WILLINGNESS TO PAY FOR AFFORESTATION AMONG NON-TIMBER FOREST PRODUCT DEPENDENT HOUSEHOLDS IN AKWA IBOM STATE, NIGERIA

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Abstract

Following the high deforestation rates in most rural communities in Nigeria and the need to sustain livelihoods of rural households, this study used a sample of 150 Non-Timber Forest Products Dependent (NTFPD) households selected randomly through a multi-stage sampling procedure using questionnaire to estimate willingness to pay for afforestation practices in Akwa Ibom State, Nigeria. Data collected was analyzed using simple percentages, means, Likert Scale Rating and Logistic Regression. Findings revealed that majority (60.7%) of respondents were males, 47.3% were married with a mean family size, farm size, age and educational attainment of 5 persons, 0.87 hectares, 39 years and 12 years, respectively. The major drivers of deforestation were economic factors such as poverty, population growth (97.3%), fuel wood consumption (93.3%), demand for forest products, (92%), urban expansion, (89.3%), agricultural production/expansion, (86.7%), illegal logging of trees for timber, (84%), mining and other exploration activities, (81.3%), forest conversion to settlement (77.3%), Others include unsustainable forest use (70.7%), weak forest laws and enforcement capacity (64%), forest fire (55.3%), political factors (14%) and ignorance (9.3%). Result also showed that 61.3% of respondents were willing to pay for afforestation practices while 38.7% were not willing to pay. The mean amount that each household was willing to pay per year and per month was N21, 469.20 and N1, 789.1, respectively. Result of the Logistic regression revealed that willingness to pay was significantly influenced by past awareness, access to extension services, monthly income, major occupation, education and age of household head. Additionally, adoption of sustainable afforestation practices was constrained by several factors. Hence, awareness and sensitization campaigns should be intensified by government and forest stakeholders to educate respondents on the benefit of afforestation as this will go a long way to change their perception.

Keywords: Willingness to pay; afforestation practices and Non- tree forest products (NTFPs)

Introduction

Forests constitute one of the most important natural resources globally because they provide essential ecosystem services, regulate climate, conserve biodiversity, and support the livelihoods of millions of rural households who depend on forest resources for subsistence and income generation (Taye, *et al*., 2021; Pastur et al., 2018. Forest ecosystems supply both timber and non-timber forest products (NTFPs), including medicinal plants, fruits, vegetables, mushrooms, honey, fuel wood, fibers, nuts, and other biological resources that contribute significantly to food security and poverty reduction among rural populations (Derebe, *et al.,* 2023; Adaaja, *et al.,* 2024).

Globally, rapid industrialization, urban expansion, infrastructural development, and population growth have accelerated deforestation and forest degradation, resulting in substantial losses of biodiversity and ecosystem services upon which forest-dependent communities rely (UNEP, 2023; Drupp, *et al.,* 2023). Forest degradation has become a major environmental concern because its impacts on carbon sequestration, ecosystem resilience, and livelihood sustainability often exceed those associated with outright deforestation (Giovanni Forzieri et al., 2022).

In developing countries, particularly in sub-Saharan Africa, NTFPs contribute substantially to household welfare by serving as sources of food, medicine, income, energy, and cultural identity, especially among poor and vulnerable rural households (Derebe et al., 2023; Padhan, 2022). Studies have shown that forest-dependent households often rely on NTFPs as primary, supplementary, and emergency sources of livelihood, thereby reducing vulnerability to economic and environmental shocks (Derebe et al., 2023; Padhan, 2022). ; Suleiman, *et al.,* 2017).

Nigeria has experienced significant forest depletion over the last several decades due to agricultural expansion, urbanization, logging, infrastructure development, oil exploration, and population pressure (Adaaja et al., 2024). The consequences of forest degradation have been particularly severe for rural households that depend on NTFPs because the reduction in forest resources limits access to products that contribute to nutrition, healthcare, employment, and income generation (Egbe, 2015; Adaaja et al., 2024).

Akwa Ibom State is among the most industrialized states in the Niger Delta region, with increasing urbanization, infrastructural development, oil and gas exploration activities, and expansion of residential settlements contributing to the depletion of forest resources. (Umoren et al., 2024).Consequently, many indigenous forest species and economically valuable NTFPs that previously supported rural livelihoods have become scarce or locally extinct in several communities. This situation has reduced livelihood opportunities for forest-dependent households and heightened concerns regarding environmental sustainability and biodiversity conservation.

Afforestation has emerged as an important environmental policy strategy for restoring degraded landscapes, enhancing biodiversity conservation, improving carbon sequestration, and ensuring sustainable supplies of forest products for future generations (Karki & Yokota, 2024; Sisay & Toru, 2023). Governments and environmental agencies increasingly promote afforestation programmes to rehabilitate degraded ecosystems and improve the welfare of communities dependent on forest resources (Karki & Yokota, 2024).

However, successful implementation of afforestation initiatives often depends on community participation and the willingness of beneficiaries to contribute financially toward forest restoration efforts (Sisay & Toru, 2023). Understanding households' willingness to pay (WTP) for afforestation is therefore crucial because it provides information on the economic value individuals place on environmental restoration and assists policymakers in designing effective and sustainable conservation programmes.(Bergstrom et al., 2021).

Against this background, this study investigates farmers' willingness to pay for afforestation among NTFP-dependent households in Akwa Ibom State, Nigeria, with a view to generating empirical evidence that can guide forest restoration policies and sustainable environmental management.

Problem Statement

Forests in Akwa Ibom State have historically served as important sources of non-timber forest products that support the livelihoods of rural households through food provision, medicinal resources, fuelwood, income generation, and environmental services. However, increasing industrialization, urban expansion, infrastructural development, oil exploration activities, and population growth have accelerated forest degradation and biodiversity loss across many parts of the state. Similar trends have been observed across Nigeria, where forest depletion continues to threaten the sustainability of NTFP-based livelihoods (Adaaja et al., 2024).

The decline in forest resources has reduced access to many economically valuable NTFPs, thereby increasing livelihood vulnerability among rural households that depend on forests for subsistence and income (Egbe, 2015; Derebe et al., 2023). In response to these challenges, governments and environmental agencies have introduced afforestation and forest restoration programmes aimed at rehabilitating degraded ecosystems and restoring the supply of forest products (Sisay & Toru, 2023).

Despite the ecological and socioeconomic importance of afforestation, there is limited empirical evidence regarding the extent to which NTFP-dependent households in Akwa Ibom State are willing to contribute financially toward afforestation initiatives. Existing studies in Nigeria have focused largely on NTFP utilization, forest conservation, and indigenous forest management practices, with relatively little attention devoted to households' willingness to pay for afforestation programmes (Akinwalere et al., 2020; Adaaja et al., 2024).

The absence of such information creates uncertainty for policymakers regarding the design of cost-sharing mechanisms, environmental levies, and community-based forest restoration programmes. Therefore, this study seeks to bridge this knowledge gap by examining farmers' willingness to pay for afforestation among NTFP-dependent households in Akwa Ibom State, Nigeria.

Research methodology

The Study area

This study was conducted in Abak Agricultural Zone in Akwa Ibom State, Nigeria. The zone consists of five local government areas; these are Abak, Oruk Anam, Etim Ekpo, Ukanafun and Ika local government areas. Akwa Ibom state is one of the states in the South South region of Nigeria. It is one of the Niger delta states rich in crude oil deposit. The state is in the rain forest belt and is prone to oil spillage, acid rain and increasing ocean encroachment. Some of the common food crops grown in the area are; cassava, plantain, waterleaf, fluted pumpkin, white yam, cocoyam, maize and banana.

Abak Agricultural Zone is located within latitude 110°N and longitude 70°E. It is characterized with dense growth of vegetation. Climate of the area is characterized by rainy season (March to October) and dry season (November-February). Rainfall ranges from 2000 3000mm per annum. Temperatures are generally high all year round, ranging between 260°C and 280°C. Relative humidity is commonly high and uniform. This gives rise to luxuriant vegetation all year round.

Source and method of data collection

Primary data used in the study was collected with the aid of a well- structured questionnaire and oral interviews.

Sampling Procedure and Sampling size

A multi-stage random sampling procedure will be used in selecting respondents. The first stage will involve a random selection of three (3) blocks from the existing five blocks that made up Abak Agricultural Zone. In the second stage, five (5) cells will be randomly sample from each of the selected blocks making a total of fifteen (15) cells. In the third stage, ten 10) rural household farmers will be randomly selected from each of the selected cells making a total of one hundred and fifty (150) rural household farmers that will be used for the study.

Method of data analysis

Data was analyzed using both descriptive and the inferential statistics. Descriptive statistics such as table, frequency, percentages and means will be used to analyzed objective (iii) and (ii) which are to examine the socioeconomics characteristics of rural farm households' respondents and to examine the major drivers of deforestation in the study area respectively.

Logistic regression model was use to estimate willingness to pay for afforestation practices by NTFP dependent households in the study area. The implicit form of the model is stated thus:

$$Y = \beta X_i + \mu \quad \text{.....(.1)}$$

Where;

Y	=	Willingness to pay (Yes=1, otherwise-0)
X_i	=	vector of explanatory variables
β	=	vector of parameter estimates
μ	=	Error term

The explicit form of the model is stated as follows:

$$WTP=\beta_0+\beta_1PAW+\beta_2ATE+\beta_3FAS+\beta_4MOI+\beta_5SEX+\beta_6FAMS+\beta_7DER+\beta_8MAS+B_9MAO+\beta_{10}EDU+\beta_{11}ATC+\beta_{12}AGE+\beta_{13}MOC+\mu \quad \text{..... (2)}$$

Where;

PAW	=	Past awareness (1 if household head has been exposed to afforestation Programme or training before, otherwise = 0)
ATE	=	Access to extension centers (Yes =1, otherwise = 0)
FAS	=	Family size (number of persons)
MOI	=	Monthly income (Naira)
SEX	=	Sex (Male =1, otherwise = 0)
FAMS	=	Farm size (hectares)
DER	=	Dependency ratio (Number of people who are below 16 years and more than 65 years in a household)
MAS	=	Marital status (Married =1, otherwise = 0)
MAO	=	Major occupation (NTFP =1 otherwise = 0)
EDU	=	Education (Years of schooling)
ATC	=	Access to credit (Yes =1, otherwise =0)
AGE	=	Age (Years)
MOC	=	Membership of social organization (Membership = 1, otherwise 0)
μ	=	Stochastic error term

Objective (iv) which is to examine the constraints for the adoption of sustainable afforestation practices in the study area will be analyzed using a 5-point likert scale type related as follow, 5=strongly agreed (SA), 4=Agree (A), 3= Undecided (U), 2= Disagree (D), 1= Strongly Disagree (SD).

Result and discussion

Socio-economic characteristics of respondents

From Table 1, majority (60.71%) of respondents were males with average farm holdings of 0.87 hectares. This indicated that NTFP depending households was dominated by men. The low hectarage of cultivation reflects the excessive land fragmentation in the study area occasioned by the polygamous nature of farm families. Majority (47.3%) were married with a mean household size of 6 persons. Bassey, Oboh and Onyia (2020) had reported that majority of farming households in the study area were married. Educationally, farming households were quite educated with a mean of 12 years of educational attainment. This is desired because education is a social capital tool that can enhances farmers adoption of agricultural innovations.

Bassey, Oboh and Onyia (2020) had reported that 86.7% of farmers were educated in the study area. Majority of respondents (42,7%) were within the age bracket of 41 -50 years with a mean of 39.2 years. This is an indication that respondents were still within the age range that is desired for intensive farm production operation. There was high membership of social organization (67.3%) among respondents showing that there was higher capital formation in the study area. This, will augur well with farm households since they can leverage on their contact and business connections to boost farm production. Bassey, Oboh and Onyia (2020) also reported that majority of farmers (62%) were members of cooperative in the study area. The mean monthly income of household was N17, 600 with high access to extension services.

Table 1: Socio-demographic characteristic of farming household

Variable	Frequency	Percentage	Mean
Sex			
Male	59	39.3	
Female	91	60.7	
Farm size			
Less than 1ha	71	47.3	
1 – 2 hectares	60	40	0.87
Above 2 hectares	19	12.7	
Marital status			
Married	71	47.3	
Single	52	34.7	
Divorced	17	11.3	
Widow	10	6.7	
Household size			
Less than 5	57	38	
5 -10	70	46.7	5
11 -15	18	12	
Above 15	9	3.3	
Educational level			
No formal education	22	14.7	
Primary school	64	42.7	12
Secondary school	50	33.3	

Tertiary institution	14	9.3	
Age			
Less than 30	8	5.3	
30 - 40	26	17.3	39.2
41 - 50	64	42.7	
51 - 60	42	28	
Above 60	10	6.7	
Membership of social organization			
Yes	101	67.3	
No	49	32.7	
Monthly income			
Less than N20,000	30	20	
N20,000- 30000	40	36.7	N17,600
30,001- 40,000	56	37.3	
Above, 40,000	24	16	
Access to extension			
Yes	85	56.7	
No	65	43.7	

Source: Field survey data, 2025

Drivers of deforestation in the study area

From Table 2, the causes of deforestation reported by respondents in order of severity of cause were economic factors such as poverty, population growth (97.3%), fuel wood consumption (83.3%), demand for forest products (92%), urban expansion (89.3%), agricultural production expansion (86.7%), illegal logging of trees for timber (84%), mining and other exploration activities (81.3%). Others were forest conversion to settlement (77.3%), weak forest laws and enforcement capacity (64%), forest fire (55.3%) political factors, (14%), political factors (14%b) and ignorance (9.3%). Increase in population and urbanization will result in intensification of land use leading to more deforestation (Boucher et al 2011). It will also lead to increased fuel wood consumption and unsustainable forest use.

Also, cropland expansion, urban settlement growth, poverty, population growth and increased food production were listed as major drivers of deforestation by Akinyemi, Ifejika and Speranza (2024), Nwosu, *et al,* (2025) and Ogunbode, *et al,* (2025), respectively. Atampugre *et al*, (2024) and Umoren, *et al*, 2024) had also listed agricultural expansion, urbanization, poor enforcement of environment regulation, agricultural encroachment and settlement expansion as drivers of urbanization. FAO (2010) had listed timber production agricultural production, poverty, conversion of agricultural lands for settlement, demand for forest products, urbanization, population explosion, weak laws and ignorance as causes of global deforestation.

Table 2: Drivers of deforestation in the study area

S/No	Driving factor	No	Percentage	Rank
1	Agricultural production/ expansion	130	86.7	5th
2	Fuel wood consumption	140	93.3	2nd
3	Illegal logging of trees for timber production	126	84	6th
4	Demand for forest products	138	92	3rd
5	Mining and other exploration activities	122	81.3	7th
6	Forest fire	83	55.3	11th
7	Forest clearing for settlement	116	77.3	8th
8	Weak forest laws and enforcement capacity	96	64	10th
9	Ignorance	14	9.3	13th
10	Unsustainable forest use	106	70.7	9th

11	Economic factors such as poverty, population growth	146	97.3	1st
12	Political factors	21	49	12th
13	Urban expansion	134	93	4th

Source: Computed from Field survey data, 2025

Analysis of NTFP Dependent Household willingness to pay in the study area

Table 3 shows that 61.3% of respondents were willing to pay for sustainable afforestation programme if introduced while 38.7% were not willing to pay. This might have been informed by the high awareness of respondents on the benefit of forest as a source of livelihood. In Ethiopia, Sisay and Toru (2023) had also reported a higher willingness to pay (88.69%) for forest conservation among farmers, The amount that respondents were willing to pay ranges from 6000 to 104,000 per annum in the study area. A breakdown of this reveals that majority (59.8%) were willing to pay less than 20,000, 20.6% were willing to pay between 20,000 to N40,000, 9.8% were willing to pay between 40,0001 to N60,000 while 5.4%, 3.3% and 1.1% were willing to pay betweenN60,001 toN80,000, N80,0001 to N100,000 and above N1100,000, respectively.

Finding implies that willingness to pay for sustainable afforestation programme in the study area will increase with decreasing price. The mean amount that respondents were willing to pay per year and per month was N21, 469.20 and N1, 789.1, respectively. This was higher than the N375.83 reported for urban vegetation restoration in Ogun State, Nigeria by Shittu and Kehinde (2020). In Ibadan, Oyo State of Nigeria, Ariyo, Okojie and Ariyu (2018) also reported a mean willingness to pay (MWTP) of N114380 per month per household and a total willingness to pat (YWTP) of N3, 461,021.22 per month among farmers, respectively.

Table 3: Willingness to pay and amount to pay for sustainable afforestation programme

Willingness to pay/ category of respondents	Number	%	Amount willing to pay	Mean amount willing to pay per category
Willingness to pay				
Yes	92	61.3		
No	58	38.7		
Total	150	100		
Amount willing to pay				
Less than N20,000	55	59.8	487,366.50	
40,001 – 60,000	19	20.6	408,500	
60,001 – 80,000	5	5.4	310,000	
80,001 – 100,000	3	3.3	276,200	
Above 100,000	1	1.1	104,800	
Total	92	100	1,975,116.50	

Mean amount willing to pay per respondent per year = N21, 469.20
Mean amount willing to pay per respondent per month = N1, 789.10
Source: Field survey data, 2025.

Logistic regression estimates for determinants of willingness to pay

Table 4 presents the Logistic regression estimates for determinants of willingness to pay for sustainable afforestation programme in the study area. The diagnostic statistics yielded a Log likelihood Ratio (LR) of 312.42 which was significant at 1 percent probability level. This denoted the goodness of fit of the estimated model. The Pseudo R^2 was 0.067 indicating that the explanatory variable included in the model explained about 67% of the variability in willingness to pay.

From the result, of a total of thirteen variables that that were included in the model, seven variables were significant with varying signs. In our interpretation, a positive sign implied that increasing such variable will increase the probability of willingness to pay and vice versa. Among that were positive and significantly increase respondent willingness to pay were past awareness of respondent (p>0.01), access to extension services (p>0.05), monthly income (p>0.05), farm size (p>0.05), major occupation (p>0.01), education (p>0.01) and age (p>0.01). The value of their marginal effects shows that a 1 percent increase in respondent's awareness, access to extension services, monthly income, farm size, major occupation and education of respondents will increase their probability of willingness to pay by 0.3%, 0.002%, 0.13%, 0.22% and 0.02%, respectively. The result for past awareness of respondents is justified because respondents who had previously embarked on or exposed to afforestation practices in the past will have a positive willingness to pay than their counterparts who never had any afforestation awareness before.

A study by Kokoye*, et al,* (2018) had previously reported that farmer's awareness increases their willingness to pay. Result for access to extension services is in line with empirical literature because consistent contact with extension agents will increase respondents' awareness as well as consciousness in afforestation practices, thereby aiding them develop a positive mindset, hence, their willingness to pay will increase. This finding support that of Belay, (2017) who reported that willingness to pay increases with increasing extension visit among Ethiopian farming households Additionally, the positive and significant relationship with of monthly income is justified in that higher monthly income will enhance respondent liquidity position, hence their willingness to pay. This supports the traditional law of demand that higher income increases the demand for a commodity. This finding lend support to those of Getachaw (2018) ; Abdeta, Ayana and Bekale (2023). And Endalew and Wondimugegnhu, (2019).

Concerning the positive and significant coefficient of major occupation, respondents whose major occupation is NTFP will most likely have a higher willingness to pay for afforestation practices than those who have other alternative sources of income. This finding is in line with those of Kokoye et al (2018) and Ariyo, Okojie and Ariyo, (2018). The positive sign for education is also justified because educated NFTP dependent are more knowledgeable on benefit of afforestation practices and will go extra mile to pay for them than their illiterate counterparts. This result support those of Kokoye et al (2018) and Ariyo, Okojie and Ariyo, (2018).

Also, the estimated coefficient for age was negative and significantly reduces the probability of willingness by one percent probability level. Its marginal effect coefficient shows that a 1 percent increase in respondent's age will reduce their probability of willingness to pay. This is the case since aged people are more risk averse than younger ones. Result corroborates that of Gestachac (2018) who reported a positive significant relationship between age and willingness to pay for forest ecosystem conservation in Ethiopia.

Table 4: Binary Logistic estimates for determinants of willingness to pay

Variable	Coefficient	Standard error	Zstat	Marginal effect
Constant	-3.2662	0.6183	5.283***	-
Past awareness	0.4784	0.1148	4.167***	0.3892
Access to extension	0.1466	0.0643	2.279**	0.0028
Family size	-00052	-0.0063	-0.809	0.1166
Monthly income	0.9033	0.4180	2.161**	0.1323
Sex	-0.0189	-0.0622	0.3038	0.0004
Farm size	0.0063	0.0091	0.692	0.1046
Dependency ratio	-0.0032	- 0.0098	-0.3205	0.0562
Marital status	-0.0072	-0.0057	1.2632	0.0004

Major occupation	0.2034	0.1023	1.9830*	0.2264
Education	0.0183	0.0051	3.588***	0.0224
Access to credit	-0.0887	-0.0598	-1.483	0.0058
Age of household	-0.0108	-0.0032	-3.375***	0.0017
Membership of cooperative	0.0516	0.0400	1.290	0.0092
Wald Chi^2	69.16			
Pseudo R^2	0.067			
Loglikelihood	312.42			

Source: Field survey, 2025.

Constraints to the adoption of sustainable afforestation practice

Table 5 presents constraints to adoption of afforestation practices in the study area. In order of severity, these were poor government support (X =3.28), lack of seedling (X =3.07), insufficient fund (X =2.98), poor access to credit (X =2.97), small size land ownership (X =2.96), high cost of forest management (X =2.80), poor extension contact and long gestation period (X = 2.76), and inadequate compensation for destroyed crops (X = 2.72). lack of credit, and long gestation period of trees were previously reported by Asunlegan and Olawale (2019) as constraints in Oyo State of Nigeria. Lack of funds, scarcity of planting material, poor institutional support was also reported by Otitojo, Nwandu and Oni (2019) in Ekiti State, Nigeria.

Table 5: Constraints to sustainable afforestation practices

Constraints	VS	S	MS	NS	Total	Mean	Remark
Ill adopted forestry laws	6	14	10	50	276	1.84	Not serious
Lack of seedling	50	60	30	20	460	3.07	
High cost of forest management	40	60	30	20	420	2.80	
Poor credit	60	55	5	30	445	2.97	
Negative effect of climate change	15	8	60	67	271	1.81	
Poor extension contact	38	70	10	32	414	2.76	
Insufficient fund	45	66	30	9	447	2.98	
Long gestation period of trees	52	49	29	20	414	2.76	
Outbreak of plant and animal diseases	5	15	30	100	225	1.5	
Small size land ownership	40	60	27	23	444	2.96	
Weak forest conservation policy	3	17	80	50	273	1.32	
Poor government support	64	70	110	6	492	3.28	
Inadequate compensation for destroyed crops	44	60	6	40	408	2.72	

Source*:* Computed using field survey data, 2025

Conclusion

In this study, NTFP dependent households' willingness to pay for afforestation practices have been examined and determinants of willingness to pay estimated among Non Timber Forest Product (NTFP) dependent households. Findings have shown that majority of respondents were willing to pay for afforestation practices and that the amount they were willing to pay varied depending on their income levels. Findings have also shown that willingness to pay was a function of their socioeconomic characteristics. Hence, the study concludes that future conservation effort should be designed such that their income level and other socioeconomic issues are taken into consideration.

Recommendations

The following recommendations are offered:

(i) Awareness and sensitization campaigns should be intensified by government and forest stakeholders to educate farmers on the benefit of afforestation. This will go a long way to change their perception.

(ii) More forest management personnel and securities such as forest guards should be recruited, trained and posted to the study area to ensure proper monitoring of the forest. If possible, existing forest laws on forest enforcement should be reviewed and stiffer punishment meted out to defaulters so as to deter other intending defaulters.

(iii) Basic afforestation inputs such as seedlings, pesticides, fertilizers etc should be given to households wishing to go into agro-forestry. If possible, nurseries should be established by government and free seedlings distributed.

(iv) More extension agents should be trained and deployed to rural communities in the study area.

(v) Formation of cooperative and enrollment in evening schools and satellite campuses as a way of
improving education should be encouraged in the study area.

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