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Potentials of *Raphia hookeri* Wine in Livelihood Sustenance among Rural and Urban Populations in Nigeria

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Abstract*—Raphia* wine is an important forest product with cultural significance besides its use as medicine and food in southern Nigeria. This work aims to evaluate the profitability of Raphia wine production and marketing in Sapele Local Government Area, Nigeria. Four communities (Sapele, Ogiede, Okuoke and Elume) were randomly selected for data collection via questionnaires among producers and marketers. A total of 50 producers and 34 marketers were randomly selected for interview. Data was analyzed using descriptive statistics, profit margin, multiple regression and rate of returns on investment (RORI). Annual average profit was highest in Okuoke (Producers – ₦90, 000.00, Marketers - ₦70, 000.00) and least in Sapele (Producers ₦50, 000.00, Marketers – ₦45, 000.00). Calculated RORI for marketers were Elume (40.0%), Okuoke (25.0%), Ogiede (33.3%) and Sapele (50.0%). Regression results showed that location has significant effects (0.000, $\rho \leq 0.05$) on profit margins. Male (58.8%) and female (41.2%) invest in Raphia wine marketing, while males (100.0%) dominate production. Results showed that Raphia wine has potentials to generate household income, enhance food security and improve quality of life in rural, semi-urban and urban communities. Improved marketing channels, storage facilities and credit facilities via cooperative groups are recommended for producers and marketers by concerned agencies.

***Keywords*—**Raphia wine, Profit margin, RORI, Livelihood, Nigeria.

I. Introduction

NON-timber forest products (NTFPs) are products of biological origin other than wood derived from forest [1], [2].

Today, about 150 NTFPs are traded nationally between countries in Africa continent and the rest of the globe. World trade in NTFPs is estimated around US $11 billion; however, statistics are scanty and unreliable for these types of products especially in developing countries [3]. In most developing countries of sub Saharan Africa such as Nigeria, NTFPs could be valued above timber for cultural uses including traditional medicine and food during period of scarcity.

Millions of rural poor households worldwide have been reported to depend heavily on NTFPs for subsistence and/or income [4], [5]. Some of these NTFPs species are highly valued in southern Nigeria for food, local medicine and cultural uses such as; *Irvingia gabonensis* (Bush Mango), *Irvingia wombulu* (Cotyledons used for Ogbono soup), *Treculia africana* (Fruits as snacks), *Tetracarpidium conophorum* (African walnut), *Pipers guineense* (Black/Guinean pepper), *Gnetum africana* (Vegetable), *Raphia hookerii* (sap extracts used as local palm wine) *Massularia acuminata* (Chewing stick), *Denetia tripetala* (Bush pepper), *Tetrapleura tetraptera* (Local spice), *Xylopia aethiopica* (Local spice), *Dacryodes edulis* (Pear Butter), *Newboldia laevis* (Leaves used in traditional chieftaincy and coronation ceremonies) etc.

Livelihood survival among the rural poor in southern Nigeria is closely linked with forest resources in the area of food, shelter and income generation. Most NTFPs are gathered and processed by women and children while men are involved in the collection from difficult terrains and those requiring physical strength [6]. Basically most NTFPs are consumed at the household level while the excess are processed and marketed for income generation for example, *D. edulis* and *T. conophorum*.

Medicinal plants such as *Piper guineense, Azadirachta indica* and *Bridelia ferruginea* are usually collected fresh for therapeutic purposes when needed or can be dried and stored for future use [7]. Raphia palm (*Raphia hookerii* G.Mann & H. Wendl. - Palmae) is an important palm species in moist forest of West Africa for local wine production, leaves for shelter and local furniture, stems are occasionally used in building construction. It is prevalent in moist forests and wetlands of southern Nigeria.

The most important local economic products from Raphia palm is the wine, research developments recently include other products such as Raphia fibre (Piassava broom), pulp for paper production and oils from the seeds that has prospects for industrial developments [8]. The plant usually clusters and grows up to 9 - 12 metres high in undisturbed natural habitat [9], [10]. Though, in a two month period, a single Raphia tree have been reported to yield 870 litres of palm wine from cutting to death, but average yields are about 100 litres per palm generally [11]. The root and wine are used in local medicines as prevention and therapeutics for malaria fever, stomach pain and related diseases. Medicinal herbs are soaked in palm wine to extract active ingredients for the treatment of wide variety of ailments.

It has been noted that well above 10 million people consume palm wine in West Africa sub-continent [12], [13]. In almost all social-cultural ceremonies across southern Nigeria, palm wine is served as refreshments to guests during

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traditional weddings, births, chieftaincy coronations and funeral of elderly persons ([14] cited in [15]). Palm wine libation is also a very important sacrificial emblem to appease gods among the Yorubas and Igbo tribes of southern Nigeria. In tropical countries, palm wine is known by different names such as; Emu, Ogoro, Tumbo, Ukod (Nigeria), Matango, Fitchuk, and Mbu (Cameroon), Doka (Ghana), Toddy (India), Lambanog (Phillipines) etc., [16], [17].

The importance of NTFPs in cultural heritage and rural household sustenance cannot be over emphasized. Production and marketing of *Raphia* wine can contribute to household income in rural areas on a sustainable basis. A detailed study of its economics will be a gateway to poverty alleviation among the rural poor in the study area. However, contributions of this economic activity are not adequately documented to reflect in the Gross National Productivity (GDP) of West African nations where palm wine tapping engage several individuals.

Local wine production provide employment for nearly 75% of male population in some villages in Cameroun, generating average income of 20 000–35 000 FRS CFA (US$ 40–70) monthly for many tappers [15]. Thousands of tons of Raphia palm wine are produced yearly in Nigeria [18]. Socio economics studies will give a better understanding of this important activity of wine production and marketing among rural dwellers. Activities capable of sustaining livelihood are panacea for improved life in the rural and urban areas. *Raphia* palm is an important natural resource in southern Nigeria culturally and economically.

This work evaluated the socio economic aspect of *Raphia* wine production and marketing in Sapele LGA of Delta State, and highlighted it's potentials in livelihood sustenance among the low income earners in the area.

II. Materials and Methods

A. Study Site

This research was carried out is Sapele Local Government Area, Delta state, Nigeria. It is located on latitude 5°40′E, longitude 5°54′N (Fig. 1), occupies an area of 450 Km² and a population density of 387.3persons/Km². The vegetation is characteristics of fresh water swamp of tropical region with complex biodiversity. Sapele has a bimodal peak of rainy season in the year and average precipitation of 1200mm annually. Population census of 2006 put the figure at 174,273 people [19]. Apart from subsistence fishing, the local inhabitants are predominantly peasant farmers producing arable crops such as cassava, maize and vegetables. Tree crops in the area include Rubber, Citrus, *Raphia* and Oil palm among others.

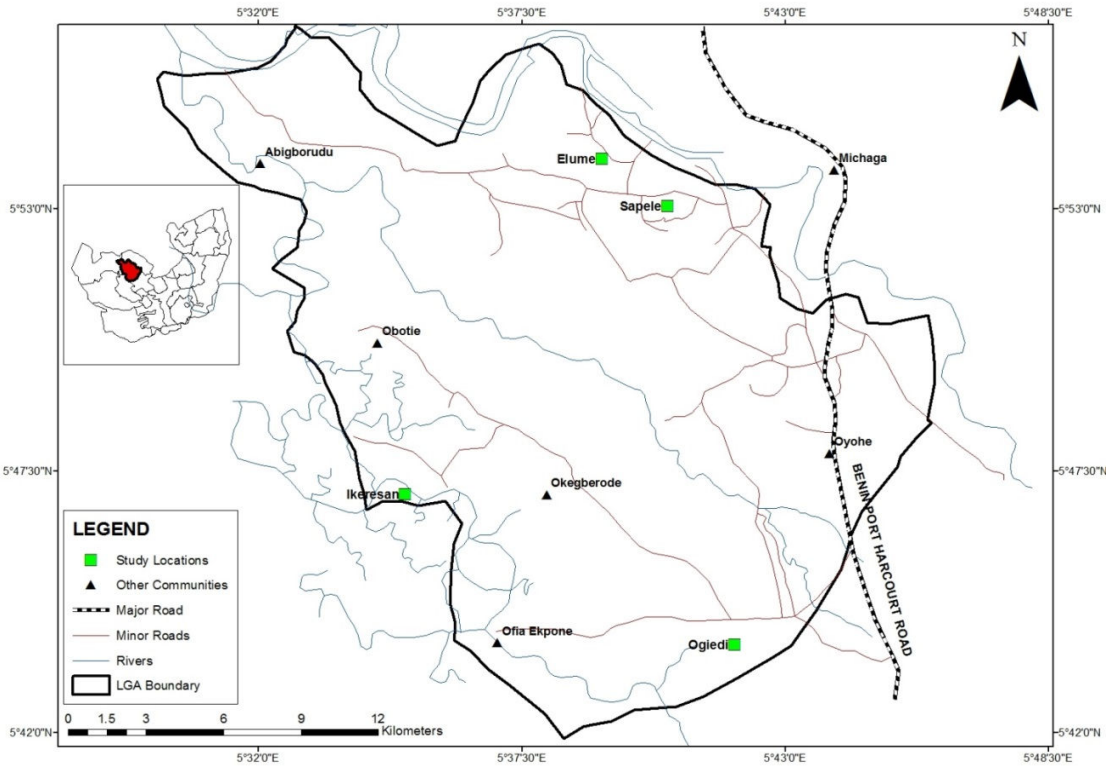


Fig. 1 Map of the study site showing the various study location (Source: Field study)

B. Sampling Techniques and Data Analysis

Four communities were randomly selected from the LGA (Elume, Sapele, Ogiede and Okuoke). In each of the communities, producers and marketers of *Raphia hookeri* wine (fresh sap) were randomly selected for interview.

A set of pre tested questionnaire was administered in the form of oral interview where questions were interpreted in the

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local language and responses carefully recorded. A total of eighty four respondents were available for interview.

The data from the completed questionnaires were analyzed using frequency tables, Net income, Rate of return on Investment (RORI), and Multiple linear regressions.

C. Analytical Tools

Net income was used to evaluate the profitability of production and marketing of *Raphia* wine.

Multiple Regression analysis was used to assess the impact of some demographic variables on the production and marketing of *Raphia hookeri* wine profitability.

Rate of returns on the production and marketing of the *Raphia hookeri* wine was calculated to determine the rate at which the money invested on the enterprises could be realized.

Sensitivity analysis on benefit cost and rate of returns on investment was used to establish the point at which viability and profitability are threatened.

Net income (NI): Net income is defined as gross income (GI) less Gross cost (GC)

$$NI = GI - GC \quad (1)$$

Multiple linear regressions**:** this model was used to determine the relationship between profit and demographic factors. It is given as:

$$\beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \ldots\ldots \beta_n X_n + \text{Error} \quad (2)$$

where Y_p = Profit margin of Raphia wine (dependent variable)

β_o = Constant of regression, β_i - β_n = Beta (Regression Coefficients)

X_i - X_n = Independent variables (independent variables consisting characters such as age, education, gender etc.), Error = Associated error of regression coefficient

Rate of return on Investment (RORI): This depicts the level of profitability of an investment

$$RORI = \frac{GI-GC}{GC} * 100 \quad (3)$$

III. Results

Populations of Raphia wine producers and marketers (Fig. 2) were highest in Sapele (39) and least in Ogiede (11). Tappers (producers) in Sapele LGA as shown in Table I were all males (100%), married (90%), age class range from 31 – 60 years mostly, only 34% lack formal education while the highest education level was secondary school (40%) and largely combine peasant farming (96%) with wine tapping. Male (58.8%) and female (41.2%) respondents engage in Raphia wine marketing, both young and old people are involved in wine marketing, married and unmarried, 29.4% of the wine marketers possess no formal education while 38.2% had secondary school education, they are also involved in trade of other forest and farm products such as wild games, insects and fruits.

Based on the marketers knowledge, uses of Raphia wine include; food (refreshment, entertainment) and medicine, (Fig. 3). Respondents observed that wine consumers preferred Raphia wine to other local wines such as wine from oil palm tree (*Elaeis guineensis*), for many reasons, Taste account for 76%, alcohol level (intoxicating power) represent (15%), availability all seasons and affordable price are all listed as preference factors (Fig. 4).

TABLE I
Demographic Characteristic of Raphia Wine Marketers and Producers in Sapele LGA

Demographic Characters		Marketers		Producers	
		Frequency	Percentage	Frequency	Percentage
Sex	Male:Female	20:14	58.8:41.2	50:0	100:0
	Total	34	100	50	100
Age	20-30	7	20-6	5	10
	31-40	4	11.8	16	32
	41-50	16	47.1	15	30
	51-60	4	11.8	12	24
	Above 60	3	8.8	2	4
	Total	34	100	50	100
Marital Status	Single	7	20.6	5	10
	Married	26	76.5	45	90
	Window	1	2.9	-	-
	Total	34	100	50	100
Education Qualification	No formal education	10	29.4	17	34
	Primary school	11	32.4	13	26
	Secondary school	13	38.2	20	40
	Total	34	100	50	100
Other Occupation	Student	3	8.8	-	-
	Farming	4	11.8	48	96
	Trading	27	79.4	2	4
	Total	34	100	50	100

Source: Authors' Fieldwork, 2012

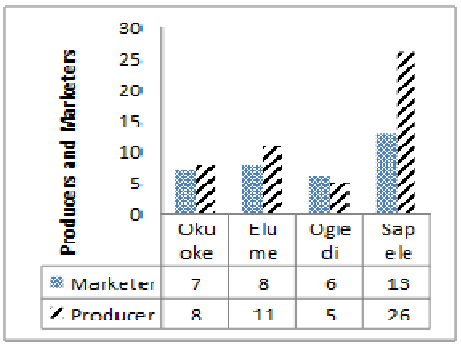


Fig. 2 Questionnaire distribution among *Raphia* wine Marketers and producers

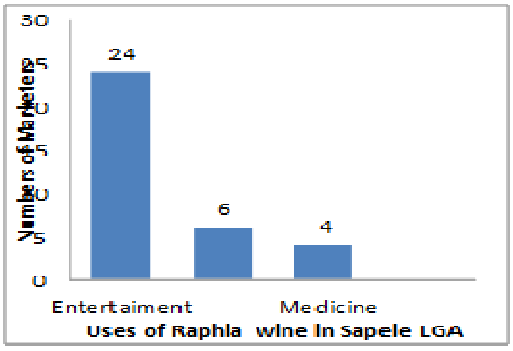


Fig. 3 Common uses of Raphia wine based on Marketers Knowledge in Sapele LGA

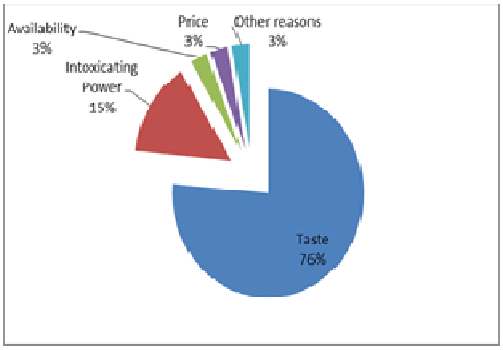


Fig. 4 Consumers' factors of preference to other type of wines in Sapele LGA

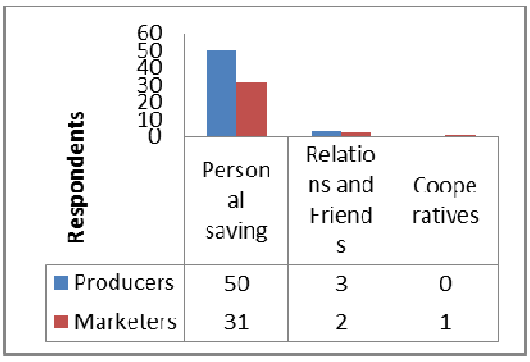


Fig. 5 Sources of Startup capital for Raphia wine marketers in Sapele LGA

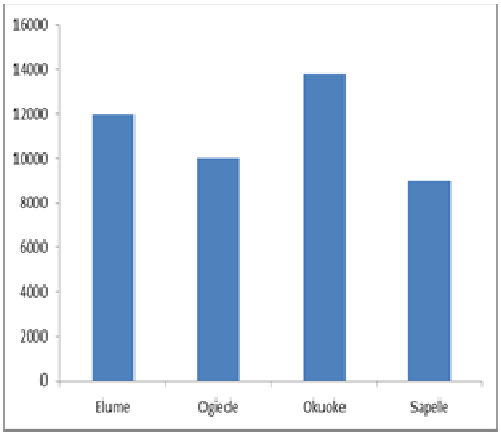


Fig. 6 Average monthly profit margin (₦) of Raphia wine marketers in Sapele LGA

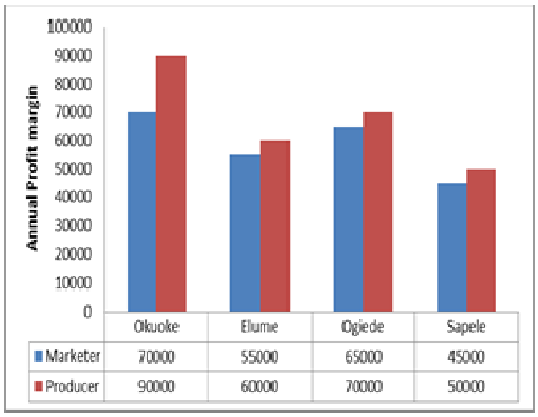


Fig. 7 Annual profit margin of Raphia wine producers and marketers

Personal savings and occasional loan from family and friends represent the source of start-up capital for both Raphia wine producers and marketers in the study area (Fig. 5). The study showed that (Fig. 6) the average monthly income of the marketers was highest in Okuoke (N13800) and least in Sapele (N9000).

In the four locations studied, Annual profit margin of Raphia wine producers and marketers was highest in Okuoke and least in Sapele as shown Fig. 7. This trend is similar to the monthly profit level of wine marketers.

A. Average Daily Sales, Net Income, Total Profit and RORI of Raphia Wine Producer in Sapele LGA

Average production cost per litre of Raphia wine range between ₦10 and ₦20 in Sapele and other communities respectively. Total daily profit made by producers was least in Sapele (₦320) and highest in Okuoke (₦1200), while RORI calculations showed minimum of 100% in Sapele and highest of 300% in Okuoke as shown in Table II.

B. Average Daily Sales, Net Income, Total Monthly Profit and RORI of Raphia Wine Marketers in Sapele LGA

Average daily sales of Raphia wine by marketers was least in Ogiede community (15 litres) and highest in Sapele (30 litres). Total monthly profit was highest in Okuoke ₦13800

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and least in Sapel Sapele; ₦9000, computations for marketers RORI revealed 50.0% at Sapele and 25.0% at Okuoke (Table III).

C. Regression Analysis of Demographic Characters on Raphia Wine Profit Margin in Sapele LGA

A total of seven demographic characters of Raphia wine marketers were tested in multiple linear regression model (Table IV), only the respondent's community (0.000) affect the profit margin significantly.

This further lends credit to profit margins in Fig. 5 where highest profits were recorded in rural communities such as Okuoke and Elume compared to Sapele which is an urban centre.

TABLE II
AVERAGE DAILY SALES, NET INCOME, TOTAL PROFIT AND RORI OF RAPHIA WINE PRODUCERS IN SAPELE LGA

Community	Average cost per litre (₦)	Average Price per liter (₦)	Average Daily sale (litre)	Average Total cost/litre (₦)	Average Total sales daily (₦)	Total daily Profit (₦)	RORI (%)
Elume	20	50	20	400	1000	600	150.0
Ogiede	20	60	15	300	900	600	200.0
Okuoke	20	80	20	400	1600	1200	300.0
Sapele	10	20	32	320	640	320	100.0

TABLE III
AVERAGE DAILY SALES, NET INCOME, TOTAL MONTHLY PROFIT AND RORI OF RAPHIA WINE MARKETERS IN SAPELE LGA

Community	Cost per litre (₦)	Sales Price per litre (₦)	Average Daily Sales in litres	Total daily cost (₦)	Total daily sales (₦)	Net Income (₦)	Total Monthly profit (₦)	RORI (%)
Elume	50	70	20	1000	1400	400	12000	40.0
Ogiede	60	80	15	900	1200	300	10000	33.3
Okuoke	80	100	23	1840	2300	460	13800	25.0
Sapele	20	30	30	600	900	300	9000	50.0

TABLE IV
REGRESSION OF DEMOGRAPHIC FACTORS IMPACTS ON PROFIT MARGIN OF RAPHIA WINE MARKETERS IN SAPELE LGA, NIGERIA

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	T	Sig.
(Constant)	30964.772	7121.003		4.348	.000
Community	-4458.762	695.543	-.749	-6.410	.000
Sex of respondent	-868.226	2418.963	-.061	-.359	.723
Age of respondents in years	1649.679	1072.591	.301	1.538	.136
Marital Status of respondent	290.486	1886.811	.026	.154	.879
Occupation of respondents	28.463	1694.983	.004	.017	.987
Experience	-643.989	816.693	-.130	-.789	.438
Seasonality	1523.977	1015.680	.177	1.500	.146

Dependent Variable: Monthly profit, $\rho \leq 0.05$. Source: Field survey, 2012

IV. DISCUSSION

NTFPs collection and marketing enhances household income of rural and urban dwellers of developing countries in tropical regions, [20], [21]. Sapele is an urban centre with high population density, it possess the highest number of producers and marketers of Raphia wine despite availability of other types of wine such as local palm wine tapped from oil palm trees, local gin (produced from fermented Raphia and oil palm saps) and imported wines**.**

High numbers of raphia wine marketers in Sapele may be attributed to high human population density compared to other parts of the state. Ogiede, Elume and Okuoke are rural and semi urban communities with sparse human populations densities due to lack of socio infrastructures that triggered rural urban migration. Available respondents on the community basis (Fig. 2) reflects the distribution of marketers in the rural (Ogiede, Elume and Okuoke) and urban (Sapele) communities.

The marketers comprises of both males (58.2%) and females (41.2%), a good number of the producers sell directly to consumers without the intervention of middlemen hence, male marketer are more than the female marketers of Raphia wine in the study area, in many cases it is performed as family business where the man produces and the spouse assists in the sales.

Tapping Raphia wine is a pretty difficult task involving climbing or axe felling coupled with the difficult swampy terrain, this is typical of most NTFPs in tropical ecosystem where men are saddled with or assist mostly in collection of certain NTFPs from difficult terrains or requiring physical strength [22], [23] observed a similar trend in Cameroun where men are solely engaged in wine tapping and women undertake marketing activities.

Women and children usually assist in the processing and marketing of such products. Young people usually hawk Raphia wine in urban areas for additional income to meet

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family needs. Young people aged 20-30 formed about 20.6% of the marketers apart from the elderly people of above 30 years of age. Raphia wine marketing is the major occupation of majority of the marketers (79.4%) as in most cases, operating a wine bar is full time activities that demand dedication in order to keep the customers.

Raphia wine serves various purposes from refreshment to medicine, findings in the study reveals that a higher number of people consume Raphia wine as refreshment (Fig. 3). In Delta State of Nigeria generally, the wine symbolizes peace and purity, hence its' usage during traditional weddings, entertainment of important guest at homes, general refreshments and medicine. It is an important item in most social gatherings in Delta state of Nigeria.

Utilization of Raphia wine for cultural and economic purposes was also reported among the Yoruba and Ibibio tribes in some parts of south western Nigeria [17], the report further emphasize the relevance of palm wine in the cultural heritage of southern Nigeria. Reference [24] also asserted that many NTFPs have cultural importance attached to them in different cultures across tropical Africa. Among the locally available natural wines such as palm wine from the sap of oil palm tree,

Raphia wine enjoys high preference among the people of Sapele LGA for its distinctive sweet taste (Fig. 4). Sweet taste is solely responsible for its acceptability among the female gender; hence it is preferred to other local wines. Ability to intoxicate due to the alcohol level accumulated during fermentation on exposure to air is another factor that attracted young people especially to Raphia wine. It is also erroneously consumed as energy drink particularly among the farmers (operating on local cutlass and hoe for land tilling) and artisans that engage in other energy sapping activities.

Marketing Raphia wine enjoy a form of perfect market, entry and exit into the enterprise has no restrictions, although the required take off capital is moderate relative to other forest based small scale enterprises, raising startup capital could be a herculean task among the rural poor population. Most Raphia wine marketers sourced startup fund mainly from personal savings (about 91.2%) and relations (Fig. 5) to open local wine bars. Similar trend was observed among local honey bee keepers in Delta state, Nigeria [25]. Credit facilities for cottage enterprises are scarce in Nigeria especially for agricultural based business, this scenario has been reported severally [26].

Lack of credit facilities has hindered the establishment of many small scale industries that can enhance household income of the poor. Funding agencies are not readily available in the rural areas and when available the stringent conditions for such loans are beyond the reach of the rural poor [27].

A. Annual Profitability of the Production and Marketing of Raphia hookeri Wine in Sapele LGA

Raphia wine trade is an important source of income among the rural inhabitants of West Africa, per capita income from wine tapping is estimated to be equal to the country's per capita income in Nigeria [28], [29]. Production and marketing of Raphia wine is most profitable in Okuoke (Marketer: ₦70, 000:00, Producer: ₦90, 000:00) per annum while Sapele had the least profit per annum (Marketing: ₦45, 000:00, Producer: ₦50, 000:00). Okuoke has the highest margin because of the price per litre (₦100:00) which is highest among all the study areas, in addition to high price per litre at Okuoke, few Raphia wine sellers exists, hence no competition in the market, in certain cases the producer is also the marketer in Okuoke community. The profit margin of Ogiede and Sapele is low because of the competition among several producers and marketers in these areas.

Rural-urban migration of youths have greatly reduced the numbers of wine tappers in the rural areas, wine tapping is now left in the hand of middle aged and old people in the community that can coop with the stress involved, this conformed with the findings of [30].

B. Rate of Returns on Investment

Rate of return on investment (RORI) indicate the rate at which capital invested in an enterprise can be recouped. The study showed that RORI on Raphia wine production was very high, this indicates that the enterprise is viable in all the study locations; Okuoke (300.0%) being the highest and Sapele (100.0%) the least (Table II). The least RORI on production in Sapele may be attributed to high cost of production compared to other communities due to its urban nature such as high cost of transport, labour, Raphia trees and rent of bars. Other associated costs in the urban centre not usually implemented in the rural areas in Nigeria include; weekly/monthly local government taxes for shop owners, utility bills and tenement rates.

Quality and cost of living in cities are higher than rural areas in Nigeria, most rural dwellers engage in peasant farming to support family needs. Farm products consumed at household level are usually not captured in family expenses; hence the calculated RORI for the rural communities with very high values may not represent the actual profit since family labour on such farm activities are not considered [31]. Returns on marketing are lower than production since most marketers incurred cost on processing, transportation and other associated cost of marketing. RORI on marketing (Table III) was lowest in Okuoke (25.0%), Sapele had the highest RORI (50.0%) contrary to the producers profit level. Although

Raphia wine marketers in Sapele usually adulterate the natural wine with either water or saccharine to make more profit at the expense of consumers. This in turn increases the volume of wine available for sale but inferior quality. RORI was high in Elume (40.0%) because the marketers in Elume do not adulterate the natural wine to attract new customers and keep old ones. Elume is also a semi urban settlement with fairly high human population and low cost of living.

Sensitivity analysis show how the variation in the cost or benefit affects profit margin in an enterprise. It can also be defined as a technique for systematically changing variables in a model to determine the effects of such changes in the output, [32]. Sensitivity computations on RORI showed that Raphia wine marketing enterprise will be threatened if marketing cost

increased at 30.0% in Ogiede (-1.23) and Okuoke (-4.0); however, Elume (-3.44) will not be viable at 45% cost increase while Sapele (0.00) profit margin will be threatened at 50.0% cost increase.

C. Effect of Demographic Factors on Profitability

Regression analysis revealed no significant relationship between the demographic characteristics of the wine marketers and profit margin on the sales of Raphia wine in the four communities.

Demographic characteristics such as age, sex, marital status and educational qualification have no influence on the profitability of the Raphia wine. However, the location of the marketers (Community) was significant (0.00, $\rho \leq 0.05$) on the profit margin, hence communities with large population have higher marketing prospects than the community with low population density (Table IV).

Availability of wine consumers with high purchasing power especially the youths and frequency of cultural/social gatherings in Sapele area of the LGA may be linked with the high RORI percentage. Consumer populations in the rural areas are relatively low, possess low purchasing power and in most cases tap the wine themselves for personal consumption and cultural/social functions.

V. Conclusion

Several NTFPs have been reported to have prospects in contributing to food security, livelihood sustenance, income generation and primary health care in sub Saharan West Africa. Wine obtained from the sap of *Raphia hookerii* is an important NTFP in Nigeria. It is valued culturally in social gatherings across southern Nigeria as food (refreshment) and medicine. Raphia wine provides employment for producers and marketers yielding substantial income to support peasant families in the rural and urban centres. The study showed that Raphia wine producers and marketers operate at small scale profitably with good returns on investment in the different communities studied. It is consumed by both rural and urban populations in the study area. Urbanization and development of social infrastructures in the rural areas could lead to loss of natural habitat for the species and threat to sustainable supply of the products. Conservation of this important forest resource by relevant agencies and improvement of the processing, storage and marketing facilities are recommended for sustainable supply. Training of Raphia wine tappers on alternative techniques that will prevent plant mortality after tapping is also an inevitable tool for the species conservation.

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