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Utilization pattern of *Garcina kola* Heckel (Bitter kola), a Panacea for its Conservation in Ibadan Metropolis, Oyo State Nigeria.

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ABSTRACT

Numerous studies have reported the uses and outcomes of *Garcinia kola* in rural areas; however, knowledge about its consumption in urban settings, including Ibadan, remains limited. This study explored the consumption of *G. kola* in Ibadan, Oyo state, Nigeria to provide relevant information on sourcing practices, benefit of consumption and consumer demand. Multistage sampling was adopted to select 197 respondents for the study. Primary data were collected with the aid of structured questionnaire and interview schedule. Descriptive statistics were used to summarize the consumption pattern and costs incurred for utilization of *G. kola*, while a logit model was used to determine the socio-economic factors by which *G. kola* consumption can be predicted in the study area. Most (n = 60) of the respondents were living in Akinyele LGA and they were mostly women (76%). From a pre-determined list, the most frequently usedpart of *G. kola* was the seed (93%; p = 0.300)which was mostly consumed in its dry form (40%; p = 0.422) either daily and/or weekly and sourced mostly from the market (80%). However, location had a statistically significant (p = 0.050) large effect (Cramer's V = 0.55) on the frequency of consumption of *G. kola*. Most of the consumers cited antibiotics(mean = 2.08) and snacks (mean = 2.04) as the highest importance of *G. kola* across the study areas. Thus, an average of ₦1 720/US$1.14 was the amount spent on monthly consumption of *G. kola*. Gender, income and awareness of benefits were the significant predictors that can influence *G. kola* consumption. The study contributed baseline information to policy makers that could support the sustainable management of *G. kola* in Ibadan and/or elsewhere.

Keywords: Cities, Forests ecosystem, "*Orogbo*", SDGs, Sustainable management

Introduction

From time immemorial, forests and the trees that form them provides a wide range of benefit at the local, national and global levels (Ngansop *et al.*, 2024). For instance, forests provide non-timber forest products (NTFPs) that is "goods and services of biological origin other than timber derived from the forests or associated ecosystem" that are consumed either directly as food, medicine, construction material, fuel wood, as well as for spiritual and cultural significance (Unaeze, *et al*., 2013). Similarly, NTFPs contribute non-consumptive values to human welfare and/or they could be harvested for both subsistence and commercial use either regularly or as a fallback during times of need (Jimoh *et al*., 2016). Globally, millions of people make extensive use of NTFPs from the wild/forests, hence, about 80% of forest dependent communities rely on NTFPs for

their subsistence and/or daily consumption (FAO, 2018; Ofor *et al*.,2018;Adebisi, 2014).

Conversely, there are a wide range of non-timber forest products (NTFPs) that are extracted from the forests for consumption purpose. One example is *Garcinia kola* (Heckel), popularly called "*Bitter kola*" in English and "Orogbo" in Yoruba.*G. kola*, belonging to the family Clusiaceae is - a multipurpose tree indigenous to the humid tropical forests of west and central Africa.The tree provides a variety of products, that isfruits, seeds, bark, twigs, leaves, and wood, however, the seeds are the most valuedand consumed to provide socio-cultural or religious significance for people (Babalola and Agbeja, 2020). For instance, *G. kola*seedsare commonly chewed and used for traditional ceremoniesand medicinesacross west African countries, Nigeria inclusive (Jimoh and Haruna, 2017). The seeds when chewed have a bitter, astringent taste, however, despite its bitter taste, they are commonly eaten as snacks and used for their stimulant effects due to high caffeine content (Aiyeloja, *et al*., 2022). *G. kola* is highly valued for its perceived medicinalattributes, and the fact that utilization of large quantitiesdoes not cause indigestion ("as cola nuts do") makes it a highly acceptable and/or desired product (Schreckenberg *et al*., 2016). Additionally, *G. kola* seeds are amongst the most-traded NTFPs in west and central Africa.Marketing of *G. kola* is considered as a profitable activity providing a substantial contribution to the livelihood of people living in rural areas(Idumah *et al.*, 2008). Most importantly, *G. kola* play a vital role in African ethno-medicinethat is for anti-poison, treatment of cough, malaria, diarrhoea, abdominal pain, to suppress headaches, *amongst others*(Adefule-Ositelu *et al*., 2014).

Several research efforts have been reported on the various uses and outcomes of *Garcinia kola* in rural areas. For instance, Ladipo (2015)and Kuponiyi (2017) investigated the medicinal potential and trade of *G. kola* in community forests of west and central Africa. Chidebere *et al*., (2016**)** and Adebisi (2014)surveyed the Consumption System of *G. kola* in rural communities of Abia and Ogun states, Nigeria. Idumah,*et al.*,(2008)and Aiyeloja, *et al*., (2022**)** reported on the importance of trading *G. kola* in rural economy of Nigeria and Aiyelaagbe, *et al* (2016) assessed the prevelence of *G. kola* and strategies for its conservation in Cross River National Park, Southern Nigeria, amongst others. Despite this, there is still a gap of knowledge on the consumption of *G. kola* in urban areas, Ibadan inclusive, such that the indigenous use of *G. kola* in the metropolis have not been thoroughly studied and/or documented. Another problem is that we are losing the trees from over exploitation and rampant deforestation, because when a forest resource becomes an article of significance, it could risk depletion due to unsustainable use by the people (Babalola and Agbeja, 2020). Moreover, failure to give *G. kola* adequate attention from policymakers could result in the resource becoming scarce, threatened, endangered or even extinct in extreme cases.

Therefore, the aim of this study was to explore the consumption pattern of *G. kola* in urban areas, using selected areas in Ibadan, Oyo State as a case study. The review of the literature was organized on the basis of the following research questions: (1) Which part(s) of *G. kola* is/or are consumed?., (2) How do people source for *G. kola*?., (3) Why do people consume *G. kola*?., (4) Does individual socio-economic factor(s) influence the consumption of *G. kola* in the study area?., (5) Do people encounter problems in

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sourcing for *G. kola* in the study area?, to provide relevant information on sourcing practices, consumer demand, benefit of consumption, and challenges faced. Obviously, sustainable use of *G. kola* can provide medicine, and related health benefits for people living in urban areas, including Ibadan. Similarly, if managed sustainably, *G. kola* could go a long way to solving many health problems, thereby increasing the standard of living of the people. Additionally, policies for sustainable development based on their consumption are not sufficient. A considerable amount of work must be conducted in the field of science to fill these information gaps. This study could serve as a potential stepping stone for *G. kola* cultivation and/or conservation that could help in contributing to various Sustainable Development Goals, i.e. SDGs 3 (Good health and wellbeing). Furthermore, results from the study are expected to provide baseline information to policy makers that could support the sustainable management of *G. kola* in Ibadan, Oyo State, Nigeria and/or elsewhere.

Methodology

Brief description of the study area

The study was conducted in Ibadan, Oyo State, Nigeria (Figure 1). Ibadan is in the Southern region of Nigeria. It is the largest City in West Africa with an estimated 4 140 000 inhabitants in a land area of 3 080 km^2 (WPR, 2025). Administratively, the City has 11 Local Government Areas (LGAs) consisting of five (5) urban and six (6) semi-urban districts (Figure 1). The geographical coordinate of the City is located at approximately Latitudes 7°10' and 7°23'N and Longitude 3°30' and 3°5'E. The average daily temperature is about 21°C. The City has two seasons: a rainy period from March to October and a dry (harmattan) season from November to February (Eseigbe and Ojeifo 2007). The vegetation distribution of the city is characterized by two (2) distinct types, that is the tropical rainforest and derived savanna zones that supports a wide range of non-timber forest products (NTFPs) that play a crucial role in the livelihoods of rural communities and the local economy. For instance, the tropical rainforest and derived savanna zones provide a variety of plant-based and animal-derived NTFPs, which are essential for food, medicine, and cultural practices. Among the most significant plant-based NTFPs is *G. kola* (bitter kola) which is highly significant for both nutritional and socio-economic purposes.

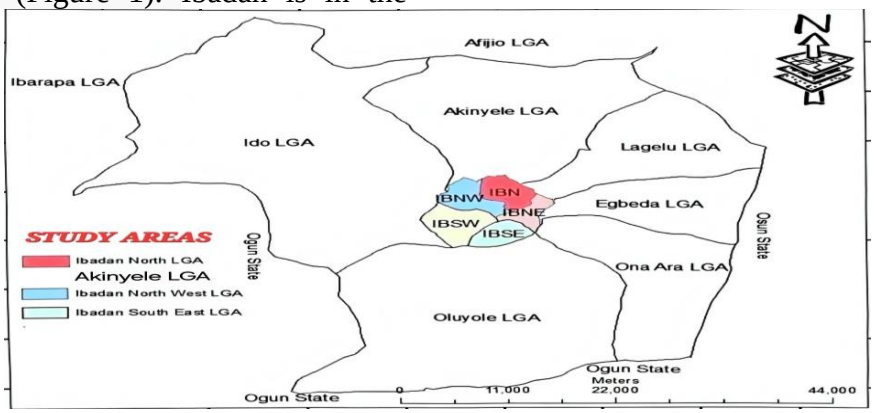


Figure 1: Schematics of the selected LGAs in Ibadan Metropolis

Data Collection

Sampling procedure:

Requisite data were collected using multistage sampling method. The purposive selection of Ibadan was the first stratum, because it fits the criteria of an urban area. In the second stratum, snowball sampling technique was used for the selection of five (5) key areas comprising Agbeni Ologede (Ibadan North West), Bodija (Ibadan North), Oja Oba (Ibadan South East), Ojoo (Akinyele), and Moniya (Akinyele) as shown in Table 1. These are major commercial hubs and/or prominent areas for high concentration of people living in close proximity to major markets of *Garcinia kola* in the city. Finally, the third stratum was the random selection of consumers in the five (5) selected sites, representing 36% of the total number of eleven (11) LGAs in Ibadan (Table 1). The survey was conducted between June and November 2023.

Table 1: Information defining the distribution of selected urban areas and number of respondents in Ibadan Metropolis

Location	Local Government Areas (LGAs)	No of Respondents
Agbeni Ologede	*Ibadan North West*	26
Bodija	*Ibadan North*	59
Oja Oba	*Ibadan South East*	46
Ojoo	*Akinyele*	31
Moniya	*Akinyele*	35
TOTAL		**197**

(**Source: Field Survey, 2023**)

***Socioeconomic survey*:**

Primary data were obtained from a sample of 197 residents in Agbeni Ologede (n = 26), Bodija (n = 59), Oja Oba (n = 46), Ojoo (n = 31), and Moniya (n = 35)who completed structured questionnaires in the form of an interview guide, i.e. to fill and return immediately.The respondents were selected randomly without considering any specific characteristic (Arabomen *et al*., 2020). Prior to data collection, reconnaissance survey and a pre-test of 10% of the total number of the questionnaire were done to ensure the validity and reliability of the sampling procedure and research instrument.The outcome combined with a review of relevant literature contributed to final questionnaire development and interpretation of study results. Secondary data was obtained using a*systematic search* within databases such as Free Full PDF, Google Scholar, Research Gate, JSTOR, and Web of Science. Keywords such as “forest ecosystem”, “*Garcinia kola*”, “Orogbo”, “non-timber forest products”, “consumption / utilization pattern”,

"sustainable management of NTFPs" *amongst others* were used to extract relevant studies. These documents include articles on reports on *G. kola* utilization, and socioeconomic significance. Furthermore, to respond systematically to the research questions raised in this study, a methodology unique to each objective was applied and the assessment procedures were carried out in three (3) phases (Table 2).

Table 2:Research Objectives and Data Analysis

Objectives	Data Sets	Type of Data	Statistical Analysis
Identify the consumption pattern of *G. kola* Determine the benefits derived from consumption of *G. kola*.	**Survey** - Questionnaire - Interview - Field observation	- Demographic profile of respondents - Pre determined list of method of use of *G. kola* - Information on part (s) of *G. kola* mostly consumed	**Quantitative: Descriptive statistics:** Frequency, percentages, Pearson chi-square, Cramer's V, mean rating
Estimate the cost associated with *G. kola* consumption	**Socioeconomic survey** - Questionnaire - Interview - Field observation	- Demographic profile of respondents - Costs incurred for utilizing *G. kola*	**Quantitative: Descriptive statistics**: Frequency, percentages, measures of central tendency (mean)
Identify the demographic factors by which consumption of *G. kola* can be predicted	**Socio survey** - Questionnaire - Interview -Field observation	-Socio-economic characteristics influencing the consumption of *G. kola* in Ibadan Metropolis	**Inferential:** Binary Logit model

Methods of Data Analysis

Overall, 182 valid questionnaires (92% response rate) were coded for the analysis. This is high for residents of large cities and qualifies to derive some general information (Arabomen *et al*., 2020). Additionally, 15 questionnaires with missing or inconsistent information on demographics and benefits of *G. kola*, were excluded. The questionnaire was in three (3) parts. The first part consisted of a list of pre-determined questions relating to (a) method of use of *G. kola*(b)Information on part (s) of *G. kola* mostly consumed (3) perceived values urban dwellers associate with consumption of *G. kola*; and (c) sources / availability of *G. kola*. In this first part, the data analysis involved computing frequencies and conducting chi-square tests to summarize the respondents' consumption / utilization pattern of *G. kola* in the study area. Where there was a relationship, the Cramer's V (Cramer's V effect size statistics ranges from < 0.1 (no effect), between 0.1 and 0.3 (small effect), between 0.3 and 0.5 (medium effect), 0.5 (large effect) (Cohen 1998) was used to calculate the magnitude of the association. The benefits were rated on a Likert-point scale of 1 (Unimportant) to 3 (Very important). This 3-point scale was necessary owing to the relatively low frequencies for some benefits. A mean rating was done to

summarize the benefits respondents associated with the consumption of *G. kola* in the study area. The second part of the questionnaire contained a list of pre-determined questions to ascertain the costs incurred for utilizing *G. kola* obtained through the 'payment card system'. The third part of the survey obtained information about socioeconomic data of the respondents to ascertain the relationship that exist among the socioeconomic profile and utilization pattern of *G. kola* (Carter *et al*., 2014).

Thus, five (5) demographic measures i.e. gender, marital status, education, household size and income were used to describe respondents from the sample in the study area. Results were summarized in spreadsheet format (SPSS 23) to extrapolate and categorize quantitative variables needed for the analysis. To capture the costs incurred for the consumption of *G. kola*, a payment card with *Naira* (Naira denotes the Nigerian currency at US$1 = N1 510) offers from ₦100 to ₦5 000 was presented to the consumers. They were to select the most amount spent on purchase of *G. kola* while considering their monthly income and expenses. For this study, a threshold of 5% was used to determine if the costs incurred was too high in relation to their income; such that questionnaires with costs higher than 5% of their income were discarded (Arabomen, *et al.*, 2020). Consumers who did not indicate any costs were given the option of selecting "₦0" and asked for their rationales.Then, the total costs value for the consumption of *G. kola* was estimated as a product of the mean amounts of the respondents against the total number of consumers, that is in this case is the total population of Ibadan residents (Arabomen *et al.*, 2020). Finally, a binary logit model was adopted to determine the socio-economic profiles by which the consumption of *G. kola* can be predicted in the study area. The results were presented in tabular forms.

Table 3: Descriptive measures in the logit model

Measures	Description	Meaning
y_1	Utilization of *G. kola*	1= yes; 0 = otherwise
X_1	The resident LGA	1 = IBNW, 2 = IBN, 3 = IBSE, 4 = A
X_2	Residential location	1 = Agebni, 2 = Bodija, 3 = Oja Oba, 4 = Ojoo, 5 = Moniya
X_3	Individual with household size 0-4	= 1 if yes, 0 otherwise
X_4	Individual with household size 5-9	= 1 if yes, 0 otherwise
X_5	Household size 10 or more	= 1 if yes, 0 otherwise
X_6	Tertiary	= 1 if yes, 0 otherwise
X_7	College	= 1 if yes, 0 otherwise
X_8	Primary	= 1 if yes, 0 otherwise
X_9	Household size 1-4	= 1 if yes, 0 otherwise
X_{10}	Household size 5-8	= 1 if yes, 0 otherwise
X_{11}	Household size 9-12	= 1 if yes, 0 otherwise
X_{12}	Household size ≥ 13	= 1 if yes, 0 otherwise
X_{13}	Monthly income Low ≤ ₦50 000	= 1 if yes, 0 otherwise
X_{14}	Monthly income Middle ₦51 000-100 000	= 1 if yes, 0 otherwise
X_{15}	Monthly income High ≥ ₦101 000	= 1 if yes, 0 otherwise
X_{16}	Marital status (married)	= 1 if yes, 0 otherwise

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X_{17}	Awareness of benefits of *G. kola*	= 1 if yes, 0 otherwise

Monthly mean costs incurred for utilization of G. kola was calculated by a mathematical expectation formula, using the amounts frequency distribution: (Zheng and Qui 2019):

$$U = \sum fx / \sum f \qquad \textbf{(i)}$$

Where: *U*= mean amount paid; f= frequency of occurrence; x= different value bids; $\sum$ = summation

Results and Discussion

Demographic profile of *Garcinia kola* consumers

The result presented in Table 4 indicates that*G. kola* consumers living in IBNW, IBSW, IBN and Akinyele accounted for 14%, 23%, 30%, and 33% of the sample respectively (Table 4). Most (n = 60) of these were living in Akinyele LGA and were mostly women (76%). The high number of women in this study could be attributed to the location of the study area that was in close proximity to major markets and women tend to visit the market more often than their male counterparts. In this survey, 84% had five (5) or more household members and only few (23%) were unmarried people (Table 4). The education level was relatively high such that only few (6%) respondents had a basic primary education whereas 95% had attained a college, graduate or postgraduate education level. The high level of education could probably be due to the residents living in cities where they can access good quality education. Additionally, 83% of the residents indicated that their monthly income was at most ₦50 000 (US$33).

Table 4: Statistics of the respondents' socioeconomic profiles (n = 182)

Socioeconomic measure††	IBNW	IBN	IBSW	Akinyele	
	Agbeni (n = 25)	Bodija (n = 55)	Oja Oba (n = 42)	Ojoo (n = 29)	Moniya (n = 31)
Gender					
Female	18	43	38	18	22
Male	7	12	4	11	9
Marital status					
Married	19	46	39	18	19
Single	6	9	3	11	12
Education attained*					
Tertiary	16	38	38	19	22
College	7	12	4	9	7
Primary	2	5	nil	1	2
Household Size*					
1-4	6	15	3	1	4
5-8	19	38	36	27	23
9-12	nil	2	3	nil	2
≥ 13	nil	nil	nil	1	2
Basic Income (₦ '000)**					
Low - ≤ ₦50	20	40	39	21	31

Middle - ₦51-100	5	8	nil	8	nil
High - ≥ ₦101	nil	2	nil	nil	nil
No Response	nil	5	3	nil	nil

[H]Rounding may result in numbers not adding to 100%; *IBNW = Ibadan North West; IBN = Ibadan North; IBSW =Ibadan South West; * Mean HHS = 5; ** Mean Monthly Income = ₦48 350*

Summary of the respondents' consumption pattern and benefits of *Garcinia kola*

This study identified the patterns of *Garcinia kola* utilization and summarized the benefits accrued to consumers in the study area (Tables 5 and 6). From a pre-determined list, the most frequently usedpart of *G. kola* was the seed (93%; p = 0.300)which was mostly consumed in its dry form (40%; p = 0.422). However, these were not statistically different, suggesting that the consumption of dry *G. kola* seeds is widespread in the study area. Findings from this study corroborate Olowoyo, (2021) and Akinmoladun *et al*. (2020) reports where the seeds of *G. kola* were the most valuedand consumed among Yoruba communities for socio-cultural, medicinal and/or religious significance particularly in dry form.

Across the LGAs most (72%) of the residents consumed *G. kola* daily and/or weekly which they sourced mostly from the market (80%). It was observed that the residents location had a statistically significant (p = 0.050) large effect (Cramer's V = 0.55) on the frequency of consumption of *G. kola* in Ibadan, suggesting that market proximity and consistent availability throughout the year strongly influence consumption frequency, a trend also observed in a study by Etuk *et al*. (2021), which found that urban market access significantly shaped the availability and use of ethnobotanical products. Additionally, findings from this study showed that on the average, an individual would purchase at least seven (7) *G. kola* seeds and consume at least two (2). Most importantly, the length of consumption of 15 years was widespread across all the LGAs.

Table 5: Consumption pattern of *Garcinia kola* in Ibadan, Oyo state, Nigeria

Variables	Proportion of Respondents (%)	χ^2
Part of *G. kola* consumed		
Seed	**93.4**	2.41
Bark	4.1	
No response	2.5	
Form of *G. kola* consumed		
Fresh	28.9	
Dry	**40.1**	1.72
Both	28.4	
No Response	2.4	
Frequency of consumption**		
Daily	**35.5**	10.69
Weekly	**36.5**	13.78
Monthly	25.4	
No Response	2.5	
Source of *G. kola*		

Farm	3.0	
Market	**80.7**	7.79
Others	13.7	
MQP = 7.37		
MQC = 2.16		
MLC = 15.15		

*χ^2 = Chi-square value; *, $p \leq 0.05$ based on Pearson chi square statistics; Cramer's V = 0.55; MQP = Mean Quantity Purchased; MQC = Mean Quantity Consumed; MLC = Mean Length of Consumption*

Furthermore, the study found that most people across the LGAs (29% - 67%) were aware of the benefits of *G. kola*by their agreement to the question "Are you aware of the benefits provided by *G. kola*?" (Table 6). In this study, the residents cited antibiotics(mean = 2.08) and snacks (mean = 2.04) as the highest importance of *G. kola*, however, the standard error for these two benefits were not statistically different. This suggests that the importance of these benefits is widespread across the study areas. This aligns with findings by Egharevba and Kunle (2020), who emphasized the antibacterial and antimicrobial potential of *G. kola*, especially its seed extract. Other benefits like 'improves eye sight'(mean = 2.02) appeared to be of moderate importance, while 'aphrodisiac', 'lowers blood pressure', 'for traditional medicine' *amongst others*, though cited were considered least important, as evidenced in the low scores (0%-8%). In addition, some verbatim responses further illustrate the ethnobotanical knowledge embedded in the communities: ***I chew bitter kola with Tom-Tom to prevent or treat* cough; I *eat it after taking sweets to reduce blood sugar; I place it around my house to repel snakes; I mix with honey for clearer eye sight to cure glaucoma and cataract.***

Table 6: Benefits of *Garcinia kola* from respondents' agreement with each statement

		% of total responses				
Associated benefits	**Ranking[y]**	**Agbeni %**	**Bodija %**	**Oja Oba %**	**Ojoo %**	**Moniya %**
Antibiotics	1 (2.08 ± 0.04)	56.0	58.18	66.67	55.17	61.29
Snacks	2 (2.04 ± 0.05)	20.0	23.64	26.19	27.59	29.03
Improves eye sight	3 (2.02 ± 0.04)	16.0	12.72	7.14	6.89	9.67
Aphrodisiac	4 (1.38 ± 0.05)	8.0	1.82	nil	nil	nil
Sedatives	5 (1.25 ± 0.04)	nil	1.82	nil	3.45	nil
Lowers Blood Sugar	6 (1.25 ± 0.03)	nil	1.82	nil	nil	nil
Stops salivation during pregnancy	7 (1.18 ± 0.03)	nil	nil	nil	3.45	nil
For Traditional Medicine	8 (1.18 ± 0.03)	nil	nil	nil	3.45	nil

[y]Ranking based on the order of the means (n = 182); Figure in parenthesis ( ) is the mean ± margin of error, at 95% confidence interval. Means are based on a scale from 1 (Unimportant) to 3 (Very important)

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Estimated costs associated with consumption of *Garcinia kola*

Findings from this study showed that most of the consumers (96%, n = 174), irrespective of their socioeconomic profiles, indicated the costs incurred for purchase of *G. kola* as opposed to the 4% (n = 8) who did not respond (Table 7). On average, the residents spent ₦1 720 or US$1.14 (US$1 = ₦1 510) per month for consumption of *G. kola* (Table 7). Using a hypothetical market scenario, when this amount is extrapolated to an estimated population of 3.9 million people (i.e. 96% of Ibadan 2025 population of 4,140,000; WPR, 2025), this results in a monthly expenditure of ₦6.8 billion (US$2.8 million) on *G. kola* in Ibadan.

Findings of the study aligns with earlier research on the economic potential of indigenous non-timber forest products (NTFPs) like *G. kola*. For example, Arowosoge and Popoola (2006) and Adepoju and Salau (2007) emphasized the increasing commercial importance of *G. kola*, particularly as a market-traded item in urban centers like Ibadan. Moreover, with respect to gender women (₦1 006) spent more to purchase *G. kola* than their male counterpart (₦600) a trend consistent with the findings of Shackleton *et al*. (2017), who reiterates that women often play a larger role in the procurement and use of medicinal and "snack-type" NTFPs in urban markets. In addition, married people and those who earned income spent considerable amounts of between ₦200 to ₦700. In table 7, people with at least a college to tertiary education spent more (₦700 - ₦900), when compared to the ₦160 for people who had a primary education. Sunderland *et al*. (2017) reported that higher education often correlates with greater awareness and spending on ethnobotanical products due to better access to health and environmental information.

Table 7: Mean costs incurred across respondents' demographic profiles

Demographics	Number (n = 182)	Total costs incurred (₦)	Monthly mean amount[†] (₦)
Gender			
Female	139	139 800	1 006
Male	43	26 015	605
Marital status			
Married	141	100 110	710
Single	41	8 530	210
Education attained			
Tertiary	133	129 600	975
College	39	29 445	755
Primary	10	1 560	160
Household size			
1-4	29	8 930	305
5-8	143	101 100	707
9-12	7	35 500	505
≥ 13	3	1 500	500
Basic income level (₦ '000)			

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Low - ≤ 50	151	12 400	200
Medium - 50 - 100	21	25 500	280
High - ≥ 101	2	24 800	400
No Response	8	0	0

†Rounding monthly mean amount to the nearest whole number

Socio-demographic factors explaining the consumption of *G. kola*

To assess which demographic characteristics influenced the consumption of G. kola, a regression-based logistic function was employed (Table 8). In general, the coefficient of determination (R^2) of 0.22, indicated that the predicted variables accounted for 22% of the variation in consumption of *G. kola* across the LGAs. The corresponding results show that tertiary education was significant across the study areas probably because learned people can increase their ability to access information on forests resources and their benefits from the media sources in their area, hence the acceptance / utilization within the group.

This findings align with FAO (2012) and Tieguhong and Ndoye (2017), who noted that education could play a pivotal role in shaping attitudes toward the use of biodiversity resources.Additionally, the consumption of *G. kola* was related to gender, awareness of benefits and having a basic income (at least ₦50 000). Other factors like marital status, residential location, LGAs, household size did not make significant contributions to the model across the study areas, this could be because of the low Nagelkerke R^2 value (0.126) indicating a significant variation in the consumption of *G. kola* that is not captured by the explanatory variables.Conversely, the results of this study may not be used to make inferences for the entire Ibadan, however, it suggests that peoples' socioeconomic measure could influence the variation in the consumption of *G. kola*.

Table 8: Binary logit result for factors influencing *G. kola* consumption in Ibadan

Variables	**Wald Criterion**	**Std. Error**	**p - value**
Constant		0.355	0.019
Basic Income*Low≤ ₦50 000*	0.108	0.033	0.001
Gender	0.201	0.062	0.001
Tertiary	0.090	0.125	0.051
Awareness of Benefit of *G. kola**Antibiotics*	0.361	0.108	0.001
Log likelihood function	1276.3		
Chi squared	13.90		
Prob. [Chi squared > value]	0.000**		
R^2	0.126		
p- value	0.001		
Number of observations	182		

* = significant at 0.1%; ** = significant at 0.05

Conclusion

In the study, a social framework was adopted to assess the consumption of *Garcinia kola* by exploring socio-demographic influences, sourcing practices, and expenditure profiles across selected LGAs in Ibadan. Findings of the study highlights the widespread reliance on *G. kola* regardless of their socioeconomic background of the respondents. In addition, consumption of *G. kola* is driven not only by cultural and medicinal relevance but also by market accessibility and individual awareness of the benefits. The study further demonstrates that variables such as tertiary education, gender, and income level significantly influence both consumption frequency and expenditure patterns.

Thus, efforts to promote sustainable management of *G. kola* resource would be more effective if conservation and management tools is designed to suit relevant demographic profiles to influence peoples' active participation in the study area. Importantly, the extrapolated economic value of monthly *G. kola* purchases suggests a substantial informal market, underlining its economic significance to urban dwellers. Therefore, the study provides valuable baseline that could support the sustainable management of *G. kola* and the need for appropriate involvement of communities, town planners, government and forest resource managers' in conservation programs towards promoting sustainable management of *G. kola* in particular, and other critical NTFPs, in general.

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