ANALYSIS OF FACTORS INFLUENCING THE SUSTAINABLE COMMERCIALIZATION OF NON-TIMBER FOREST PRODUCTS BY RURAL HOUSEHOLDS IN DELTA STATE, NIGERIA

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Abstract

The research was on the analyses factors influencing sustainable commercialization of Non- Timber Forest Products (NTFPs) among rural households in Delta State, Nigeria. The sampling techniques used to select 340 rural households was the multistage random sampling. Data were gathered with the aid of a structured questionnaire and analysed using descriptive statistics and regression analysis. Results showed that about 66.5% men and women of active age were involved with respect to NTFPs commercialization. There were more head of households with formal education (51.8%), though they were more of First School Leaving Certificate (FSLC). The study found the mean household size of 8 persons. Commercialization of NTFPs was not sustained. Forest conservation was poor and deforestation was high (72.5%). The regression analysis with an R^2value of 0.948 and F-ratio of 254.712 implied a significant impact between the dependent and independent variables at 0,05 level. The explanatory coefficients and t- values (in parenthesis) of educational qualification 0.437 (2.758), access to technology 2.695 (2.324), access to credit4.415(5.721), total household size 2.421(3.677), amount of NTFPs resources owned 2.68 (4.434) and extension services received 2.593 (3.316) were significant. Recommendations include improvement in technology used in NTFPs production. Adopting participatory approach towards NTFPs management.

Key words: factors, sustainability, commercialization, NTFPs, rural household

INTRODUCTION

There are many off-farm activities but the rural people especially the poor are dependent on forest for most of their livelihood. Forest are those resources that can produce forest products which are farm bush, and bush fallow, trees on farms, woodland and scrubland. They also include ecosystem dominated by trees [7]. Forest plays important role in rural household employment, consumption and income. The roles include the use of forest for building materials animal fodder and live fencing. Forest provides additional income to the rural households through the sale of processed products especially food products. Forest act as food security before harvest and during hunger periods [5]. In recognition, the United Nation millennium development goal included the forest because of its role in livelihood and stability of the environment through forest conservation. Over 90% of the rural population in Nigeria depends on forest for their economic

survival and livelihood [19]. Among the forest products is a group known as non-timber forest products (NTFPs). Apart from the commercially exploited timber, all other forest products are called non-timber forest products (NTFPs) [7]. NTFPs can originate from animals or plants. Examples of NTFPs are fuelwood (which include charcoal, sawdust and firewood), chewing stick, tanning extracts, latex, fodder, sponges, medicinal plants, jute fibres, honey, cocoons, natural vanish, cloth, bee wax, rubber, mushrooms, resins and gums, decorative beads, forest games, bast fibres, bark and lacs, tooth cleaners, clean water, wine, fruits beverages, nuts and oil. NTFPs account for so many animal and plant species which are collected from cultivated, semi-wild and wild areas. In order to reduce the scope of the study and paucity of data that will be generated and managed within the period, only NTFPs from plant origin will be considered. [9] found that NTFPs from plant origin serve as medicine, food and raw materials to rural

households and their cottage industries. Fuelwood is very significant and very commercialized among the plant NTFPs and depended upon by rural households for cooking. Findings from [1] showed that in Nigeria about 60-70% of domestic energy supply comes from fuelwood. [12] found that the values of NTFPs were higher when compared to the values of cultivated crops and when income from NTFPs was excluded from the total income of the rural household income generating activities, poverty increased in the rural household. Similarly in a study that compared the contributions of the various rural income sources to rural household total income, it was observed that while Agriculture contributed 39.3%, NTFPs contributed 33.8% [13]. Sustainable commercialization of NTFPs is possible with the availability of NTFPs. This can only be possible with a well conserved NTFP s. Sustainable management of species for the product they yield and to ensure their availability in future is called conservation [17]. Conservation may be ex-situ or in-situ. Conservation of species outside their natural habitat is known as ex-situ while conserving species in their natural habitat is known as in-situ conservation [11]. [2] stated that successful conservation will happen if the rural people are allowed to participate. This is because much will be gained by drawing on their knowledge of NTFPs which can in turn lead to building upon a stainable system. That commercialization of NTFPs by rural households will improve their income and livelihood is not in doubt. However, the sustainable availability of the NTFPs at their primary resource base which will in turn sustain their commercialization needs investigation. [10] stated that NTFPs is dependable source of food supply and income to the rural household however NTFPs as a resource is diminishing. The Government, environmentalists and users involved in the management of plant NTFPs have expressed concern about how to sustain the availability of the product. This because of the fact that the products are used increasingly without being replaced coupled with the ever-expanding deforestation and degradation of the forest and threatening product availability.

[14] observed that only 4% of Nigeria's forest cover is remaining. In fact, many species have been extinct because a substantiative portion of the Nigeria's rich vegetation has been removed [18]. Natural forest loss by far exceeded afforestation and secondary forest growth on previously cleared lands. This has caused a lot of the products not to be available. Harvesting of the products are not controlled and majority of them are over-harvested. Harvesting is also carried out with very destructive methods. Rural households are hardly considered when planning new policies either for the management of forest resources or sustaining the community own forest. The study therefore, investigates what factors affect the sustainable commercialization of NTFPs by rural households.

The main purpose of the study is to analyse factors influencing the sustainable commercialization of NTFPs by rural households Delta State. The research will also address the following specific objectives: Specific objectives include to: (i) determine the socio- economic characteristics of rural households engaged in NTFPs commercialization; (ii) determine the extent of sustainable availability of NTFPs for commercialization; (iii)examine factors that hinder sustained commercialization of NTFPs and (iv) ascertain socio- economic factors influencing sustainable commercialization of NTFPs.

MATERIALS AND METHODS

Area of study

Study area was Delta State. It is estimated that 70 percent of the state population is rural of which 75 percent is engaged in one form of farming or the other [3]. Apart from agriculture majority of the rural population were engaged in non-agricultural activities which include artisanship, business, employment in both public and private sectors, forestry and other forms of wage labour [3]. The state has relatively moderate forest resources in existence [4]. Vegetation of the state ranges from mangrove swamps along the coast to rainforest in the central and northern areas of the state. The state's wide coastal belt is

interlaced with numerous rivers, creeks and creek lets while the hinterland has many perennial rivers and streams which form part of the Niger Delta. The total land area of Delta state is estimated at 17,698 square kilometres The annual average rainfall is 241.52mm, temperature is 28.64^OC while humidity is 81.14%.

Sample and Sampling Techniques

The State is divided into 3 Agricultural zones with 25 Local Government Areas (LGA). The 3 Agricultural Zones include Delta North (9 LGAs), Delta Central (8 LGAs) and Delta South (8 LGAs). Multistage sampling technique was used for the study. The first stage was the selection from the 3 Agricultural zones, 2 local government areas each giving a total of 6 LGAs. These LGAs were purposively chosen since they were identified from Delta State Ministry of Environment to have forest resources. The next stage was the selection of villages. Through random sampling techniques 4 rural villages were selected from each of the LGAs chosen from the list of villages compiled by the Delta State Ministry of Lands and Survey, Asaba. These villages and their LGAs were Oshimili South – Obiokpu, Oko-Anala, Oko-Ogbele and Akpako. Ndokwa East – Utchi, Abala, Oshimili and Asaba-Ase. Ethiope West – Ovade, Otefe, Jesse and Oghareki. Okpe – Jakpa, Aragba, Ometan and Jeddo. Patani – Bulou-Angiama, Koloware, Odorubu and Toru-Angiama, Isoko South – Irri, Uro, Uzere and Ada. This selection gave 24 villages.Households formed the final sampling stage.Selection of households will be done through simple random sampling. With the assistance of the village heads, the list of the total number of households in each village was compiled. There was a total of 1,488 households in the 24 villages selected for the study. The sample for the study will be determined using the equation: [6]

$$n = \frac{N}{1 + N(e^2)} \quad ....(1)$$

where:
n = the sample size
N = population size
e = the level of precision
With a population size of 1,488 rural households and precision level of ± 7% at P = 0.5for maximum variability, the sample size was obtained as follows:

$$n = \frac{1,488}{1 + 1,488(0.07^2)} \quad ....$$
$$= 179$$

This infers that 179 households will be adequate for the study. However, in order to be within the sample frame and effectively achieve the objectives of the study, a sample size of

Fifteen (15) households will be randomly selected from each of the24 villages giving a total of 360 household respondents that will be used for the study.

Data Collection

Data was collected through questionnaire, oral interviews and group discussions. The questionnaire was administered on 360 respondents. 20 respondents were unable to complete the questionnaire correctly making such questionnaire to be incomplete and invalid. Such questionnaire was discarded and was not used for computations. The remaining 340 respondents' questionnaire was successfully completed and was used for data analyses.

Analysis of data

Data was analysed with descriptive statistics and multiple regression analysis. Descriptive statistics include frequency distribution, percentages and mean.

The extent of availability of plant NTFPs to rural households for commercialization was analysed using a 4-point Likert scale of 1 – Not available (Na), 2 – Diminishing availability (Da), 3 – Available (A) and 4- Very available (Va)

The assigned mean value is 1+2+3+4= 10
  The number(n) = 4
  Mean = 10/4 = 2.5.
Decision rule: Any mean above 2.5 is accepted while means below 2.5 is rejected.

Multiple Regression Analysis

$$Y_1 = f (X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9) + U \quad ....(2)$$
where:

Y_1 = Sustainable commercialization of NTFPs

The independent variables include:

X_1 = Educational qualification of household head (Number of years spent in formal education)

X_2 = Access to technology (1 = modern, 0 = otherwise

X_3 = Access to credit (₦)

X_4 = Access to extension services (1 = access, 0 = otherwise)

X_5 = Total household size

X_6 = Number of members of household engaged in NTFPs employment

X_7 = Hours spent on NTFPs employment

X_8 = Gender of household head

X_9 = Amount of NTFPs resources owned (₦)

Various functional forms such as linear, semi-log and double-log were fitted to the data to obtain model estimates.

The model with the best fit, in terms of F-value, R^2 and individual coefficients was the linear form and was selected for detail interpretation.

RESULTS AND DISCUSSIONS

Socio- economic characteristics of rural households engaged in NTFPs commercialization

On age, findings revealed that households between the ages of 31 – 60 years constituted 79.7% and were the active age of the household involved in NTFPs activities.

The implication is that for any meaningful intervention in NTFPs activities the target group should be households between the ages of 31 – 60 years.

Findings also revealed that 80% of rural household heads were married. High rate of married households will result to large household size which in turn may influence the population engaged in NTFPs activities.

A mean household size of 8 persons was obtained. Household size of 8 persons has been found to have direct relationship to NTFPs exploitation [8]. The study also found that majority of the respondents had formal education. However, a further breakdown showed that majority of those with formal education are those with First School Leaving

Certificate (FSLC) with a rating of 45.6%. The implication is that with time these FSLC respondents tend to forget what they have learnt since they hardly practice them due to the kind of activities they are engaged. This may influence enlightenment on controlled extraction of NTFPs, conservation of NTFPs, value addition and commercialization of NTFPs.

Table 1. Socio- economic characteristics of rural household respondents

Characteristics	Frequency	Percentage	Mean
Age			
20 – 30	19	5.60	
31 – 40	90	26.50	
41 - 50	101	29.70	
51 - 60	80	23.50	
61 – 70	43	12.60	
Marital Status			
Married	272	80.0	
Widowed	36	10.60	
Single	4	01.2	
Divorced	28	8.20	
Sex			
Male	142	41.80	
Female	198	58.2	
Household Size			
Less than 4 persons	11	3.24	8 persons
4 – 6	80	23.52	
7 – 9	187	55.0	
10 – 12	62	18.24	
Educational Qualification			
Post-Secondary	29	8.60	
Secondary	76	22.40	
Primary	155	45.60	
Non- Formal	80	23.50	
Occupation			
Main Occupation			
Agriculture	340	100	
Forest and Tree Products	340	100	
Other Occupations	75	22.10	
Artisan	121	35.60	
Business	78	22.90	
Agricultural Labour	66	19.40	
Public and Private sector employment			

Source: Field Survey, 2023.

Table 1 also showed the common occupations engaged in by rural households. The main occupations were Agriculture and Forest and Tree Products (FTPs) activities. Other occupations engaged in by rural households include business with the highest proportion of 35.6%. This was followed by agricultural labour and artisans. In [12] Forest and Tree Products activities were usually grouped with agriculture but in this study, they were separated to find out the contributions of each sector to the rural economy.

Extent of sustainable availability of NTFPs for commercialization

Among the NTFPs identified by the rural households in the study area as commercialized, the study selected 24 NTFPs for analysis. The result was as presented below in Table 2.

Table 2. Extent of sustainable availability of NTFPs for commercialization

S/N	Common Name	Local Name (Igbo)	Botanical Name	Uses	Mean	Remark
1	Fuel wood			Fuel	3.15	A
2	Chewing stick	Atu	*Massularia acuminate*	Mouth cleaning	1.65	NA
3	Walnut	Ukpa	*Juglans regia*	Fruit	2.10	DA
4	Pear	Ube Igbo	*Canarium schweinfurth*	Fruit	2.18	DA
5	Mai-Mai leaves	Akwukwo Uma	*Thaumatococusdanielli*	Wrapping	2.05	DA
6	African plum	Mbebe Igbo	*Vitex donianu*	Fruit	1.85	NA
7	African kino tree	Ora	*Pterocarpus spp*	Leaf/food	2.15	DA
8	Kolanut	Oji	*Cola acuminate/nitida*	Entertainment	3.04	A
9	Hot leaf	Uziza	*Piper guineense*	Spice/food	2.05	DA
10		Uda	*Xylopia aethiopica*	Spice/food	2.06	DA
11	Mushroom	Elo		Food	2.35	DA
12	Native pear	Ube	*Dacyodis edulis*	Fruit/food	3.05	A
13	Locust bean	Ukpaka	*Penaclatramacrophylia*	Food	2.45	DA
14	Raffia palm	Ngwo	*Raffia soup*	Wine/building materials	1.35	NA
15	Oil palm	Nkwu	*Elaeisguineensis*	Wine/building material	3.12	A
16	Salad	Okazi	*Gnetumafricanum*	Leaf/food	2.25	DA
17		Utazi	*Gongronema latifolia*	Spice/food	3.10	A
18	Alligator Pepper	Ose Oji	*Affromomumspp*	Entertainment/Medicine	2.08	DA
19	Bitter Kola	Akuilu	*Garcina Kola*	Entertainment/Medicine	2.44	DA
20	Bush Mango	Ogbono/Ugiri	*Irvingiagabonensis*	Food	2.02	DA
21	Bread Fruit	Ukwa	*Treculia Africana*	Food	2.18	DA
22		Icheku Oyibo	*Tramarindusindics*	Fruit	2.18	DA
23	African Apple	Udara	*Chrysophyllum Albidum*	Fruit/Food	3.05	A
24	Sponges			Washing	1.65	NA

Source: Field Survey, 2023.

Table 2 showed that the mean values of 6 of the items used namely, fuel wood (3.15), Kola nut (3.04), Oil palm (3.12), Africa Apple (3.05), *Gongronema latifolia* (3.10) and native pear (3.05) were rated to be very available, 13 of the items namely: Bread fruit (2.18), bush mango (2.02), Alligator pepper (2.08), Bitter kola (2.44), *Tramarindusindics* (2.18), Hot leaf (2.05), *Xylopia aethiopica* (2.06), Mai-Mai leaves (2.05), Locust Bean (2.45), *Gnetum africanum* (2.25), *Ptercarpusspp* (2.15), *Canarium schweinfurth* (2.14), Walnut (2.10), Sponges and Mushroom (2.35) were rated as having diminishing availability while 4 namely, *Vitex donianu* (1.85), Sponges (1.65), Raffia Palm (1.35) and Chewing stick (1.65) were rated as not being available

Factors hindering sustained commercialization of NTFPs

Table 3 showed that deforestation with a rating of 74.44% was a major hinderance to sustainable availability of NTFPs and hence their sustainable commercialization.

Table 3. Factors that hinder sustained commercialization of NTFPs

S/N	Description	Frequency	Percentage
1	Deforestation	253	74.44
2	Paying attention to conservation	89	26.17
3	In-situ and ex-situ tree planting culture	95	27.94
4	Technology used for NTFPs	123	36.17
5	Adopting participatory approach to forest management	95	27.94
6	Enforcing regulations on NTFPs removal and replacement	111	32.64
7	Price at which NTFPs are sold	141	41.47

Source: Field Survey, 2023.

Diminishing forest means alteration of ecosystem and depletion of forest resources. [18] observed that a greater proportion of Nigeria's forest has been removed and many species have gone into extinction. Findings also showed that paying attention to conservation received a low rating of 26.17%. The implication is that NTFPs commercialization will not be sustained since it will be difficult to maintain regular supply of the NTFPs from primary resource base. There was also poor in-situ and ex-situ tree planting with a rating of 27.94%. Planting of NTFPs will ensure availability and sustainability. [14] recommended consciously planting forest resources and being highly committed to afforestation. Technology for NTFPs received low rating of 36.17% showing that poor technologies were used. Use of poor technology will affect efficiency in harvesting, processing and marketing which will in turn affect value addition to the NTFPs and income generated. Findings also revealed that participatory approach which will include the rural households was not adopted in forest management with a rating of 27.94. This showed that availability and sustainability of the NTFPs will be uncoordinated and in the long run affect commercialization. [15] stated that top – bottom approach is being used in the conservation of the forest with little or no participation from the rural communities.

[2] recommended that rural households should be allowed to participate in forest management for good result to be achieved. This is because the indigenous knowledge of forest and forest products possessed by these locals which can help to create a sustainable system. The study also found that regulations on NTFPs removal and replacement was not enforced with a rating of 32.64%.

[16] reports that State Department of Forestry (SDF) and Local Governments are responsible for the regulation and control of NTFPs extraction but that these regulations were not enforced which brings about lack of management and for some NTFPs unsustainability of their harvesting. Prices at which NTFPs are sold had reasonable rating of 41.47%. [12] found that the values of Forest and tree products were usually higher than the cultivated crops. A major reason is that NTFPs demand is high while their supply is unsustainable which drives the price high for the quantity available.

Socio-economic factors influencing sustainable commercialization of NTFPs

To ascertain the socio-economic factors influencing sustainable commercialization of NTFPs, multiple regression analysis was carried out. The four functional forms – linear, double log, semi-log and exponential were used. Linear functional form was selected since it provided higher number of variables with significant levels and also based on its records of having best R^2, F- ratios and also best coefficients when signs and significant were considered. From the linear regression analysis result in Table 5, the R^2 value of 0.948 revealed that 94.8% of the variations in dependent variable (Sustainable commercialization of NTFPs was accounted for by variations in the independent variables put together. The adjusted R^2 also supported the claim with a value of 0.964 or 96.4%. This implied that the independent variables explained the behaviour of the dependent variable at 96% level of confidence. The calculated F-ratio of 242.817

was greater than any critical F-ratio value and implied that there was significant impact between dependent variable and the independent variables.

Table 4. Regression estimates of socio-economic factors influencing sustainable commercialization of NTFPs'

S/N	Explanatory Variables	Coefficients	Std Error	t-ratio
1.	Educational qualification of household head	0.437	0.188	(2.758) *
2.	Access to technology	2.695	0.964	(2.324) *
3.	Access to credit	5.415	1.146	(5.721) *
4.	Extension services received on NTFPs	2.593	0.898	(3.316) *
5.	Household size	2.421	0.574	(3.677) *
6.	Number of members of household engaged in NTFPs employment	0.030	0.123	-0.243
7.	Hours spent on NTFPs employment	-0.242	0.039	(6.152) *
8.	Amount of NTFPs resources owned	2.683	0.000	(4.347) *

Constant term = 27.455
R^2 = 0.948
Adjusted R^2 = 0.964
F-Value = 242.817
* = 0.05 level of significance
( ) Number in parenthesis is t-value
Source: Estimated from Field Survey, 2023.

The coefficients and t-values (values in parenthesis) of educational qualification of household head 0.537 (2.858); access to technology 2.596 (2.694) access to credit 5.514 (4.811); total household size 2.166 (3.776); amount of FTP resources owned 2.83 (4.34) were all positively signed and significant at 0.05. These variables conform with *apriori* expectations. That is, they were significant and positively affect sustainable commercialization of NTFPs resource base. Analysis showed that education as a human capital development makes an individual to be more informed which attracts better options and diversify methods of sustainable availability from NTFPs resource base. Access to technology was also significant and positive. Technology aids planting and maintenance at both in-situ and ex-situ conservation. Technology is also important in communications and information dissemination which are important in commercialization.

Access to credit was positive and significant. Credit improves production, processing and marketing. It also influences the quantity that is eventually planted and replenished. Credit will be used for planting and replanting of NTFPs when they are depleted in quantities from their natural resource base Credit could also be used to procure technology. Household size was also significant and positive. Household size influences commercialization since the more the number in the household the higher the chances of more members engaging in commercialization. Amount of NTFPs resources owned was positive and significant at 0.05. Generally, resources owned influences sustainable commercialization. Resource ownership will help to control harvesting and maintenance of the NTFPs resource base. Resource owners could use their land to raise plantation of economic trees or leave them as forest for availability of NTFPs. Receiving extension advise will help the rural households to manage the NTFPs resource base which in turn will help sustained availability of NTFPs for commercialization.

However, the coefficient of hours spent on NTFPs employment was negatively signed with a value of -0.242 (6.152) but significant. The number of hours spent on NTFPs employment negatively affect sustainable availability of NTFPs since members of the rural households may concentrate more on collections than replenishment. From the explanatory variables analyzed thus far, the t-values were all significant and the probability of rejecting any of them was less than 1% confidence level. The standard errors of these explanatory variables were also very low.

Coefficients and t-values of number of members of household engaged in NTFPs employment (0.030) were insignificant at 0.05. They were therefore ignored. It implied that they do not have effect on sustainable commercialization of NTFPs.

CONCLUSIONS

Sustainable commercialization of NTFPs is possible if there is sustainable availability of the products from the primary resource base. Findings of the study revealed that NTFPs were a diminishing resource. NTFPs were collected from their resource base without planed replacement. These were due to certain factors such as deforestation, poor tree planting culture, poor methods of forest conservation, use of poor technology and not adopting participatory approach to forest management among others. Hence there is urgent need to rebuild and restore the degraded forest in order to sustain availability of NTFPs. Recommendations include the involvement of youths in the plan to restore the forest since they are active and major culprits of deforestation activities in the rural areas. Introduction of "permmitteeship" system to regulate NTFPs removal and rural communities should work with State Government in ensuring that only permitted members were allowed to harvest NTFPs sustainable in the forest. Improvement in technology used in NTFPs production, processing and marketing. Adopting participatory approach towards NTFPs management. Enlightenment and education of rural households on deforestation and the need for forest conservation. There should be research into ways of improving values of NTFPs to attract sustainable commercialization.

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