Adept Journal of Agricultural and Environmental Sciences (AJAES)
Vol. 2, No. 1 (2026)
https://journals.unizik.edu.ng/index.php/ajaes

DETERMINANTS OF AWARENESS AND UTILIZATION OF THE NIGERIAN INSTITUTE FOR OIL PALM RESEARCH'S INNOVATION: CASE STUDY OF OIL PALM PRODUCERS IN SOUTH-SOUTH NIGERIA

ABU R. A.[1*], OSUAFOR O. O.[2], ERUMWENBIBI B. O.[1], AISAGBONHI E. P.[1] and UNUABONAH E.[1]

[1]*Nigerian Institute for Oil Palm Research (NIFOR), Benin City, Nigeria.*

[2]*Department of Agricultural Economics and Extension, Nnamdi Azikiwe University, Awka, Nigeria.*

Corresponding Author:
aburamanu@yahoo.com
0009-0001-9898-5068

DOI:
https://doi.org/10.5281/zenodo.22845583

Copyright © 2026 The Author(s). THIS IS AN OPEN ACCESS ARTICLE DISTRIBUTED UNDER THE TERMS OF CREATIVE COMMONS ATTRIBUTION NONCOMMERCIAL-NODERIVATIVES 4.0 INTERNATIONAL (CC BY-NC-ND 4.0), WHICH PERMITS ANYONE TO SHARE, USE, REPRODUCE AND REDISTRIBUTE IN ANY MEDIUM, PROVIDED THE ORIGINAL AUTHOR AND SOURCE ARE CREDITED

ABSTRACT*: Despite the significant potential of agricultural research innovations to improve oil palm productivity, a good number of oil palm producers in South-South Nigeria may be lacking the awareness of existing agricultural research innovations developed by NIFOR which could hinder their ability to optimize yields, reduce costs and enhance their livelihoods. Against this backdrop, this study becomes expedient. A multi-stage sampling technique was used to select 360 respondents. Primary data were collected using a structured questionnaire while descriptive and inferential statistics were used to analyze the data. The result on socioeconomic profile indicates that the oil palm producers had a mean age of 59 years with a predominant male composition of 97.50% while the females represented 2.50%. Majority of the respondents (97.50%) were married, while 2.50% were widowed, and an average household size of six persons. Educational attainment was moderately distributed with 35% having primary education, 35.80% secondary education and 29.20% tertiary education which correspond to an average of approximately 11 years of schooling. Awareness of NIFOR's technological innovations was observed in 57.20% of the respondents and was significantly influenced by some of the respondents' socioeconomic characteristics. Key constraints to the utilization of NIFOR technologies as indicated by likert scale ratings, include; inadequate finance, high transportation cost, limited information on NIFOR innovation, lack of government intervention/subsidy, high cost of NIFOR innovations and limited contacts with extension agents. It was suggested that NIFOR, ADP and other agencies should strengthen extension services through targeted awareness campaigns on improved planting and processing materials available at NIFOR. Additionally, government should subsidize agricultural innovations such as planting and processing equipment while policy makers and financial institutions should promote inclusive agricultural financing by expanding access to low-interest loans with flexible repayment plans to enable the oil palm producers conveniently pay for improved planting and processing equipment.*

KEYWORDS: *Determinants, Oil palm producers, Awareness, Innovations, Utilization, and NIFOR.*

Introduction

Agriculture has played a substantive role in the nation's gross domestic product generation, averaging around 24% over a seven year period between 2019 & 2023 (NBS, 2024). Nigeria (1,500,000 MT), currently produces more palm oil than any other African country and ranks number five in the world after Indonesia (46,500,000 MT), Malaysia (19,300,000 MT), Thailand (3,700,000 MT) and Colombia (1,900,000 MT) who are ranked first, second, third and fourth respectively (USDA, 2024). The oil palm industry supplies palm oil and palm kernel oil for both household and industrial uses and also supplies non-edible products including biodiesel (Abdul-Qadir and Abu, 2021). The industry provides income, employment and raw materials for other industries (Ojemade *et al,* 2020).

In achieving its mandate and by extension, finding solution to the unemployment situation in the country, the Nigerian Institute for Oil Palm Research, (NIFOR) has developed cutting-edge technologies that when utilized by the farmers, will create employment, increase income and also improve their general wellbeing (Abdul-Qadir and Abu, 2021)

Established in 1939, NIFOR is currently under the aegis of the Federal Ministry of Agriculture and Food Security (FMAFS) with a mandate to conduct research into the production and products of the Oil palm, Coconuts, Raphia, Shea, Jojoba as well as Date palm, while ensuring the effective transfer of its research outputs to farming households in order to enhance their productivity and living standards.

The Institute has developed numerous cutting-edge research technologies including the Extension Works Seeds (EWS) and the Plantation Establishment Technology (PET), amongst other technologies. The Plantation Establishment Technology (PET) is an important technology in plantation establishment that minimizes losses and plantation abandonment. The NIFOR *Tenera* hybrid seed technology can create employment opportunities for a large number of people in the oil palm value chain when commercialized. This hybrid popularly known as Extension Work Seeds (EWS), is the starting point of the oil palm value chain. Within the value chain, there are other value addition technologies developed by NIFOR, some of which includes; oil palm seedlings/ seedlets production, modern agronomic method of plantation establishment and Small Scale Processing Equipments (SSPE) (NIFOR, 2006). The *Tenera* hybrid or Extension Work Seeds (EWS) released by NIFOR to farmers, has the potential of producing up to 18-25Metric Tones of Fresh Fruit Bunches per hectare per year under good plantation management as against 1-3Metric Tones of Fresh Fruit Bunches/ha/year in the wild or unimproved variety (Okiy *et al.,* 2006).

The Institute also manufactures SSPE for sale to oil palm farmers and processors for milling efficiency and improved extraction rate. The NIFOR SSPE are of three types; (a) NIFOR large; whose capacity is 0.5-1.0 tone FFB/hour and capable of processing FFB from 50-100ha plantation; (b) NIFOR Medium: with a capacity of 0.25-0.50 tone FFB/hr designed for farmers with oil palm holdings of between 20-50ha and; (c) NIFOR Mini, which caters for farmers with less than 20 ha and it is appropriate for cottage palm oil production. Both the NIFOR mini and NIFOR medium are miniature SSPE with slight modification in design. The major difference between the two is that while the latter is automated, the former is fully manual. (NIFOR, 2006)

Although agricultural research innovations have the potential to improve oil palm productivity and sustainability, many oil palm producers in South-South Nigeria may be lacking awareness of these innovations which could hinder their ability to optimize yields, reduce costs and enhance livelihoods. Low awareness rate among the oil palm producers could limit use or adoption of a technology and also significantly impact on the yields and income of the farmers. Research has shown that farmers who have better access to information, training opportunities and institutional support, are more likely to adopt modern oil palm innovations than those who lack such privileges (Tey *et al.,* 2015). Research innovations in the oil palm industry have contributed significantly to improving productivity and sustainability. However, certain barriers can limit their use or adoption. Nonetheless, identifying and addressing these barriers remains critical. (Murphy *et al.,* 2021)

In view of the foregoing, the study specifically: (i) profiled the socio-economic characteristics of the oil palm producers in South-South, Nigeria, (ii) examined the oil palm producers awareness of NIFOR developed innovations (iii) examined the key factors influencing the oil palm producers awareness of NIFOR developed technologies (iv) identified the constraints faced by the farmers in utilizing NIFOR developed technologies

It is hoped that the information derived from this study will be useful to policy makers in making policies aimed at creating awareness and enhancing the use of NIFOR developed technologies among oil palm producers

Research Methodology

Study Area

The research was conducted in South-South Nigeria. The Atlantic Ocean borders the region on the south and Cameroon on the east. The South- South States occupy 85,303 Square Kilometers of land and are made up of six States that include Akwa Ibom, Bayelsa, Cross River, Delta, Edo and Rivers.

The area lies between latitudes 4°45' and 6°2' North of the equator and longitudes 5°1' and 7°2' east of the Greenwich meridian (Tawan, 2006).

Sampling Technique

The researcher worked very closely with the Oil palm Growers Association of Nigeria (OPGAN) in each of the States, which provided the sampling frame of registered oil palm farmers in Edo (1,713), Delta (1,628), and Akwa-Ibom States (1,707) as at the time of this research. A multistage sampling technique was used at 95% confidence level from the oil palm producers' population of 5,048 to get the number of respondents that served as the sample size for the study using the following formula.

$$\text{n} = \frac{N}{1 + N * (e)^2}$$

Where:
n = sample size,
N = size of target population,
e = limit of tolerable error (level of significance = 0.05) and
1 = constant.

$$n = \frac{5{,}048}{1 + 5{,}048 \ * \ (0.05)^2}$$

n = 370.6 = 371

Data Collection

A multistage sampling technique was used for sampling. Data on socio-economic profile, awareness rate and constraints to the utilization of NIFOR developed technologies were obtained using a set of questionnaire structured in line with the specific objectives of this research. The researcher also engaged the services of the States' Agricultural Development Programme (ADPs) for trained resident enumerators that assisted in the administration of the questionnaire in the States selected.

In the first stage of sampling, three States were purposively selected from the six States in the South-south geopolitical zone of Nigeria for logistical reasons. They include Edo, Akwa-Ibom and Delta States. The second stage involved a purposive selection of all three agro-ecological zones per State, making it nine zones in all. The purposive selection of all three zones across the States was because the crop is cultivated across all the agro-ecological zones. The third stage involved a random selection of two local government areas across each of the agro-ecological zones of the three selected States which brought the LGAs selected to six per State and 18 in all across all three States.

Stage four involved a random selection of two towns/communities from each of the six selected LGAs per State bringing the total number to 12 towns/communities selected per State, and 36 towns/communities across all three States. The last stage was the selection of 371 respondents proportionately, based on the population or concentration of the oil palm farmers in each of the States with 124 oil palm farmers selected in Edo{ Ozalla(10), Uhonmora(10), Ikpeshi(10), Igarra(10) , Uromi(10), Eguare(10) , Irrua(10), Ewu(10), Isiuwa(14), Okada(10), Ehor (10) and Eguomhe(10)}; 116 in Delta{ Agbor (10), Isele-uku(10), Onicha-ugbo(10), Ozoro(10), Otor-owhe(9), Akugbene(9), Asaba(10) ,Okoloba(9), Ugheli(10), Agbarho(10), Otumara(10) Edjeba(9), and 120 in Akwa-Ibom{Afaha Ibesit(10), Ikot Edet(10), Ekpone Ibia(10), Nung Ita(10), Abak(10), Afaha Obong(10) , Ikot-Ekpene(10), Ikot- Obio Nso(10), Obot Inwang(10), Amamong(10), Oron town (10) and Akai Uko(10). However, 11 out of the 371 questionnaire retrieved were not useful, hence, 360 was the sample size for the study.

Data Analysis

Descriptive and inferential statistics were used for this study and they include means, percentages, standard probit regression and ratings from a 5-point likert scale. For the 5-point likert scale ratings, the corresponding values for the categories were 5, 4, 3, 2 & 1 (for very serious, serious, not serious, moderately serious and not a problem respectively). The mean score was calculated as follows: $\frac{5+4+3+2+1}{5}$ = 3. This served as the cut-off point. Based on this, any score below 3 (MS< 3) was taken as a weak factor and was not considered serious while those with mean score of 3 and above (MS ≥ 3) were taken as strong factors and considered serious.

Model Specification

The standard (binary) probit regression model specification for analyzing factors influencing awareness is given below, taking a binary value of 1 = aware, 0 = not aware. The model is specified as:

$$P(Y_i=1) = \Phi(B_0+B_1Z_1+B_2Z_2+B_3Z_3+B_4Z_4+B_5Z_5+B_6Z_6+B_7Z_7+B_8Z_8+B_9Z_9)$$

Where:
Y_i = 1 if respondent i, is aware, or 0 if otherwise
Φ is the cumulative distributive function of the standard normal distribution
Z_i is a vector of independent variables
B_i is a vector of coefficients to be estimated
Z_1 = Age of respondent (years)
Z_2 = Gender (1 if male, 0 if female)
Z_3 = Household Size (Number of people in the household)
Z_4 = Education (number of years spent in school)
Z_5 = Credit access (₦)

Z_6 = Farm Size (in hectares)
Z_7 = Extension visits (Number of extension visits in the past year)
Z_8 = Ln off-farm income (₦)
Z_9 = Cooperative Membership (1, if member of a cooperative, 0, if otherwise)

Results and Discussions

Socio-Economic Characteristics of the Respondents

The socio-economic characteristics were ascertained and presented in Table 1. The results showed that the mean age of the oil palm farmers was 59years. This implies that the farmers were still within the productive age of farm production and could still be productive within the next one and a half decade with availability of the requisite farm inputs and other interventions. This result agrees with the findings of Omonfonwan, *et al.,* (2021) who found that oil palm producers in Edo and Delta States of Nigeria, had an average age above 50 years (53yrs). The result on gender showed that men (97.50%) and women (2.50%) were actively involved in oil palm production but the percentage of men was higher. This agrees with the findings of Awotide *et al.,* (2015) who found that male-headed households dominates agricultural production in Nigeria

Table 1: Distribution of Respondents According to Socioeconomic Characteristics

Response option	Frequency	Percentage	Mean
Age of Farmers			
41-50	54	15.00	59
51-60	146	40.60	
61-70	116	32.20	
71-80 Years	44	12.20	
Gender			
Male	351	97.50	
Female	9	2.50	
Marital Status			
Single			
Married	351	97.50	
Divorced	0	0.00	
Widowed	9	2.50	
Educational Level			
No formal Education	0	0.00	11.1
Primary education	126	35.00	
Secondary Education	129	35.80	
Tertiary Education	105	29.20	
Farming Experience			
11-20 years	180	50.00	20.13
21-30 years	176	48.90	
31-40 years	4	1.10	

Household Size			
1-5	192	53.33	6.33
6-10	160	44.44	
11-14	8	2.22	
Farm Size			
1-5 ha	0	0.00	12.7
6-10 ha	120	33.30	
11-15 ha	240	66.7	
Extension Visit			
None per month	178	49.4	1.33
Once per month	7	1.9	
Twice per month	98	27.2	
Three times and above	77	21.4	
Cooperative Membership			
Yes	171	47.5	
No	189	52.5	
Credit Access			
Yes	170	47.20	
No	190	52.80	
Off-Farm Income (₦) Per Annum			
101,000-200,000 P/A	23	6.39	329,400
201,000-300,000 P/A	26	7.22	
301,000-400,000 P/A	294	81.67	
401,000-500,000 P/A	17	4.72	
Total	**360**	**100.00**	

Source: Field survey, 2025

The result on marital status showed that 97.50% were married, while 2.50% were widowed, implying that married people were more. From the result, it can be said that the oil palm producers will most likely handle their farm businesses with a high level of commitment due to household demand.

On educational level, the mean number of years of schooling by the oil palm producers was approximately 11years. This suggests that there were more educated people engaged in oil palm production in the study areas. This agrees with Okere *et al.*, (2024) who found out that a greater proportion (66.7%) of oil palm processors in Agbor, Delta State, Nigeria, had formal education. With this high level of education, there is the tendency that the respondents will understand the need to embrace new innovations if they are aware of its existence.

The distribution of respondents according to farming experience suggests that average number of years of farming was 20 years. Farm experiences acquired over time could have an impact in embracing or adopting new farming methods.

The result on farm size indicates that majority (66.70%) of the farmers had farm holdings of between 11-15 hectares, while 33.30% had a farm size of between 6-10ha. Farm holding of a farmer refers to the piece of land cultivated by the farmer. It is often assumed that farmers who own large farms are richer and are very quick in taking risks of adopting new farming technologies as well as have better access to information on improved farming techniques than farmers with lesser acreages of farmland (Adakaren *et al.*, 2018).

Result on extension visits showed that the average number of extension contact was about once per year. The more extension contacts farmers have, the higher their chances of being aware of new agricultural innovations

On cooperative membership, majority of the respondents (52. 50%) were not members while 47.20% were members. It is expected that social participation could facilitate a farmer's awareness and willingness to use agricultural research innovations. Cooperative membership as reported by Umunna *et al*., (2012) plays a vital role in accessing information as it relates to agriculture.

Majority (52.80%) had no access to credit from either government or private credit agencies while 42.20% of them had access. Lack of credit access by farmers may hinder the use of modern farm method which is capable of increasing agricultural yields and according to Freeman *et al*, (1998), when farmers are able to access credit, it can help them operate optimally, given fixed resources such as land.

Result**s** on off-farm income showed that the average off-farm income was ₦329,400 per annum, an indication shows that respondents had other source of income aside income generated from farming.

Awareness rate of NIFOR Developed Technologies

Table 2 presents farmers' rate of awareness about NIFOR developed research innovations which includes the NIFOR Extension Works Seeds (EWS), and the Small Scale Processing Equipments (SSPE). Farmers' awareness rate is important for both the farmers and the agricultural sector as a whole. When a great portion of farmers are well-informed about the latest innovations and technologies, they can make informed decisions about adoption which can improve food security and their overall welfare. Results on the rate of awareness shows that 57.20% were aware of NIFOR developed technologies, while 42.80%were not aware.

This agrees with Mbamalu (2019) whose findings showed that knowledge and awareness of renewable energy and its characteristics were high in Lagos and Ogun states, but disagrees with the

findings of Kendall *et al.,* (2017) who observed low awareness of farmers and adoption of precision agriculture on family farms in China

Table 2: Awareness rate of NIFOR Developed Technologies

Category	Frequency	Percentage (%)
I am aware of NIFOR developed EWS and SSPE	206	57.20
I am not aware of NIFOR EWS and SSPE	154	42.80
Total	360	100.00

Source: Field survey, 2024

Factors influencing farmers awareness of NIFOR developed Technologies

Table 3 presents the standard probit analysis of factors influencing farmers' awareness of NIFOR developed technologies. Four variables significantly influenced the oil palm farmers' awareness of NIFOR developed technologies. The empirical results from the analysis revealed that the coefficients of household size, farm size, extension visits and cooperative membership were statistically significant.

Table 3: Probit Estimates for Factors Influencing Awareness of NIFOR Developed Technologies Among the Oil Palm Farmers

Variables	Coefficients	t-values	Marginal Effects
(Intercepts)	-12.115	6.067	-1.359
Age	0.007	0.016	0.001
Gender	0.253	1.302	0.028
Household size	0.506*	0.275	**0.057***
Education	0.036	0.038	0.004
Farm size	**0.149****	0.060	**0.017****
Extension visit	**2.006*****	0.481	**0.225*****
Ln off farm income	0.440	0.400	0.049
Cooperative membership	**1.102****	0.495	**0.124****
Observations Pseudo R2	360 0.6986389		
Log Likelihood	-74.064		
Akaike Information Crit.	166.128		

Source: Field survey, 2024 *significant at 10% **significant at 5%, ***significant at 1%

The coefficient of household size (0.506), P=0.1, indicates a positive and significant relationship between household size and farmers' awareness. The marginal effect of 0.057 indicates that household size increases the probability of a farmer being aware of NIFOR developed technologies by 5.7% holding other factors constant. This is an indication that larger household sizes are associated with increased awareness of agricultural research innovations as members of a large household may have more opportunities for exposure to information about modern farming technologies because the larger the household size, the higher the chances of at least one or two members of the households, having access to the information.

The coefficient of farm size (0.149), P=0.05, indicates a positive and significant relationship between farm size and farmers' awareness about NIFOR developed technologies at 5% probability level. The marginal effect of farm size (0.017) represents the change in probability of a farmer being aware of NIFOR developed technologies when farm size increases by one unit (e.g. one more hectare). Specifically, the marginal effect of 0.017 suggests that a one-unit increase in farm size, increases the probability of an oil palm farmer being aware of NIFOR developed technologies by 1.7% holding other factors constant. This further suggests that larger farm sizes are associated with increased awareness of agricultural research innovations due to the fact that farmers with a large farm size, tend to have more financial resources or flexibility to invest in agricultural innovation compared to farmers with small holdings who may be constrained by finances as a result of reduced farm income. Cameron and Trivedi (2005) emphasized the importance of interpreting marginal effects in probit models to understand the impact of explanatory variables.

The coefficient of extension visits (2.006), P=0.01, showed a positive and significant relationship between awareness and extension visits. This indicates that oil palm producers who had access to extension services where more predisposed to information on research innovation or technologies developed by NIFOR thereby highlighting the crucial role of extension in creating awareness. This is in line with the findings of Oduniyi, Oluwaseun Samuel, Antwi Micheal,(2018) who revealed that extension services had a positive influence on climate change awareness. The marginal effect for extension visit (0.0225) suggests that extension visits increased the probability of awareness of NIFOR developed technologies by 22.5% holding other factors constant. Oparinde, Amos, Aturamu, & Daramola, (2018), also stated that extension education delivered by extension agents boosts farmers' awareness.

The coefficient of cooperative membership (1.102), P=0.05, was positive and significantly related to farmers awareness of NIFOR developed technologies at 5% level of probability which suggests that cooperative membership has a significant and positive impact on farmers awareness. The marginal effect of 0.124 indicates that, membership of a cooperative society, enhances the chances of a farmer being aware of NIFOR developed technologies by 12.4% holding other factors constant. This is indicative of the fact that cooperative membership improves farmers' chances of awareness through access to information, networking opportunities, and capacity building. This finding aligns with that of Rahman *et al.* (2018) who established that an increase in cooperative membership increases awareness of information communication technology.

Constraints in the Use of NIFOR Developed Technologies

Table 4 presents the results on the constraints faced by the oil palm farmers in using NIFOR developed technologies. It showed that inadequate finance, limited access to credit, high interest rates on loans, high transportation cost, limited information on NIFOR innovations, lack of government intervention/subsidy, high cost of NIFOR developed technologies and limited contacts with extension agents were the serious constraints faced by the farmers. Inadequate finance with a mean score of 4.96, was the most serious constraint militating against the oil palm farmers in adopting or using NIFOR developed technological innovations in the study area

Table 4: Constraints Faced by the Respondents in the Use of NIFOR Developed Technologies

Variables	Mean
Inadequate finance	4.96*
Limited access to credit	4.50*
High interest rates on loans	4.90*
Uncertainty about return on investment	2.44
Lack of technical know-how or skills	2.43
Limited access to maintenance or repairs services	2.07
High transportation cost	4.92*
Limited information on NIFOR innovation	3.21*
Risk aversion or skepticism	2.46
Seasonality in business	2.87
Price fluctuation	2.96
Insecurity	2.49
Lack of government intervention/ subsidy	4.93*
Limited access to Extension Agents	3.55*
High cost NIFOR research innovations	3.51*

Source: Field survey, 2024 (*Serious; mean score = 3.00)

On the other hand, uncertainty about returns on investment, lack of technical know-how, risk aversion, seasonality in business, price fluctuation and insecurity, had the least ratings with means scores of 2.44, 2.43, 2.07, 2.46, 2.87, 2.96, and 2.49 respectively and therefore not serious constraints.

Conclusion

The study examined the determinants of awareness and utilization of NIFOR developed technologies. Findings on awareness indicate that only a slight majority of the respondents (57.20%) had knowledge of NIFOR's technological innovations on oil palm. The study also revealed that household size, farm size, extension visits, and cooperative membership, significantly influenced the farmers' awareness, while inadequate finance, limited access to credit, high interest rates on loans, high transportation cost, limited information on NIFOR innovations, lack of government intervention/subsidy, high cost

of NIFOR developed technologies and limited contacts with extension agents were the serious constraints faced by the oil palm farmers in the use of NIFOR developed technologies in the study area.

Recommendations

1. For more oil palm farmers to be aware of NIFOR's developed technologies, the ministry of agriculture and food security, ADP and other relevant agencies of government saddled with the responsibility of creating awareness of improved agricultural innovations, should embark on an aggressive awareness campaigns on the availability of improved planting and processing materials developed by NIFOR, for farmers to adopt same, as a means of improving their livelihoods. Also, on its part, NIFOR should aggressively create awareness about its research technologies in other to effectively market them to the oil palm producers.
2. Extension visits was found to have significantly influenced farmers awareness of NIFOR agricultural innovation at 1% probability level. The government should therefore deploy adequate extension officers in other to scale up extension visits to ensure prompt information dissemination through regular contacts with the farmers.
3. Cooperative membership also significantly influenced farmers' awareness. Therefore, it should be promoted. This will enhance the oil palm farmers access to current information on agricultural research innovation through networking or knowledge sharing.
4. Policy makers and financial institutions can work to improve access to credit for the oil palm farmers to increase their ability to afford agricultural research innovations. This could be done by establishing credit facilities with favorable interest rates and repayment terms.
5. The Government at the State and federal levels should also subsidize the cost of acquiring agricultural research innovations (improved planting materials, processing equipments, etc) at affordable rates as this will encourage more oil palm farmers to use the developed technologies which is crucial for food security and their overall wellbeing.

References

Abdul-Qadir,M.I & Abu, R.A (2021). Promotion of tenera hybrid seed technology in oil palm value chain. *Nigerian Journal of Palms & Oil Seeds. 19*, 69-7

Adakaren, B., Abu, R.A. & Osemwegie, Q.E. (2018). The role of date palm in the livelihood of farmers in Jigawa State, Nigeria. *Proceedings of the 52nd annual conference of Agricultural Society of Nigeria (ASN) Abuja.* 22-26 October, 2018. 1132-1139

Awotide, B. A., Abdoulaye, T., Alene, A., & Manyong, V. M. (2015). Impact of access to credit on agricultural productivity : evidence from smallholder cassava farmers in Nigeria. *Proceedings of the International Conference of Agricultural Economists*, August 9-14. 1-32

Cameron, A. C., & Trivedi, P. K. (2005). *Microeconometrics: Methods and applications*. Cambridge University Press.

Freeman, J. M., Vining, E. P., Pillas, D. J., Pyzik, P. L., Casey, J. C., & Kelly, L.A.M.T. (1998). The efficacy of the ketogenic diet—1998: a prospective evaluation of intervention in 150 children. *Pediatrics*, *102(*6), 1358-1363.

Kendall, H., Naughton, P., Clark, B., Taylor, J., Li, Z., Zhao, C., & Frewer, L. J. (2017). Precision agriculture in China: exploring awareness, understanding, attitudes and perceptions of agricultural experts and end-users in China. *Advances in Animal Biosciences*, *8*(2), 703-707

Mbamalu, M. (2019). Awareness and adoption of renewable energy in Nigeria: the case of Lagos and Ogun residents. *Covenant Journal of Communication. 6(1)22-46*

Murphy, D.J.,Goggin, K., & Paterson, R.R.M.(2021). Oil palm in the 2020s and beyond: challenges and solutions. Agriculture and Bioscience, 2(39), 1-22.

National Bureau of Statistics (2024). Unemployment rate in Nigeria. Available online at www.nigerianstat.gov.ng. Accessed on the 4th of March, 2025

Nigerian Institute For Oil Palm Research (2006). NIFOR Services, mandate, mission statement and annual report. Available online at www.nifor.org.ng. Accessed on the 4th of January, 2025.

Oduniyi, O.S., & Antwi-Micheal, B.N. (2018). Determinants of climate change awareness amongrural farming households in South Africa. *Journal of Economics and Behavioral Studies*, *10*(5), 116-124.

Okere, R.A., Apeh, C.C., Oghogho, I.A & Bankole, A.S. (2024). Willingness to pay for POME modern treatment technologies for environmental sustainability by small holder oil palm farmers in Agbor, Delta State, Nigeria. *Journal of Agriculture, Environmental Resources and Management. Vol.6(1)1-400pp 150-158*.

Omofonmwan, E.I., Adewuyi, S.A & Erumwenbibi, B.O (2021). Socioeconomic profile and livelihood strategies of small scale farmers in oil palm production in Edo and Delta States. *proceedings of the In-house research review & seed meeting held at the Nigeria Institute For Oil Palm Research (NIFOR)*, July, 2021. pp101-104

Ojemade, A.C., Osuafor, O.O. & Offiah, E.O. (2020). The Role of the Agricultural Economist in agricultural adaptation to climate change in the oil palm industry in the Southern Nigeria. *Journal of Agriculture and Sustainability, 13*(7), 1-16.

Okiy, D.A., Nwawe, C.N. & Ikheloa, M., (2006). The oil palm and the Nigerian economy. *A paperpresented at 40th annual conference of the agricultural society of Nigeria (ASN),* held atNational Root Crops Research Institute, Umudike, Abia State, Nigeria

Oparinde, L., Amos, T., Aturamu, O., & Daramola, A. (2018). Attitudes towards risk and risk combating strategies among maize and cassava farmers in Southwest, Nigeria. *Journal of Economics, Management and Trade*, *21*(7), 1-12.

Rahman, M. H., Uddin, M. N., & Khan, M. S. (2018). Factors influencing farmers' knowledge on information and communication technology in receiving agricultural information in Bangladesh. *Bangladesh Journal of Extension Education,* 39-51

Tawan, C.C. (2006), Effectiveness of Agricultural Agencies in Fisheries Management and Production in the Niger Delta. (Unpublished Doctorial Dissertation). Rivers State University of Science and Technology (RSUST) Port Harcourt, Nigeria. P 180.

Tey, Y.S., Brindal, M.,Darham, S., Sidique, S.F.,& Djama, M. (2015). Information networks that generate economic value : A study of adopters of new and improved technologies among oil palm growers. Agricultural Systems, 135, 122-132.

Umunna, M. O., Adeeko, A., Onifade, O. T., Adigun, O. S., & Apapa, A. N. (2012). Poultry farmers' access to extension services in Atisbo Local Government Area of Oyo State, Nigeria. *African Journal of Basic & Applied Sciences*, *4*(6), 221-225

United States Department of Agriculture (2024). Agriculture/Palm oil /production. Available online at www.indexmundi.com Accessed on the 13th of April, 2025