IJAAR PUBLISHING®

African Journal of Sustainable Agricultural Development | ISSN: 2714-4402
Vol. 7, Number 2 (2026) | https://doi.org/10.46654/se1jhb28

ASSESSMENT OF ATTRACTION TO AFRICAN WALNUT (*Plukenetia conophora* Mull. (Arg)) ENTERPRISE IN EDO STATE, NIGERIA

Kalu, P. C., Enoghayin, J. and Aigbobo, E.N.
Department of Forest Resource and Wildlife Management
Faculty of Agriculture, University of Benin, Benin City
cpkalu@uniben.edu

ABSTRACT

African walnut (*P. conophora*) is of importance due to the various benefits associated with its production, trade and consumption but this study addresses the attractions to its trade in Edo State, Nigeria. A multistage stratified sampling method was used to select a total of 390 respondents/traders of walnut from the three agro-ecological zones of the state which include Edo South, Central and North. Simple percentage, mean, analysis of variance (ANOVA) and Least Significant Difference (LSD) were used to analyze data. Results showed that the nuts were sourced from the farm and wild which accounted for 52.7 and43.9% respectively. Varied identified uses were food (43.9%), trade (31.0%), medicine (18.8%) while industrial and / or add-in for many preparations stood at 0.6%. The reason for attractions to trade on African walnut was its lucrativeness which was significantly different ($P<0.05$) from the other reasons identified in the study. Other identified reasons for enticement include; time convenience (18.53%), availability of nut (18.29%), low cost (11.4%) while lack of government levy/tax (0.87%) and ease of transporting accounted for 0.87 and 0.47% respectively. The sources of financing this enterprise were personal saving (18.53) while gift and credit/loan stood at 6.53 and 2.07% respectively. Efforts should be geared towards improving the supply and production base of African walnut in order to achieve the desired benefits in sustenance, livelihood and people living standard while engaging in the trade and businesses.

Key words: African walnut, agro-ecological zone, attraction, enterprise, production base

INTRODUCTION

The *Pluckenetia conophora* (African walnut) nut "okhue" (Bini) is one of the most cherished snacks in Edo State (Apkuaka and Nwankwo, 2000). It is a perennial climber found in the moist forest zones of sub-Sahara Africa (Oke, 1995). It is grown majorly for the fruits that are boiled and eaten as snacks, along with cooked corn (Oke, 1995; Edem *et al*., 2009). Its fruiting season coincides with the fruiting season of corn in Edo State. It is always found in the markets around June to September (Oke, 1995). *P. Conophora*is one of such fruits in Edo State that are harvested, processed, stored and distributed around the forest communities as well as the urban areas. They are very vital to the sustenance of the rural people, and they provide substantial employment opportunities in both rural and semi-urban areas (Opii and Babalola, 2008). The nuts are procured from the wild and sometimes grown under agro-forestry system, usually cultivated among tree components like cocoa (Bastiaan *et al*., 2009). Collecting and processing of the fruits is done by the farmers' household, meaning that it is a subsistence system of trade that involves only members of the immediate family; the father, mother and the children (Oke, 1995).

This fruit serves as supplements to diets as well as provide relief at critical moments due to cash squeeze. The fruits of *P. conophora* like many fruits have been proven to have nutritive, medicinal, agricultural and industrial values over the years (Oke and Fafunso, 1995). According to Kanu *et al*. (2015) the nuts are rich in protein (15%), carbohydrate (16.9%) with calories about 600J, fat and oils (60%), vitamins (A, B1, B2, B3, B5, B6, B9, B12 and E) and minerals (folate, sodium, potassium, manganese, copper, and chloride). Their green hulls or the immature fruits are good sources of vitamin C (Ndie *et al*., 2010, Oke and Fafunso, 1995). The ability of *P. conophora* to reduce cholesterol seems to be one of their health benefits, though walnuts contain a host of other antioxidants such as ellagic acid, which helps to support the immune system, they also possess some anticancer properties.

The importance of *P. conophora* as an indigenous fruit climber is high as it is a multi-purpose crop. Local populations of which small scale farmers constitute the highest within the West and Central African region exploit the seeds to generate incomes to improve their standard of living (Jiofack *et al.,* 2013). This study seeks to determine the attractions to the African walnut enterprise in Edo State, Nigeria.

Methodology

Study Area. The study was carried out in Edo State, Nigeria. Edo State is roughly located between latitudes $05^0$30′N and $07^0$25′N of the equator and longitudes $05^0$00′E and $06^0$50′E of the Greenwich Meridian. Its capital is Benin City. It is bounded in the north and east by Kogi State, in the south by Delta State and in the West by Ondo State. It has a total land area of 19,794km^2 and the 2006 national census put its population at 3,233,366. Edo state has a tropical climate characterized by wet and dry seasons. The wet season begins in April and ends in October while the dry season begins in November and ends in March. The average annual rainfall is 2500mm near the coastal area and 1500mm in the extreme northern part of the state. Temperature across the state is relatively high with a very narrow varies in seasonal and diurnal ranges between 22-36^{0}C. The maximum relative humidity throughout the year varies between 95 and 98%, with minimum between 51 and 74%. Three vegetation belts are discernable from the south to the north, the mangrove swamp forest in the southern part, the rainforest at the middle while the northern part has the savannah vegetation (Ojeifo and Eseigbe, 2012).

Sampling Method.A multistage stratified sampling method was used in carrying out the study. In the first instance, two Local Government Areas (LGA) were randomly selected in each of the three vegetation zones of the state. Secondly, 10% sampling intensity was used to select a total of fifteen (15) communities from among the identified communities in the six selected local government areas. Lastly, twenty six(26) respondents were randomly selected from each of the 15 communities. Thus, a total of 390 respondents were used for the study (Tables 1) as it conforms to the 384 sample size required to validate a study on a population of one million and above (Bajang, 2021)

Table 1. Sampled Local Government Areas and Communities.

Vegetation Zones	Sampled L.G.A.	Total Communities Identified	10% S.I.	Sampled communities
North	Akoko-edo	36	4	Igarra, Ososo, Ibilo and Somorika
	Etsako central	11	1	Auchi
Central	Esan central	18	2	Irrua and Ewu
	Igueben	10	1	Amahor
South	Egor	11	1	Iguosa
	Ikpoba-okha	60	6	Oregbeni, Ogheghe, Idogbo, Obayantor, Temboga and Umelu
	Total	146	15	

S.I. – Sampling intensity

Data Collection and Statistical Analysis.

Primary data were collected through the administration of three hundred and ninety copies of well-structured questionnaire to respondents which consist of sellers or collectors of African walnuts. Personal interview was also done using field assistants who made use of local language and dialects such as Bini, Ishan, Etsako, Igarra, andOsoso amongst others. Data collected were analyzed using descriptive and inferential statistics.

RESULTS AND DISCUSSION

Pluckenetia conophora (African walnut) was sourced from the farm (52.7%) and the wild (47.3%) (Table 2). The results from the various vegetation zones showed little differences between the two sources of African walnut from tree vegetation zones under consideration such as; South (25.1% farm) and (21.5% wild), North (17.8% farm) and (16.5% wild), while Central vegetation zone accounted for 11.0 and 9.5% farm) and wild respectively.

Table 2. Source of African Walnut in Edo State (%)

Vegetation zones	Communities	Wild	Farm
North	Auchi	2.9	3.9
	Ibilo	2.6	3.9
	Igarra	2.9	4.2
	Ososo	3.9	2.9
	Somorika	4.2	2.1
	Sub-total	16.5	17.0
	Amahor	3.7	3.1
Central	Ewu	2.4	4.5
	Irrua	3.4	3.4
	Sub-total	9.5	11.0
	Idogbo	3.7	3.4
South	Iguosa	2.1	4.7
	Obayantor	3.9	2.6
	Ogheghe	2.6	3.7
	Oregbeni	2.6	4.2
	Temboga	2.9	3.9
	Umelu	3.7	2.6
	Sub-total	21.5	25.1
	Grand Total	47.3	52.7

Source: Field Survey, 2015

The findings reveal that *P. conophora* sourced from the farm and from the wild is almost equally in proportion in the study area. This contrasts the view of Babalola (2011a) and Petrova (1980) who stated that bulk of the nuts is obtained from plantation through cultivation by peasant farmers while Samson *et al*. (2014) opined that they are widely harvested from natural forests, plantations, multi-strata agroforestry systems and compound farms.

Uses of African Walnut

There are quite a number of uses of African walnut identified in Edo State (Table 3). These include; food (43.9%), commercial (31.0%), medicine (18.8%) and other forms (0.6%). The use of walnut as food dominated other uses considered also in each of the agro-ecological zones because it accounted for 18.7, 15.2 and 10.7% for South, North and 10.7% respectively.

Table 3. Various Uses of African Walnut in Edo State (%)

Vegetation zones	Community	Commercial	Food	Medicine	Other forms
North	Auchi	1.8	1.9	0.7	-
	Ibilo	1.8	3.4	1.1	0.2
	Igarra	3.1	2.2	1.4	-
	Ososo	2.3	3.6	0.9	0.2
	Somorika	1.8	4.1	0.2	-
	Sub-total	10.8	15.2	4.3	0.4
Central	Amahor	2.3	3.6	0.9	-
	Ewu	2.2	3.2	1.6	-
	Irrua	2.7	3.2	1.8	-
	Sub-total	7.2	10.0	4.3	-
South	Idogbo	2.5	3.1	1.1	-
	Iguosa	1.8	1.8	1.1	-
	Obayantor	1.6	3.4	1.8	-
	Ogheghe	2.2	3.4	1.6	-
	Oregbeni	1.4	1.6	1.1	0.2
	Temboga	1.9	3.1	1.1	-
	Umelu	1.6	2.3	1.4	-
	Sub-total	13.0	18.7	10.2	0.2
	Grand Total	31.0	43.9	18.8	0.6

Source: Field Survey, 2015

This agrees with Oke, (1995); Edem *et al*., (2009); Oke and Fafunso (1995) that walnuts are grown mainly for the fruits that are boiled and eaten as snacks, sometimes with cooked corn.

Attractions to Africa Walnut Enterprise

The various attractions to the trade in African walnut in Edo State are; its lucrativeness, time convenience, availability of the nut, low cost, lack of government levy/tax and ease of transporting with mean values of 23, 18.53, 18.29, 11.4, 0.47, 0.87and 0.47 respectively (Table 4). Hence, the prominent attraction of most people to the trade in African walnut is its lucrativeness which is a pointer that the business of African walnut is profitable.

Table 4. Attractions to Africa Walnut Trade

Vegetation zones	Communities	Low Cost	Time Convenience	Ease of Transporting	Lack of Levy	Availability	Lucrativeness
North	Auchi	7	12	-	1	20	20
	Ibilo	24	23	-	-	13	26
	Igarra	6	20	-	-	17	23
	Ososo	5	26	2	3	19	25
	Somorika	7	9	3	3	20	22
Central	Amahor	15	20	2	2	20	26
	Ewu	8	19	-	-	18	26
	Irrua	14	10	-	-	23	26
	Idogbo	7	25	-	-	13	21
South	Iguosa	23	20	-	-	18	22
	Obayantor	15	24	-	-	15	21
	Ogheghe	6	20	-	-	`16	20
	Oregbeni	11	11	-	-	20	25
	Temboga	8	26	-	2	22	25
	Umelu	15	13	-	2	18	17
	Total	171	278	7	13	256	345
	Mean	11.4^{c}	18.53^{b}	0.47^{d}	0.87^{d}	18.29^{b}	23^{a}

Means with the same alphabet are not significantly different using least significant difference LSD (P<0.05)
Source: Field Survey, 2015

This is consistent with FAO (2001) that the three overarching attractions to non-timber forest products trade in sustainable forest management are income generation, more equitable sharing of the benefits from forest, and local participation in forest management. According to Jiofack *et al*. (2013) rural settlements within the West and Central African region of which Edo State belongs exploit the seeds of *P. conophora* to generate incomes to improve their social and economic need. As the period of abundance (August to September) of the nuts in the market are convenient and compatible with other businesses engaged in by the tradersbecause the production of its seeds and commercialization does not take so much time or sacrifices. Furthermore, the lucrativeness of African walnut trade can be linked to its maximum profitability since there is no equipment needed for its harvest and conservation and no seed processing task (Oke and Fafunso, 1995; Jiofack *et al*., 2013).

Employment Opportunities in African Walnut Enterprise

Employment opportunities in African walnut enterprise in Edo State are shown in Table 5, and the variables assessed included family labour, non-family labour and sole proprietor. The results showed that there are significant difference among the various labour units (P<0.05) with sole proprietor and family labour dominating and significantly different from non-family labour. The walnut enterprise is thus, a subsistence system that mainly depends on family labour for its operation because it is not labour intensive. The only work required for its operation is the collection of its fruit under storage, boiling and selling (Jiofack *et al*., 2013).

Table 5. Employment Opportunities in African Walnut Trade

Vegetation zones	Communities	Family labour	Non-family labour	Sole Proprietor
North	Auchi	18	4	2
	Ibilo	13	2	11
	Igarra	10	-	16
	Ososo	17	-	9
	Somorika	11	1	14
	Amahor	6	-	20
Central	Ewu	20	2	4
	Irrua	2	2	18
	Idogbo	8	8	10
South	Iguosa	6	1	19
	Obayantor	14	5	7
	Ogheghe	8	4	14
	Oregbeni	13	5	8
	Temboga	19	2	5
	Umelu	6	5	15
	Total	171	41	172
	Mean	11.4^{a}	2.7^{b}	11.5^{a}

Means with the same alphabet are not significantly different using least significant difference LSD ($P<0.05$)
Source: Field Survey, 2015

This agrees with FAO (2005) which stated that Brazil forest nuts business are microenterprises owned generally by one who works in the harvesting process, who contracts mainly family labour or sometimes none family labour. Also, Babalola (2011b) stated that the collection and processing of the walnut fruits is done by the farmer's household, meaning that it is a subsistence system of trade involving family; father, mother, children and other relatives.

Source of Finance for African Walnut Trade

Table 6 shows the source of finance for the trade of walnut and this includes personal savings (18.53), grant/gift (6.53) and credit/loan (2.07). Also, there are significant difference among the sources of finance for African walnut trade ($P>0.05$) and personal savings dominated other sources of finance considered in the study.

Table 6. Source of Finance for African Walnut Trade in Edo State

Vegetation zones	Community	Personal Savings	Credit/loan	Grant
North	Auchi	13	2	8
	Ibilo	20	1	9
	Igarra	13	4	10
	Ososo	26	-	-
	Somorika	20	4	3
Central	Amahor	24	-	2
	Ewu	14	2	13
	Irrua	18	-	7
South	Idogbo	17	2	12
	Iguosa	19	-	11
	Obayantor	21	3	3
	Ogheghe	18	6	4
	Oregbeni	19	4	3
	Temboga	15	2	9
	Umelu	21	1	4
	Total	278	31	98
	Mean	18.53^{a}	2.07^{c}	6.53^{b}

Means with the same alphabet are not significantly different using least significant difference LSD ($P<0.05$)
Source: Field Survey, 2015

This in a way corroborated the views of Faleyimu, Ishola and Adejoba (2016) that majority of African walnut marketers (48.4%) source their capital from friends and personal saving (48.4%) while 3.2% of its marketers uses capital sourced from cooperatives. The African walnut enterprise as a small-scale enterprise will find it extremely difficult to secure loan as a result of series of bottle necks that the small scale traders cannot afford. Hence, it operates as many parallel business ventures that their finances or personal savings tend to flow between them. A small scale enterprise like the African walnut trade that cannot get a loan will definitely rely on personal savings or grants/gifts from friends/relatives (Auren and Krassowka, 2004).

Challenges Faced by African Walnut Traders

The challenges faced by the traders of this nut in the course of their business spanned from light, sometimes, moderate, severe to extremely severe respectively ranked using the Linkert scale of 1-5 (Table 7). These challenges are financial constraints (4.4), transport/roads (3.9), processing difficulty (3.8), low patronage (3.4), levies (3.1) and procurement difficulties (2.7). The results indicated that there were significant difference among various challenges faced by sellers ($P>0.05$). Financial constraints and transportation difficulties dominated other problems encountered by the traders. The financial constraint could be due to the difficulties faced in accessing loans as a small scale enterprise.

African Journal of Sustainable Agricultural Development | ISSN: 2714-4402
Vol. 7, Number 2 (2026) | https://doi.org/10.46654/se1jhb28

Table 7. Challenges Faced by Walnut Sellers in the Edo State

Vegetation Zones	Communities	Financial Difficulties	Low Patronage	Difficulty of Processing	Procurement Difficult	Levy	Transportation/Road
North	Auchi	3.7	3.4	3	3.6	4.4	4
	Ibilo	4.7	3.1	4	2.9	2.9	3
	Igarra	4.2	3.6	4.4	4	1.1	4
	Ososo	4.8	4.5	4.1	2	2.8	4.1
	Somorika	4.4	4	3.9	3	2.2	4.4
Central	Amahor	4.2	3.1	3.4	1.2	3	3.8
	Ewu	4.7	3.2	4	1.1	2.4	3.6
	Irrua	3.2	3.1	3.6	3.3	4.9	4
South	Idogbo	4.6	3.7	3.7	3.3	4.6	2.8
	Iguosa	4.7	2.8	3.9	2.9	3.4	4.9
	Obayantor	4.5	3.1	3.6	3.1	2.2	4.5
	Ogheghe	4.4	4.5	4.3	4	4.6	4.5
	Oregbeni	4.4	2.5	3.5	2	1.6	4
	Temboga	5	3.2	3.7	2	4.5	3.5
	Umelu	3.9	3.2	3.9	2.6	1.8	3.8
	Total	65.4	51	57	41	46.4	58.9
	Mean	4.4^{a}	3.4^{cd}	3.8^{bc}	2.7^{e}	3.1^{de}	3.9^{ab}

Means with the same alphabet are not significantly different using least significant difference LSD ($P<0.05$)
Source: Field Survey, 2015. using Linkert scale of 1-5

This agrees with the opinions of Babalola (2011a) that the most prominent problem encountered by producers of African walnut is inadequate transportation as a result of deplorable rural road networks. Also, in places where the vehicles can get to the production site, high transportation cost is incurred in conveying the product to the market. Hence, these nuts become spoilt due to transportation problems resulting from inaccessibility to the fields where it is sourced and subsequently, increases the cost of running its trade. This leads to heightened financial stress on the poor trader who finds it difficult to assess loan.

CONCLUSION

The tropical forest ecosystems provide thousands of non-timber forest products which include African walnut (*Pluckennetia conophora*) that is consumed as snacks/food, medicines and commerce. The lucrativeness of walnut trade has been a major attraction of people to its trade as it provides employment to many local farmers/traders, thus serving as a means of improving their livelihood. Despite the benefits associated with the forest fruit,the traders of this nut are still faced with the problem of finance and poor transportation.

REFERENCES

Akpuaka, M.U. and Nwankwo, E. (2000). Extraction, Analysis and Utilization of a Drying Oil from *Tetracarpidium conophorum. Bioresearch Technology*, 73: 195-196.

Auren, R. and Krassowsk, K. (2004). Small and Medium Forestry Enterprise in Uganda: How can they be Profitable, Sustainable and Proverty Reducing? A Review of Key Issues.

Babalola, F. D. (2011a). Cultivation of Africa Walnut *Tetracarpidium conophora* Mull. (arg) on Agricultural Plantation: An Approach to Conservation Agriculture in Nigeria. *5th World Conference on Conservation Agriculture and 3rd Farming Systems Design Conference* (WCCA/FSD), Brisbane, Australia from 26-29 September 2011. Pp180-181.

Babalola, F. D. (2011b). Marketing of African Walnut (*Tetracarpidium conophorum* Mull. (Arg)) in Southwest Nigeria: Production Issues and Contributions to Stakeholders. *Journal of Agricultural Science and Technology*, 1: 523-531.

Bajang, A.M. (2021) A step-by-step process on sample size determination for medical, Malays Journal of medical Sci, 28(2): 15-27.

Bastiaan, L., Fischlin, A., Gluck, P., John, I., Lucier, A., Parrotta, J., Santoso, H., Thompson, I., and Wreford,

A. (2009). Forest Ecosystem Services: A Cornerstone for Human Well-Being. In: RistoSeppälä, Alexander Buck and PiaKatila. (Eds). *Adaptation of Forests and People to Climate Change*. A Global Assessment Report. IUFRO World Series Helsinki., 22: 15-27.

Edem, C. A., Dosunmu, M. I. and Bassey, F. I. (2009).Determination of Proximate Composition, Ascorbic Acid and Heavy Metal Content of African Walnut (*Tetracarpidium conophorum*). Pakistan. *Journal of Nutrition,* 8 (3): 225-226.

Faleyimu, O. I., Ishola, I. A. and Adejoba, O. R. (2016). Socio-economic Analysis of Walnut Fruit (*Tetracarpidium conophorum*) in Iwo Local Government, Osun State, Nigeria.

Proceedings of the 1st Commonwealth Forestry Association (CFA) Conference, Nigeria Chapter, Forestry Research Institute of Nigeria (FRIN), Jericho, Ibadan, Nigeria.

Famuyide, O. O., Adebayo, O., Bolaji-Olutunji, K. A., Awe, F., Owoeye, A. Y., Awodele, D. O. and Adeyemo, A. (2013). Assessment and Sustainable Management of Non-Timber Forest Products used as Food and Medicine among Urban Dwellers in Oyo State, Nigeria. *Journal of Horticulture and Forestry*, 5(11): 186-193.

FAO (2001). *Resource Assessment of Non-Wood Forest Products: Experience and Biometric Principles*. FAO, Rome. 109pp.

FAO (2005). *Microfinance and Forest Based Small-Scale Enterprises*. FAO Corporate Document Repository Paper No. 146, Rome. 41p.

Jiofack, T., Tchoundjeu, Z. Guedje, N. M., Lejoly, J., Fokunang, C. and Mweru, M. (2013). Can the Contribution of the African Walnut Diversifying Cocoa Agro Forests being Profitable for Local Stallholders in Cameroon? *Wudpecker Journal of Agricultural Research*, 2(5): 142-150.

Kanu, A. M., Kalu, J. E. and Okorie, A. C. (2015). Nutritional and Health Values of African Walnut (*Tetracarpidium conophorum*). *International J. of Scientific and Tech. Research*, 4(9): 215-220.

Ndie, E. C., Nnamani, C. V., and Oselebe, H. O. (2010). Some Physicochemical Characteristics of Defatted Flours Derived from African Walnut (*Tetracarpidium conoforum*): An Underutilized Legume. *Pak. J. Nutr*., 9(9):909-911.

Ojeifo, O. M. and Eseigbe, J. O. (2012). Categorization of Urban Centres in Edo State, Nigeria. *Journal of Business and Management*, 3(6): 19-25.

Oke, O.L. (1995). *Leaf Protein Research in Nigeria*. University of Ibadan Press, Ibadan, Nigeria. Ed. 2nd.Pp38-42.

Oke, O. L., and Fafunso, M. A., (1995). Lesser Known Oilseeds: The Nutritive Value of Conophor Seeds in In Vitro. *Nutrition Report International*, 12: 41-49.

Opii, E.E. and Babalola, F.D. (2008): Marketing of *Prosopis Africana* (Guill, Perrott and Rich): Implication on Sustainable Exploitation in Benue State, Nigeria. *Obeche Journal*, 26(1): 86-95.

Petrova, U. V. (1980). *Studies of Chemical Composition and Correlations between Chemical Characteristics in some Walnut Varieties*. Naoka Publishing Co. Ltd. London. Pp 98-110.

Samson S. E., Mitsan O., Samuel E. U., Yomi R. A., Alfred F. E. and Comfort B. E. (2014). Antibacterial Activity of Methanolic Leaf Extract of Plukenetia conophora Mull. Arg. against Selected Bacteria Isolated from Urinary Tract Infection. *International Journal of Microbiology and Application*, 1(1): 1-10.