Journal of Agriculture and Social Research (JASR) Vol. 12, No. 2, 2012

EVALUATION OF THE CONTRIBUTIONS OF *VITELLARIA PARADOXA C. F. GAERTN* AND *PARKIA BIGLOBOSA* (JACQ.) BENTH TO RURAL LIVELIHOOD IN OYO STATE, NIGERIA

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ABSTRACT
Upsurge in population has resulted in pressure on many tree species including Vitellaria paradoxa C.F.Gaertn.and Parkia biglobosa (Jacq.) Benth. These species are highly valued for their socio economic potentials. The study therefore assessed the contribution of V. paradoxa and P. biglobosa to rural livelihood in Oyo State, Nigeria with a view to generating information on the socio-economic values of the species to the rural communities. Stratified sampling technique was used to divide the study area into three based on ecological zones where twenty percent of each ecological zone was selected. A multistage sampling procedure was employed in collecting data on socio-economic importance of the two species using structured questionnaire. Data collected were analyzed using descriptive statistics, cross tabulation and chi-square. The result of chi-square analysis revealed that degree of contributions of the species to daily income of processors, marketers and harvesters were significant (P < 0.05) in dry woodland and moist woodland but not significant in the rainforest zone. The degree of contribution of V. paradoxa to household food consumption was not significant in moist woodland and rainforest but significant in dry woodland (P < 0.05). It is recommended that domestication and plantation establishment of the two species should be encouraged by the forestry stakeholders in order to sustain the contribution of the species to the livelihoods of rural household.

Keywords: *Vitellaria paradoxa, Parkia biglobosa,* Livelihood, Socio-economics.

INTRODUCTION

Traditional farming systems in the tropics have been known to rely on trees and shrubs for soil fertility maintenance and regeneration (FAO, 2004). Trees play a vital role in this process and leguminous trees have added advantages over other trees in this respect. Trees also provide shade for animals and crops, provide animal fodder and in most cases supply human food. In the farming system, these trees are capable of enhancing both crop productions, through soil fertility maintenance and livestock production through increased availability of high quality feeds. (Bayala, 2006).

Farmers have long recognized the importance of trees. They deliberately incorporate trees in production systems (FAO, 2009). Majority of the rural households depends on forest resources to meet subsistence need for staple and supplementary foods, construction materials, fuel, medicine, cash, local ecosystem services and farm inputs, such as animal feed and nutrients for crops (Raintree, 1999). In rural areas, the contribution of multipurpose indigenous agroforestry fruit trees such as *Vitellaria paradoxa* C.F.Gaertn. and *Parkia biglobosa* (Jacq.) Benth.to food supply is essential for food security as they serve as safety net during 'hunger period' when stored food supplies are dwindling and the harvest is not yet available.

Traditionally, farmers in Africa preserve these valuable resources by nurturing them in agroforestry system within the agricultural lands, characterised by scattered trees on fallow and cultivated land. The system has worked well in the past, but it is

now loosing its vitality under increasing population pressure (Boffa, 1999). In fallow, the incidence of protected trees of varied species and sizes indicates a strong correlation between conservation and the productive values of a given species (Bonkoungou, 2002).

The natural forest can no longer sustain the demand on it for timber, food and other forms of livelihood. This has resulted in attention being shifted to indiscriminate exploitation of many tree crops in free areas including multipurpose tree species such as *V. paradoxa* and *P. biglobosa* regardless of their numerous socio-economic and ecological values (Ismaïla and Abibou, 2002). It is also known that, in traditional farming, certain tree species are often left by farmers either as source of wood for building, fruits, medicinal purposes, yam stakes and shade plants, among others. Inspite of the fact that these multipurpose tree species are conserved on farmlands, their socioeconomic potentials in agroforestry are not fully documented (Popoola and Tee, 2001). It is therefore, necessary to study the socio-economic potentials of these multipurpose species in rural livelihood in order to provide necessary information for the planning of conservation and sustainable management of the species.

V. paradoxa and *P. biglobosa* have been widely recognised as important indigenous fruit tree species throughout their ranges and they have acquired protective status in most parts of their ranges in Nigeria (Oni, 2006; Bonkoungou, 2002). They are highly valued by farmers for their economic potentials. *V. paradoxa*'s fatty kernels are sold both in local and international markets, thereby considerably contributing to wealth creation. *P. biglobosa* seeds used as condiments have been observed to play significant roles in the nutritional requirements and primary health care status of the people of Nigeria (Oni, 2006). However, these numerous contributions are not adequately documented. The study therefore, evaluates the contributions of *V. paradoxa* and *P. biglobosa* to rural households' livelihoods in Oyo State, Nigeria.

MATERIALS AND METHODS

The study area is Oyo State. It is located in South Western part of Nigeria. It lies between latitudes 7^0N and 9^0N and between longitudes 2.5^0E and 5^0E. It has a total land area of 28,454 square kilometres. The vegetation pattern of the State is that of rain forest in the South and guinea savanna in the North. Thick forest in the South gives way to grassland interspersed with trees in the North (www.oyostate.gov.ng., 2011).

A multistage sampling procedure was used to collect data on socio-economic importance of *V. paradoxa* and *P. biglobosa* in the State. In the first stage of sampling, the three ecological zones of Oyo state i.e. Dry-woodland, moist-woodland and Rainforest (Odebiyi *et al*., 2004; Figure 1) were purposively selected. At the second stage of sampling, two Local Government Areas from each ecological zone were randomly selected to make a total of 6 Local Government Areas. Purposive sampling technique was used to select four (4) villages/communities located in four cardinal points of each Local Government Area (North, South, East and West) so as to cover sociocultural features of the study areas. In each community, quota sampling was used to sample 5 farmers, 5 harvesters, 5 processors and 5 marketers giving a total of 480 respondents for the 24 communities. Focus Group Discussion (FGD) and target informant interview were also employed in the data collection process. This was to obtain additional and sensitive information which people may not want to give willinly in questionaire survey.

Descriptive and cross tabulation analyses were used in analyzing the data and these include: percentages, frequency distribution and chi-square.

Hypothesis tested

Ho: There is no association between contributions of species to households' livelihood and ecological zones.

The Chi-square test is given by:

$$X^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i},$$

Where

X^2 = Chi- square
O_i = Contribution of the species to households' income
E_i = Expected frequencies
n = the number of cells in the table.

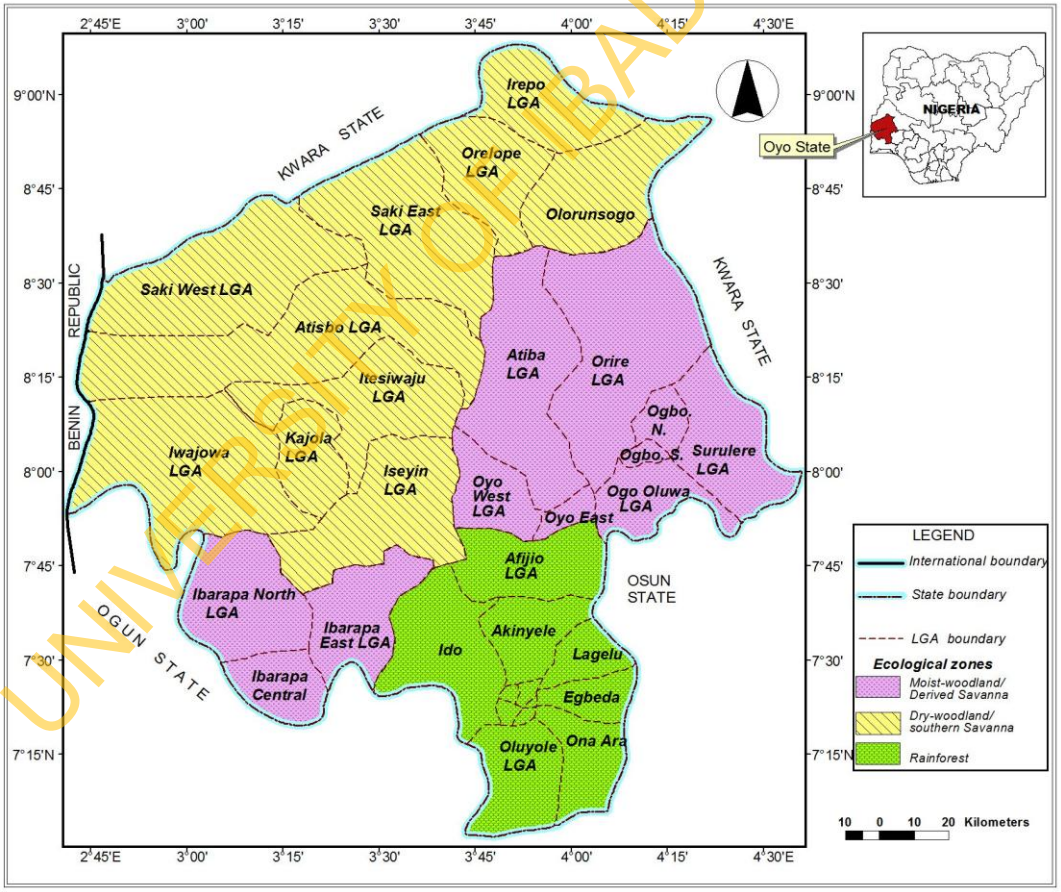

Fig. 1: Map of Oyo State Showing Ecological zones

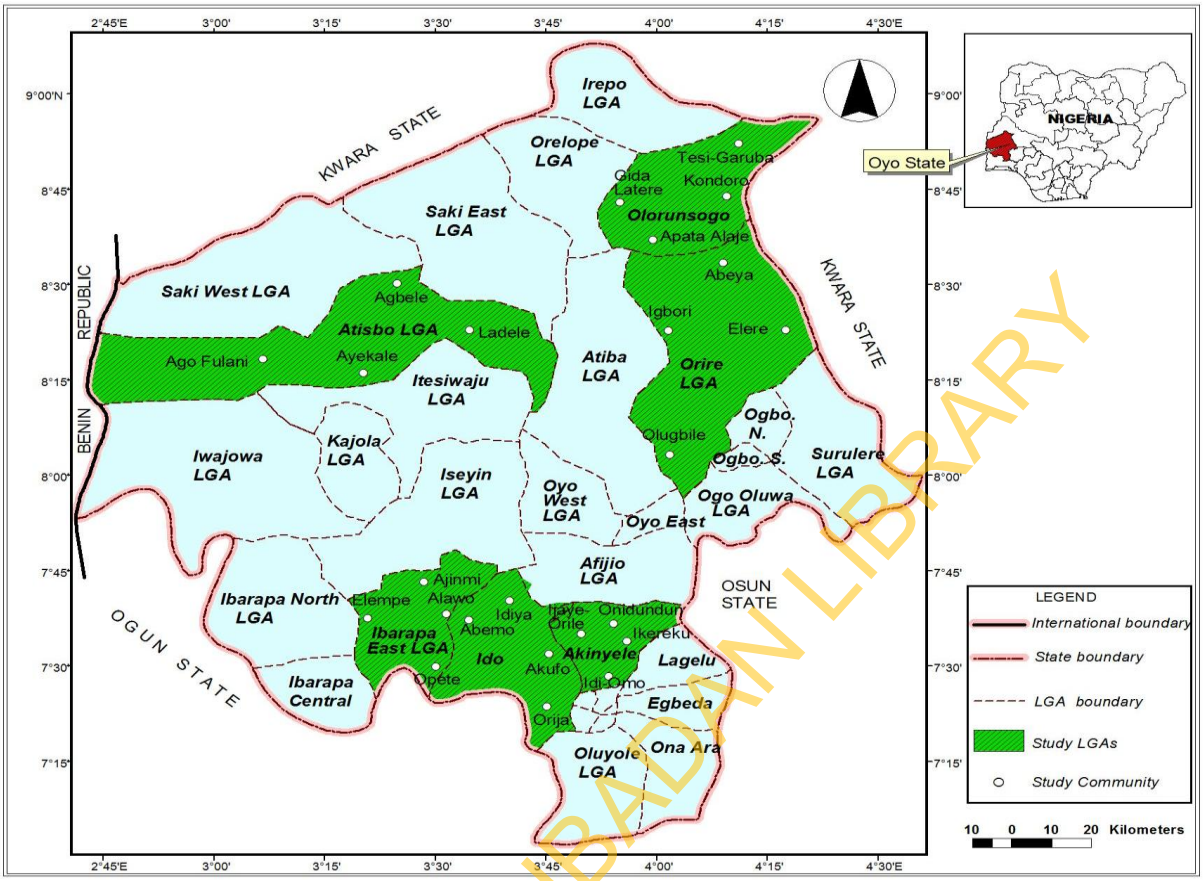

Fig. 2: Map of Oyo State Showing Study Location

RESULTS AND DISCUSSION

Demographic information on the marketers of *V. paradoxa* and *P. biglobosa*

In the three ecological zones, marketers of *V. paradoxa* and *P. biglobosa* products were all females. The domination of the marketers of the two species by female may be an indication that marketing of the products of these species like many other non-timber forest products are regarded as feminine business. This agrees with the report of Popoola (1999) and Ogunwande *et.al* (2009) that women play crucial roles in agroforestry enterprise development at all stages. It depicts employment creation potentials of the species to the weaker members of the rural households who though are not fully involved in farming rigours but are still able to contribute to family income by engaging in marketing of these products. Arnold (2001) have also submitted that NTFP activities are important for women because they can be combined with regular family and household tasks, often at or near home, thereby allowing them to combine these income earning activities with other household chores such as child care.

Over 21% of the marketers of *P. biglobosa* respondents were within the age range 20-30 years, 42.2% were between 31-40 years of age while 38.9% were aged 41-50 years. Those above 51 years were 8.9% (Figure 3). Details of age distribution of *V. Paradoxa* marketers are shown in figure 4. The figure shows that marketers are generally young. This is in agreement with Jimoh and Adedokun (2005) that *P. biglobosa* production and marketing is an energy-demanding task requiring physical strength which only active people are able to exert. The involvement of young people in the business indicates the prospect of the business. This is a good omen for

sustainable management of the species. Since the younger generation who benefit from the business will most likely contribute to its conservation.

Majority of the marketers were married. This indicates that the business provides support to household welfare. People depend on the marketing of these products to earn a living for their families; especially house wives, widows and divorcees who depend on the income to support their homes. Therefore, for continued support of the species to the welfare of the families, sustainable management of the species must be ensured. Also, 50% of the marketers of *P. biglobosa* respondents had no formal education. Those with primary education constitute 45.6% and those with secondary education 5.6% (Figure 6). Marketers of *V. paradoxa* with no formal education were 85% while 15% had primary education. Highest proportion of the respondents had primary education, though educational background may not have influence in the marketing of the products but it has its importance in business for effective transaction and proper record keeping (Ogunwande *et. al*, 2009).

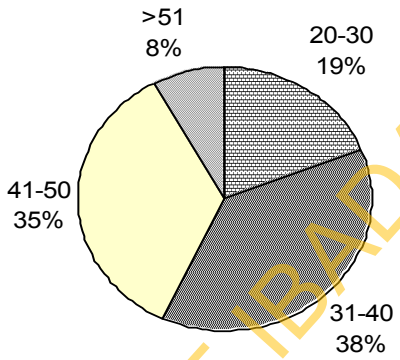

Figure 3: Pie-chart showing age distribution of the marketers of *P. biglobosa* products in the three ecological zones of Oyo State.

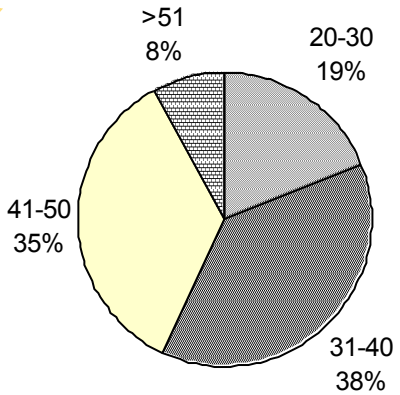

Figure 4: Pie-chart showing age distribution of the marketers of *V. paradoxa* products in the three ecological zones of Oyo State.

Contributions of *V. paradoxa* and *P. Biglobosa to Marketers' livelihood in the study area*

Annual income from the sales

As shown in Figure 5, 85% of the respondents realized average of ₦ 33,600 per annum from *V. paradoxa* while 15% realized average of ₦72,000 per annum. This contributes about 35% to annual income of the respondents. From the sales of *P. biglobosa*, 93.7% of the respondents realized average of ₦ 72,000 per annum. This amounts to about 50% of annual income of the respondents (Figure 6). The fact that 50% of income comes from the marketing of *P. biglobosa* products indicates the level of support of the species to the rural livelihood.

Chi square test shows that the degree of contribution of *V. paradoxa* and *P. biglobosa* to marketer's annual income in dry woodland and moist woodland is significant at 5% level of probability but not significant in the rain forest (Table 1). This might be as a result of low abundance of the species in the rain forest ecological zone. The income from the marketing of the species serve as a lifeline for those engaged in the business. This agrees with assertion of FAO (2009) that many forest based businesses provide substantial employment opportunity and supplementary income.

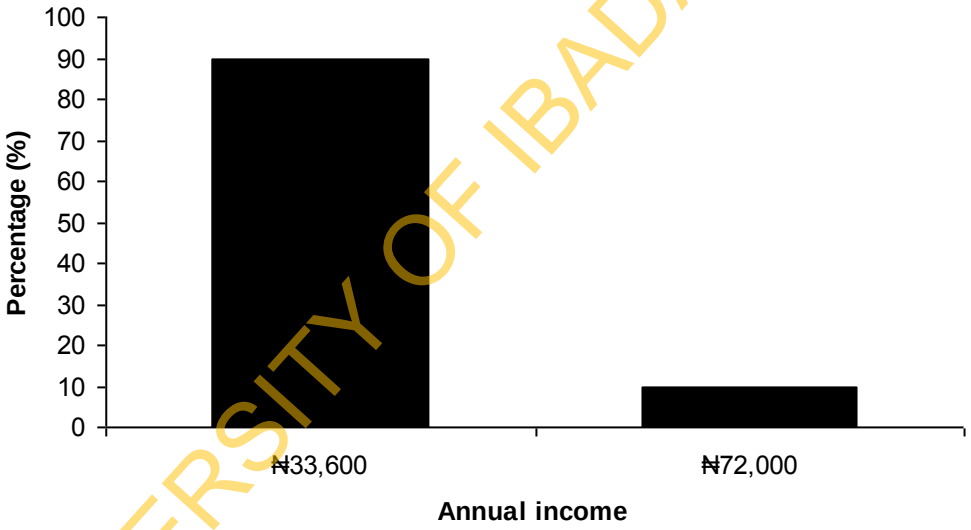

Fig. 5: Bar-chart showing annual income from the sales of *V. paradoxa* products in the three ecological zones of Oyo State.

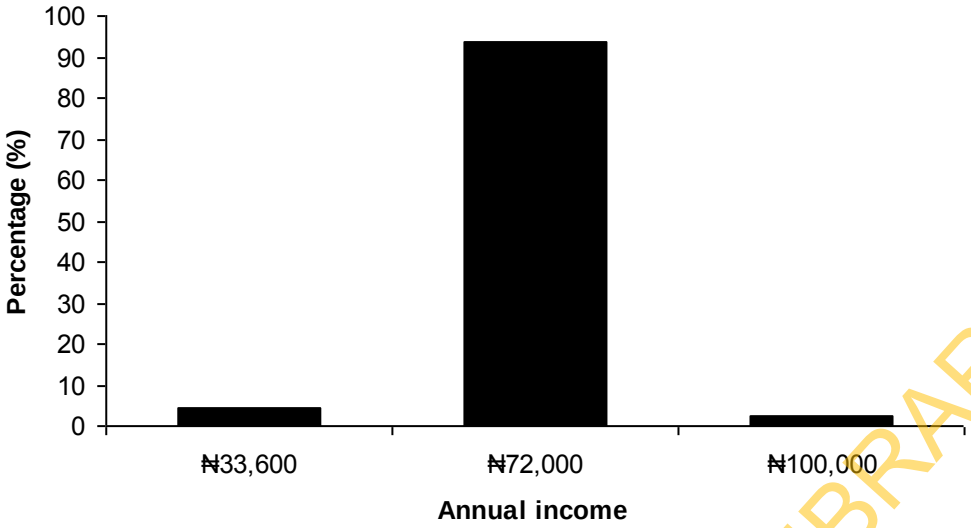

Fig. 6: Bar-chart showing annual income from the sales of *P. biglobosa* products in the three ecological zones of Oyo State.

Contributions of the Study Species to Employment Generation Among the Processors.

P. Biglobosa generates 20% of the processors' annual employment. This is probably because seeds of *P. biglobosa* are much more abundant and that demand for its products is higher. Involvement of majority in the processing of *P. biglobosa* corroborates the finding of Oyerinde and Daramola (2004) that higher percentage of the population of rural dwellers is directly involved in the processing of many non-timber forest products.

The result from the survey indicates that processing of *V.paradoxa* generate about 14.2% of annual employment in the study area. Hence, this species plays crucial roles in economic well being when it matters most. All year round employment and income is being generated from processing of *P. biglobosa* and *V.paradoxa*. They contribute to 50% and 35% of annual income of the processors respectively. This finding agrees with Jimoh and Haruna (2007) and FAO (2009) that forest based activities provide supplementary sources of family income apart from agriculture.

Chi-square test indicates that the degree of contribution of *V.paradoxa* and *P.biglobosa* to processors annual income in dry woodland and moist woodland are significant at 5% level of probability but not significant in the rainforest (Table 2). The significant contribution of the species in dry woodland and moist woodland conforms to the findings of Bayala *et.al*, (2005) that rural households derive livelihoods sustenance from NTFPs.

Demographic information on the Harvesters of *V.paradoxa* and *P. biglobosa*

51.6% harvesters engaged in the harvesting of *P. biglobosa* only while 48.4% harvest the two species throughout their harvesting season. As a result of this, conservation of the species is crucial for sustainability of socio-economic values.

Harvesters engaged in harvesting for 2 – 3 months annually. This implies that supplementary employments are being generated (25% of annual employment) during the harvesting season of this species in addition to their primary occupations of farming.

Harvesting of *V.paradoxa* contributes 23% to annual income of majority of the harvesters while harvesting of *P.biglobosa* accounts for 38% of *harvesters* annual income. The chi square test shows that the degree of contribution of *V.paradoxa* and *P. biglobosa* to harvesters' daily income in dry woodland and moist woodland is significant at 5% level of probability (Table 3). This shows that income reported here plays crucial role in household finances as such funds come handy during emergency cash needs (Hopskins, 1990).

Consumption of *V.paradoxa* and *P.biglobosa* in Local Diets

Almost every respondent consume *P.biglobosa* everyday. About 35% of daily food intake contains *P.biglobosa* (Table 5). This shows the important contribution of the species to food security and confirms the finding of Jimoh and Adedokun (2005) that those who consume *P.biglobosa* (iru in Yoruba) daily have the largest percentage (64.7%). It is therefore, expedient to ensure sustainability of this species through effective management. A few numbers of respondents consume *V. paradoxa* products (shea butter) while many do not consume it at all (Table 4). This might be due to the availability of alternative oil like palm oil and vegetable oil. On the other hand, many respondents affirmed the use of the products for medicinal purpose.

Chi square test shows that the degree of contribution of *P.biglobosa* to household consumption in dry woodland, moist woodland and rainforest is significant at 5% level of probability (Table 6). On the other hand, the degree of contribution of *V.paradoxa* to household consumption is significant at 5% level of probability in dry woodland but not in the moist woodland and rainforest (Table 6). It is clear from the above findings that contribution of the species to food security depends on ecological zones.

Table 1: Chi-square Test for Association between the Degree of Contribution of *V.paradoxa* and *P.biglobosa* to Marketers' Annual Income and Ecological zones

Species	Ecological zones	X^2	Tab. X^2	Df
	Dry woodland	12.40*	11.67	4
V.paradoxa	Moist woodland	11.9*	11.67	4
	Rainforest	0.20ns	11.67	4
	Dry woodland	14.40*	11.67	4
P.biglobosa	Moist woodland	12.9*	11.67	4
	Rainforest	11.84*	11.67	4

* = Significant at 5% level of probability.
ns = Not significant at 5% level of probability.

Table 2: Chi-square Test of Association between the Degree of Contribution of *V.paradoxa* and *P.biglobosa* to Processors' Annual Income and Ecological zones.

Species	Ecological zones	X^2	Tab. X^2	Df
	Dry woodland	11.90*	11.67	4
V.paradoxa	Moist woodland	11.88*	11.67	4
	Rainforest	0.19ns	11.67	4
	Dry woodland	14.87*	11.67	4
P.biglobosa	Moist woodland	12.83*	11.67	4
	Rainforest	11.84*	11.67	4

* = Significant at 5% level of probability.

ns = Not significant at 5% level of probability.

Table 3: Association between the Degree of Contribution of *V.paradoxa* and *P.biglobosa* to Harvesters' Annual Income and Ecological zones

Species	Ecological zones	X^2	Tab. X^2	Df
V.paradoxa	Dry woodland	12.20*	11.67	4
	Moist woodland	30.20*	11.67	4
	Rainforest	0.90ns	11.67	4
P.biglobosa	Dry woodland	30.20*	11.67	4
	Moist woodland	33.80*	11.67	4
	Rainforest	5.40ns	11.67	4

* = Significant at 5% level of probability; NS = Not significant at 5% level of probability.

Table 4: Consumption of *V. paradoxa* in the three ecological zones of Oyo State

	Total	
	Freq.	%
Consumption of *V.paradoxa*		
Yes	51	42.5
No	56	46.7
No response	13	10.8
Total	120	100
Frequency of consumptions		
Every day	15	12.5
Once in 2 days	1	0.8
Once in 3 days	12	10
Once in a week	38	31.7
No response	54	45
Total	120	100

Source: Field survey, 2011

Table 5: Consumption of *P. biglobosa* in the three ecological zones of Oyo State.

	Total	
	Freq.	%
Consumption of *P. biglobosa*		
Yes	117	97.5
No	3	2.5
Total	120	100
Frequency of consumptions		
Every day	109	90.8
Once in 2 days	11	9.2
Once in 3 days	0	0
Once in a week	0	0
Total	120	100

Number of times daily		
Once a day	68	56.7
Twice a day	45	37.5
3 times a day	0	0
No response	7	5.8
Total	120	100

Source: Field survey, 2011

Table 6: Association between the Degree of Contribution of *V.paradoxa* and *P.biglobosa* to Household Consumption and Ecological zones.

Species	Ecological zones	X^2	Tab. X^2	Df
	Dry woodland	17.400*	11.67	4
V.paradoxa	Moist woodland	10.82ns	11.67	4
	Rainforest	09.35ns	11.67	4
	Dry woodland	32.40*	11.67	4
P.biglobosa	Moist woodland	38.12*	11.67	4
	Rainforest	36.10*	11.67	4

* = Significant at 5% level of probability.
ns = Not significant at 5% level of probability.

CONCLUSION

Harvesting, processing and marketing of *V. paradoxa* and *P. biglobosa* play significant roles in food security, employment and income generation in the study area. The degree of contribution of *P. biglobosa* to food security, income and employment generation in the three ecological zones were significant at 5% level of probability, while contribution of *V. paradoxa* to food security, income and employment generation was significant in dry woodland and moist woodland but not in rain forest. The study has revealed the socio-economic importance of the species and therefore, their management should be improved. Enrichment planting and domestication of the two species should be encouraged by the forestry stakeholders in order to ensure sustainability of the species. Moreover, farmers should be encouraged by forestry stakeholders to improve on the retention and planting of new trees for the increase in the socio-economic values which they are deriving from the species.

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