in the state, six (6) were sampled, and these include Otukpo, Ohimini, Buruku, Gboko, Okpokwu, and Gwer, given a sampling intensity of twenty six percent (26%). Based on the population density of the communities within the LGAs, other sub-divisions of urban, peri-urban, and rural were obtained. The respondents were then selected from these sub-divisions. In all, 360 marketers (That is 120 marketers from each of the three divisions) of *P. africana* products were sampled. Market surveys were carried out in local markets where *Prosopsis africana* were sold. The same market was sampled every second market day. The choice of this approach was informed by the size of the markets, and this favour complete assessment of all the products. During the market survey, information were collected on demographic characteristics of the traders, nature of the products and their uses, sources of supply, and distribution channel, among others.

RESULTS

Markets and Marketing Days in the Study Areas: The surveyed markets for the study were presented in Table 1. The observed difference in the markets is that

Table 1: Visited local markets and their marketing days in the study area

S/N	Local Government area (LGA)	Name of market	Market days
1	Otukpo	Otukpo main market	Daily
		Ogobia	5
2	Buruku	Adi	9
		Mbatie	9
3	Ohimini	Onyagede	5
		Ochobo	5
4	Okpokwu	Ugbokolo	5
		Okpoga	5
5	Gboko	Gboko main market	Daily
		Ikyumbur	9
6	Gwer	Alaide	9
		Howe	9

Table 2: Demographic information of the *P. Africana* producers and traders in Benue state, Nigeria

		Urban		Peri-urban		*Rural*	
	S/N	Freq n=120	Percent	Freq n=120	Percent	Freq n=120	*Percent*
1	Gender						
	Male	28	23.3	120	100	78	*65*
	Female	92	76.7	0	0	42	*35*
2	Age						
	< 20	0	0	0	0	0	*0*
	21-40	28	23.3	0	0	42	*35*
	41-60	83	69.2	24	20	60	*50*
	> 61	9	7.5	96	80	18	*15*
3	Marital Status						
	Single	0	0	30	25	12	*10*
	Married	102	85	90	75	72	*60*
	Widowed	18	15	0	0	36	*30*
	Divorced	0	0	0	0	0	*0*
4	Occupation						
	Farming	18	15	60	50	108	*90*
	Civil service	0	0	30	25	12	*10*
	Trading	102	85	30	25	0	*0*
	Student	0	0	0	0	0	*0*
5	Education						
	-Non-formal	28	23.3	30	25	48	*40*
	-Adult Literacy	0	0	0	0	18	*15*
	-Primary	65	52.2	0	0	18	*15*
	-Secondary	27	22.5	0	0	12	*10*
	-OND/NCE	0	0	90	75	24	*20*
	-HND/Degree	0	0	0	0	0	*0*

Table 3: Availability of *P. africana* in the last ten years in Benue State, Nigeria

	Urban		Peri-urban		*Rural*	
Variables	n	%	N	%	N	*%*
1. Availability of *P. Africana*						
- Always abundant	10	8.1	15	12.5	10	*8.6*
- Steadily abundant	7	5.4	23	18.8	17	*14.3*
- Steadily decline	71	59.5	75	62.5	62	*51.4*
- Do not know	32	27	7	6.3	31	*25.7*
2. Reasons for the decline						
- Over exploitation	*43*	*35.7*	*45*	*37.5*	*30*	*25*
- Use for mortar making	*60*	*50*	*45*	*37.5*	*60*	*50*
-Lack of silvicultural/technical requirements	*4*	*3.3*	*0*	*0*	*15*	*12.6*
- Competition for land	*13*	*10.7*	*30*	*25.3*	*15*	*12.4*

sellers convened for transaction at different days ranging from daily (in few places) and after every other five (5) days or nine (9) days. The marketers convene for transaction from early morning till dawn. Table 1 shows the visited markets with their corresponding days.

Demographic Information of the *P. Africana* Traders: As indicated in Table 2, marketing of *P. africana* products is a progression in the peri-urban (100%) part of the study area. However, 65% of the identified marketers are males in the rural area, while female gender formed 76.9% in the urban. More than sixty nine percent of the marketers in urban area and 50% in rural areas were in the age bracket 41-60 years respectively, while 80% in peri-urban area were >60 years. Trading dominated the occupation of the respondents in urban area (85%); while 50% and 90% respectively in peri-urban and rural areas were farmers. Majority of the marketers were married. On their educational status, 52.2% attended primary education in urban, 75% OND/NCE in peri-urban, and 40% with no formal education in rural areas.

Availability of P. Africana in the Last Ten Years in the Study Area: Availability of *P. africana* for the past ten years has witnessed a steady decline (rural 51.4%, urban 59.5% and peri-urban 62.5%. Some reasons for decline in *P. africana* availability were the use of its trunk (stem) for mortar and pestle; over exploitation; competition for land; and lack for silvi-cultural/technical requirements for its husbandry (Table 3).

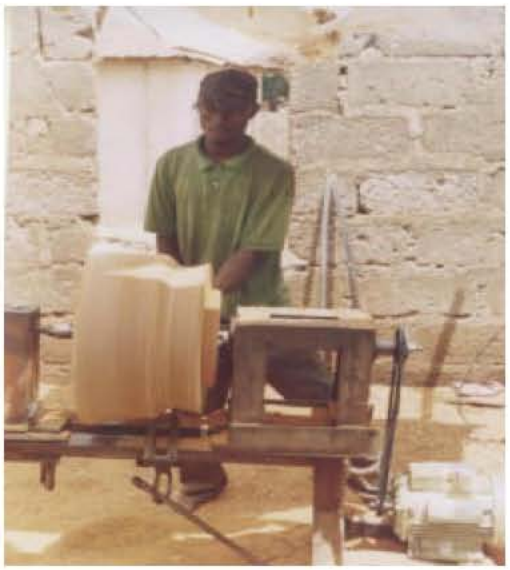

Plate 1: An operator processing *P. africana* stem into mortar

Plate 2: Mortar and Pestle made from *P. africana* stem

Plate 3: *P. africana* marketer measuring raw seeds

Trade Attributes of *P. Africana*: More than thirty percent of the marketers in the urban area engaged in the business between 6-10 years, 50% in peri-urban engaged less than one year, while majority of the marketers in rural areas engaged between 1-5 years (42.5%). Majority of the respondents in urban (45.8%) and peri-urban (50%) sourced the *P. africana* from their personal farm but 81.7% in rural area sourced from the wild (Table 4). On the parts traded-in, processed (fermented) seeds of *P. africana* ranked on top in both urban (35.7%) and rural (48.5%) areas, while mortar and pestle (40%) (Plate 1 and 2) was the highest in peri-urban. Other marketers traded in the raw seeds (Plate 3) and firewood. More of the traders in peri-urban engaged other people in their activities (Table 4).

Table 4: Trade attributes of *P. africana* in Benue state, Nigeria

		Urban		Peri-urban		Rural	
	S/N	Freq n=120	Percent	Freq n=120	Percent	Freq n=120	Percent
1	Years of experience						
	<1	0	0	60	50	0	0
	1-5	0	0	0	0	51	42.5
	6 -10	37	30.8	0	0	17	14.2
	11-15	36	30	0	0	26	21.7
	16-20	28	23.3	30	25	9	7.5
	>20	9	7.5	30	25	17	14.2
2	Source of products						
	-Personal farm	55	45.8	60	50	22	18.3
	-Wild	37	30.8	30	25	98	81.7
	-Others	28	23.4	30	25	0	0
3	Parts traded-in						
	-Raw seeds	18	14	30	20	66	33.3
	-Processed seeds	46	35.7	30	20	96	48.5
	-Mortar and pestle	28	21.7	60	40	18	7.6
	-Fuelwood	37	28.6	30	20	18	7.6
4	*Engaging other people*						
	-Yes	*55*	*45.8*	*90*	*75*	*51*	*42.5*
	-No	*65*	*54.2*	*30*	*25*	*69*	*57.5*

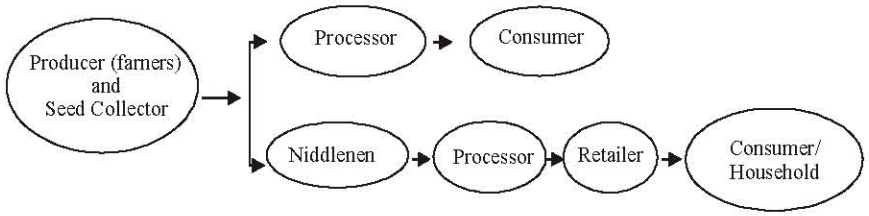

Fig 1: Marketing channel and distribution for the *p. africana* seed collectors

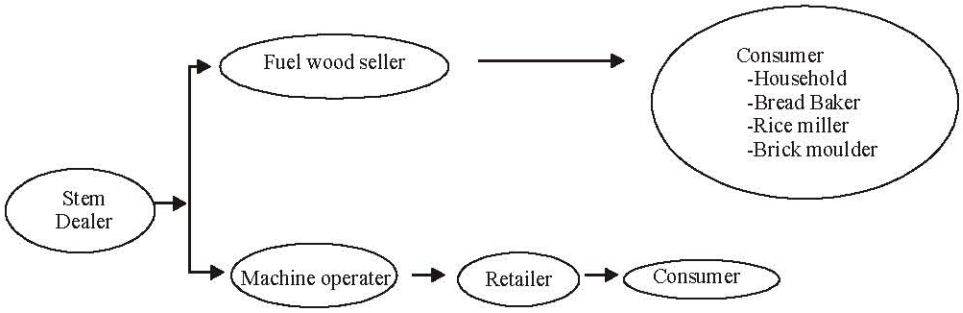

Fig 2: Marketing channel and distribution for the *P. africana* stem dealer

Distribution Channel of *P. Africana*: The channel of distribution for the mature and dry seeds of *P. africana* is slightly different from that of the trunk dealers. This then leads to two channels of distribution for the marketing of *P. africana* products. The producers (who have the trees on their farms) and seed collector (who exploit in the wild) are the starting point for the marketing of the raw seeds. This eventually progresses to the middlemen, processor, retailer, and finally to the consumer. For the marketing of the trunk, after the stem dealer has obtained the trunk from the farm or in the wild, he sells to the fuelwood seller or the machine operator for energy production, and mortar and pestle making respectively. These distribution channels were presented in Fig. 1 and 2.

DISCUSSION

The study revealed that majority of the producers of *P. africana* was farmers who either have the trees on their farm, although a considerable number of the producers also exploit the tree in the wild. The highest percentage of traders of *P. africana* was found in the urban area and this was due to more demand for the products in such places than rural area. The traders of *P. africana* purchase raw seeds from the open market. For those who process the stem into mortar, pestle and fuelwood, they bought their raw materials (stems) from people who have the tree species on their farms. Both the traders and the producers have low level of education and the implication of this was the observed low product development coupled with poor marketing strategies. Poor level of education also affects the quality of marketing information system and its utilization to strengthen / improve sales.

Marketing of *P. africana* products experienced some differences in the state under study. In urban areas, both the raw and processed seeds were sold in closed store markets that were opened for transaction on the daily basis. On the contrary, the open market structure found in the peri-urban and rural areas operate in such a way that sellers and buyers only come together for transaction every five (5) days or nine (9) days when that the markets hold. The marketers convened for transactions from early morning till dusk. Female dominated the trade of *P. africana* in urban area, but on the contrary, male dominated the trade in peri-urban and rural areas. Women's involvement in the trade of *P. africana* was concentrated in the processing of the seeds as flavour / condiments and collection of tree parts which is used as fuelwood. High dominance of the male was observed in the area of felling and splitting of the *P. africana* tree. In line with the foregoing, the result obtained by Hyman [12] on a survey of fuel wood sellers and charcoal marketers in Philippines, many fuelwood traders were male, although he (Hyman) discovered that the marketers did not depended on communal sources for their wood but instead obtained their wood exclusively from their land.

The distribution of the respondents in the marketing of *P. africana* products is such that majority of the marketers were within the age bracket of 41-60 years and they formed the bulk of processors and sellers. Moreover, most of the respondents that were involved in the marketing of *P. africana* products were either married or widowed. The high proportion of the married in the marketing of *P. africana* was as a result of the need for the marketers to generate additional income to argument family financial needs.

Two major channels were observed in the marketing of *P. africana* products. The sale of seeds followed a slightly different channel from that used in the sale of trunk and its products. The producer / collector sell the seeds to middlemen who later sell to the processors. The processors add value to the seeds by subjecting it to the fermentation and sell either to the retailer who in turn sells to the consumer (mainly households). For the marketing if the trunk, the collector sells directly to either the fuelwood dealer or machine operator. The fuelwood seller splits the trunk bought and sells directly to rice millers, bakers, brick moulders and household for domestic cooking. As for the machine operator, he processes the trunk into mortars and pestles of different sizes and either sell directly to the consumer(s) or to retailer who then sells to consumers.

The trunk of *P. africana* tree is used for making mortars and pestles in the middle belt where mortar is used intensely for pounding boiled yams for food. In recent time, the same stem is used for making artifacts or items of gifts using specialized machines. The local rice millers and brick moulders also fell and use the tree for parboiling their rice and curing of bricks. Some respondents in the rural areas reported that they trade in *P. africana* roots for medicinal purpose. Prices are low during abundant season especially when the fruits are harvested and this occurs from November-March and increase steadily from April to September. This price fluctuation is presently compounded by excessive logging of the tree species for mortar and pestle making as well as fuelwood.

The trade in mortar and pestle was the most lucrative product obtained from the Prosopis tree. Unfortunately, this has serious implication on sustainability of the tree species as well as the ecological problem in terms of stock depletion. Most operators revealed that they made one and a half trip to the bush/wild to source for their raw materials (that is, the *P. africana* tree stem) on a weekly basis. The amount paid per trailer load of *P. africana* log was seven thousand Naira (₦7,000) and when processed into mortar and pestle, the products could be sold for as high as forty thousand (₦ 40,000) or more.

The trade in the seeds of *P. africana* is strongly influenced by season. Difficulty in harvesting during rainy season is a serious constraint that impedes this line of trade. A great percentage of the traders indicated that they do not engage other people while others indicated that they do engage people to work with/for them. The nature and volume of products traded in determined the number of people to be engaged. Those who process seeds need extra hands to dehull the parboiled seeds

while the fuelwood sellers engaged extra hands to split the trunks before sale. For the operators of mortar and pestle machines they engage other people to unload and debark the log and clear the dust generated in the course of operation from the machine.

The contributions of *P. africana* to the economy of the study areas cannot be over-emphasized. It is unfortunate to mention that exploitation of the tree in the production of mortar and pestle has a serious impact on its availability and distribution. In an effort to curb the overexploitation of the tree species, government has banned the felling of *P. africana* tree species in the state, though the result of this is farfetched.

CONCLUSION

In order to fully take advantage of the opportunities offered by the use and marketing of Prosopsis, the state government should strengthen the ban on the felling of the prosopis tree and further device effective means of controlling the current rate of other exploitation. Also there is need for awareness creation on the current decline rate of the tree species and development of more comprehensive management strategy that will involve the local communities, this is imperative so as to guide against over exploitation of the tree species.

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