MAUN J AGR NAT (2025) 5(1): 1-13
DOI: 10.59359/maujan.1251422
e-ISSN: 2822-3500

dergipark.org.tr/en/pub/maujan
maujan@alparslan.edu.tr
maujan.alparslan.edu.tr

MUŞ ALPARSLAN ÜNİVERSİTESİ
TARIM VE DOĞA DERGİSİ

MUŞ ALPARSLAN UNIVERSITY
JOURNAL OF AGRICULTURE AND NATURE

Analysis of farm households' Savings: a case of small-scale tomato farmers in Akwa Ibom State, southern region of Nigeria

Sunday B. Akpan[1*], Glory E. Edet[2], Ernest E. Charlie[3]

[1] Akwa Ibom State University, Faculty of Agriculture, Department of Agricultural Economics, Mkpat-Enin, Nigeria
[2] University OF Uyo, Faculty of Agriculture, Department of Agricultural Economics, Uyo, Nigeria
[3] Akwa Ibom State University, Faculty of Agriculture, Department of Agricultural Economics, Mkpat-Enin, Nigeria
*Correspondence: sundayakpan@aksu.edu.ng

Please cite this paper as follows:
Akpan, S.B., Edet, G.E., Charlie, E.E. (2025). Analysis of farm households' Savings: a case of small-scale tomato farmers in Akwa Ibom State, southern region of Nigeria. *Muş Alparslan Üniversitesi Tarım ve Doğa Dergisi*, 5(1), 1-13. https://doi.org/10.59359/maujan.1251422

Research Article

Article History
Received: 02.06.2024
Accepted: 25.03.2025

Keywords:
Capacity to save,
Decision to save,
Household savings,
Nigeria,
Tomato farmers,

ABSTRACT

The study analyzed decision to save and saving capacity of small-scale tomato farmers in Akwa Ibom State in the Southern Region of Nigeria. One hundred and twenty tomato farmers were randomly selected using multistage sampling technique. A well designed structured questionnaire was used to obtain the required data. The Heckman two-step selection method was used to analyze the data. The result of the first step estimation (Probit estimates) showed that age (18-35 years), marital status, family size and family dependent ratio were significant negative determinants of the probability to save among tomato farmers; whereas adult farmers (> 35 years), membership in social organization, farming experience, owned farm land, farm income, non-farm income, farmers' sex and years of formal education were positive determinants. Also, the result of the second step estimation indicated that a youthful age (18-35 years), marital status, family size and dependent ratio were significant negative determinants of savings capacity of the tomato farmers, while adult age (>35 years), farming experience, membership in a social organization, owned farm land, non-farm income, farm income, farmers' years of education were positive determinants To enhance the likelihood of saving and the saving capacity among tomato farmers in the region, it is recommended to promote formal education, encourage the formation of social groups, facilitate land ownership, and support the development of diversified income sources for the farmers.

1. Introduction

In Nigeria, similar to other countries in sub-Saharan Africa, the majority of rural farmers are resource-poor (Sadiq et al., 2023; Akpan et al., 2023a; Yahya and Ogunyemi 2024). Agricultural productivity is low in the country when compared to some countries in the northern and southern regions of Africa (Asfaw 2021, Akpan et al., 2022). The agricultural sector's low productivity has been a persistent issue, which many researchers attribute to poor financial sector and credit mismanagement from the formal sector of the economy (Mu'azu and Lawal 2017, Fowowe, 2020, Adewale et al., 2022, Akpan et al., 2023b, Akpan et al., 2024a). Most rural farmers lack the capacity to fulfil the credit requirements available in the formal sector (Akpan et al., 2020 and Adewale et al., 2022). Consequently, these farmers heavily rely on informal credit sources to enhance their farm production. However, the

shortcomings and inefficiencies of the informal system have compelled farmers to turn to the most accessible and reliable alternative, which is saving their plough back profits from previous farming seasons. Given the challenging credit environment in Nigeria (Ubon et al., 2016, Umoren et al., 2016a, Umoren et al., 2016b, Umoren et al., 2018, and Umoren and Akpan 2021), it is evident that cultivating a culture of farm income savings is crucial for ensuring sustainable agricultural production both now and in the future.

Savings mobilization refers to the portion of household disposal income that is not allocated towards household consumption. It plays a crucial role in the economic development of developing nations, as it significantly influences the circular flow of income within the economy. According to Wieliczko et al. (2020), Strzelecka and Zawadzka (2023), and Aidoo-Mensah (2023), savings serve as a vital means to enhance the well-being of farmers, providing them with insurance against unforeseen disasters or risks, and offering a buffer to navigate through times of crisis. The maintenance of household savings enhances the potential for future investments at both the micro and macro levels of the economy.

The significance of saving within farming households in developing countries, particularly Nigeria, is evident. Various challenges such as banditry, terrorism, kidnapping, and conflicts between herdsmen and farmers have become prevalent in the agricultural landscape of the country (Udemezue & Kanu 2019, Bello and Abdullahi 2021, Adisa et al., 2022). These detrimental activities inculcate fear, amplify uncertainties, and contribute to risky situations in agricultural production. Unfortunately, government intervention programs that occasionally offer financial assistance to farmers are scarce and often subject to political influences and lacking a sustainable plan. To mitigate the impact of these adversities and ensure the continuity of farming operations, farmers must prioritize saving. Another factor that underscores the necessity of saving among Nigerian farmers is the volatility of input and output prices. The country currently experiences an unstable inflation rate and exchange rate (Central Bank of Nigeria (CBN), 2024). In many instances, farmers must save in order to offset any shortfall in their farm incomes and manage unexpected expenses. By building a savings buffer, farmers can safeguard their livelihoods and maintain a level of financial stability amidst the uncertainties of the agricultural sector.

The significance of savings within farming households can be examined from various perspectives, all of which contribute to the sustainability of the agricultural sector in the country. One such perspective is the critical role that household savings play in assessing the creditworthiness of rural farm households. Drawing from the principles of classical economists, saving is a significant factor in determining economic growth. The mobilization of savings is a crucial element in stimulating domestic investment. Research conducted by Lidi et al. (2017) and Wieliczko et al. (2020) indicates that farming households with higher savings rates are more likely to accumulate farm assets, embrace innovative practices, and demonstrate resilience. The accumulation of farm assets serves as a solution for expanding farms or achieving economies of scale, ultimately facilitating the transition from subsistence farming to commercial agricultural enterprises. Additionally, farm household savings provide a safety net for precautionary purposes and enable access to social services, among other benefits.

Despite the multifaceted importance of savings for farmers' well-being and the economy, it is evident that small-scale farmers in Nigeria face challenges in mobilizing savings (Adebayo et al., 2010, Akpan et al., 2011, Obalola et al., 2018, Isiorhovoja et al., 2020, Lawal et al., 2021). This results in low real income, high consumption expenditure, and limited development opportunities for these farmers (Wieliczko et al., 2020). In the specific context of tomato *(Lycopersicom esculentum)* production in southern Nigeria, savings mobilization is crucial for enhancing welfare, smoothing consumption patterns, and enabling the acquisition of depreciable and non-depreciable assets.

Tomato, a highly popular and widely consumed vegetable in Nigeria, holds a significant position in the daily vegetable consumption of Nigerians. Its consumption is diverse, and it offers various medicinal benefits due to its rich content of vitamins, minerals, fiber, antioxidants, and beta-carotene. The cultivation of tomatoes is predominantly carried out by small-scale farmers in the southern region of the country. Tomato production is an emerging agro-enterprise that has attracted young farmers and it also one of the preferred components in most of the youth intervention programmes in the region. The success and sustainability of this agricultural enterprise depend, in part, on the extent of savings mobilization among farmers. However, the mobilization of savings is influenced by multiple factors, including economic conditions, farmers' specific circumstances, and climate conditions. Given that household savings is expected to play a crucial role in ensuring the sustainability of tomato production in the region, it becomes imperative to identify the significant factors that determine savings mobilization among tomato farmers (Amurtiya & Adewuyi 2020; Norbert et al., 2023; Bolarinwa et al., 2024; Raaijmakers et al., 2018, Snoek et al., 2022; Adeosun et al., 2022; Ali et al., 2020, Campestrini et al., 2019).

Several studies have explore the factors that influence saving behaviour among arable crop farmers

in developing countries. Researchers such as Akpan et al. (2011); Lidi et al. (2017); Saliya (2018); and Geta (2020) have utilized various econometric methods to identify key determinants of savings mobilization among farming households in Africa. These determinants include household income, tax obligations, credit usage, farming experience, educational attainment, family size, participation in social groups, age of the household head, household size, proximity to formal financial institutions, employment status of the household head, and dependency ratio of the household. In addition to the factors mentioned earlier, Odoh et al. (2020), Isiorhovoja et al. (2020), Nwosu et al. (2020), Mazengiya et al. (2022), Lusaya and Mulunda (2022), Balcha et al. (2022), and Sisay (2023) have broadened the scope of determinants influencing farming household savings mobilization. These include household farm size, land ownership, marital status of the household head, location of the farm household, access to agricultural extension services, gender of the household head, household annual expenditure, financial literacy, and non-farm income.

The literature examined did not provide adequate details on savings mobilization and its determinants among vegetable farmers in the southern part of Nigeria. Moreover, the limited information available from other crop enterprises in different regions of the country may not be directly applicable to the southern region due to varying climatic conditions, farmers' income levels, poverty rates, and consumer preferences, among other factors. Tomato cultivation, as an emerging agricultural sector among youth farmers, holds significant potential for creating employment opportunities, enhancing food security in the region, and contributing to the achievement of Sustainable Development Goal Number 2 (Akpan and Okon, 2019; Akpan et al., 2024b). Therefore, ensuring the sustainability of tomato production and involving youth in this sector necessitates providing insights into savings mobilization practices among farmers in the area. Based on these considerations, this study was specifically designed to investigate the determinants of decision to save and saving capacity of tomato farmers as well as develop policy recommendations to enhance production sustainability.

2. Material and Methods

Study Area

The study was carried out in the two agricultural zones of Akwa Ibom State, namely: Abak and Ikot Ekpene agricultural zones. Ikot Ekpene Agricultural Zone consist of five (5) local government areas namely: Ini, Obot Akara, Ikot Ekpene, Ikono and Essien Udim. Abak agricultural zone is made up of five local government areas namely; Abak, Etim Ekpo, Ika, Oruk Anam and Ukanafun. The people are predominantly farmers producing food crops and vegetables such as pepper, tomato, cucumber, fluted pumpkin, melon, sweet potatoes among others.

Sampling Techniques and Sample Size

A multistage sampling procedure was adopted in selecting tomato farmers in the study area. A list of registered tomato farmers was obtained from Akwa Ibom State Agricultural Development Programme (AKADEP) office in both agricultural zones selected. In the first stage, Abak and Ikot Ekpene Agricultural Zones were purposively selected from the existing six Agricultural Zones due to their prominence as primary hubs for commercial tomato cultivation within the State. In the second stage, a sample frame of one hundred and seventy three tomato (173) farmers from the two zones were obtained from the list of registered tomato farmers. In the next stage, the representative sample size (Sn) was obtained using the formula developed by Yamane, (1967) as thus:

$$S_n = \frac{N}{1 + N(e^2)} = \frac{173}{1 + 173(0.05^2)} = 120 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where; Sn = representative sample size; N = sample frame; e = absolute error at 5% probability level of type 1 error

Hence, a total of one hundred and twenty (120) registered tomato farmers were needed for the study. The third stage involved a random selection of one hundred and twenty (120) tomato farmers from the merge list using a ballot system. In the final stage, the selected tomato farmers were contacted and interviewed to obtain the necessary data for the study.

Data source

The data for this study were collected through the use of a well-designed structured questionnaire. A cross sectional data were collected from the small-scale tomato farmers. The data collected includes; social and economic data, farm specific and production data.

The conceptual framework

The conceptual framework of the study was based on the concept of the Keynesian saving function. The concept relates savings to disposal income and consumption. This relationship postulates that individual will save if the disposal income exceed consumption expenditure. Implicitly, the relationship can be expressed as thus:

$$S = Y_d - C \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

$$S = f(Y_d, C) \ldots\ldots\ldots\ldots\ldots (3)$$

Incorporating the consumption function into equation 2 produces Keynesian explicit saving function as thus:

$$S = Y_d - (\alpha + \beta Y_d) \ldots\ldots\ldots\ldots\ldots (4)$$

$$S = -\alpha - (1-\beta)Y_d \ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Hence, the Keynesian saving function signifies a relationship between the disposable income of a household and savings. This function show the amount of saving a household will save when the disposal income increases. The coefficient α represents savings at zero income, while β is the marginal propensity to consume. Nonetheless, household saving decisions in reality is influenced by several factors aside the disposal income and consumption expenditures. The Keynesian saving function serves as a foundational framework from which a more intricate saving function can be developed. Essentially, a saving function illustrates how household savings respond to variations in influencing factors. In accordance with this principle, equation 5 was revised as:

$$S = -\alpha - (1-\beta)Y_d + \delta Z_i \ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Where δ is a parameter of other factor Z that affect savings. Hence the saving function can be expanded to accumulate other necessary variables.

Analytical technique

The study used two-step Heckman model (Heckman, 1979) to analyze the objective of the study. The model is basically designed to detect, correct, and expunge the sample selection bias problem. Since the tomato farmers were selected from the list of registered tomato farmers in the study area within a period, then there are possibilities that other non-registered tomato farmers were omitted resulting to a possible sample bias. Sample selection bias occurs when the representative sample does not confers the true characteristics of the population resulting in unfair or bias estimates. Hence, the model provides a means of correcting for non-randomly selected samples. The Heckman model is based on the assumptions that, the error terms of the selection and the main or outcome equations are correlated and the first stage decision dominates the second one. Also, the model assumes that both explanatory variables in both equations are independent or uncorrelated with the error terms.

In the first step, a probit model or selection equation is estimated (using maximum likelihood estimation method) to predict the probability of savings among tomato farmers. A vector of inverse Mills ratios (estimated expected error) is jointly generated from the estimated parameters (Greene, 2000). The probability of saving among tomato farmers is given in equation 7:

$$Q_i^* = X_{1i}'\beta_1 + U_i, \qquad U_i \sim N(0,1) \ldots\ldots\ldots\ldots (7)$$

where Q_i^* *is* 1, *when a farmer chooses to save and* 0, *otherwise*

Note, Q_i^* *is* the latent discrete savings choice variable that denotes binary censoring, X_{1i}' is a vector of explanatory variables hypothesized to influence the probability of savings among tomato farmers and β_i is a vector of parameters. U_i is the standard error term. The variable Q_i^* is observed and is equal to unity when a farmer chooses to save and is unobserved or zero when a farmer chooses otherwise.

In the second step, the Inverse Mill Ratio (IMR) (i.e. λ, lamda) generated in the first step is incorporated in a saving capacity function and estimated using the Ordinary Least Squares (OLS) estimation method. The model is specified as thus;

$$SAV_i = \alpha_0 + X_i\theta_i + \delta_i\lambda_i + V_i \qquad V_i \sim N(0,1) \ldots (8)$$

Where: SAV_i amount of money a tomato farmer saved in a planting season, X_i are the explanatory variables, θ_i is unknown parameters to be estimated, δ_i is the coefficient of the inverse mill ratio. Greene (2000), asserted that the IMR term corrects the problem of sample selection bias. If the term (δ_i) is not statistically significant, then sample selection bias is not a problem (Heckman, 1979). The statistically significant value of δ_i means that significant correlation exists between the farmer's decision to save and saving capacity of tomato farmers in the region. V_i is the error term. Assuming the error terms in (7) and (8) are correlated and have a bivariate normal distribution, it can be written as thus:

$$\begin{pmatrix} U_i \\ V_i \end{pmatrix} \sim N\left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & \rho\delta \\ \rho\delta & \delta^2 \end{pmatrix}\right] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

Since the occurrence of the second step depends on the outcome of the first step, (i.e. the actual amount save by a tomato farmer depends on the farmer's decision or choice to save), hence this dependency relationship can be expressed as shown in equation 10.

$$\rho = \frac{Cov(V_i, U_i)}{\sqrt{Var(V_i)\,Var(U_i)}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

Note, If ρ = 0, then there is dominancy (the zeros obtained in the first step are only associated to those tomato farmers who do not save and not standard corner solutions). The implication of this is that once the first step is passed, censoring is no longer appropriate, as those tomato farmers who choose to save their income would not report zero farm income. The Heckman two-step selection model with dependent error terms can be estimated by the following log-likelihood function (Flood and Grasjo, 1998; Aristei et al, 2007):

$$LogL = \sum_0 In[1 - \emptyset(X_{1i}'\beta_i)\phi] + \sum In\left[\phi\left(\frac{X_{1i}'\beta_i + \frac{\rho}{\delta}(Q_i - X_{1i}'\beta_i)}{\sqrt{1-\rho^2}}\right)\frac{1}{\delta}\phi\left(\frac{Q_1 - X_{1i}'\beta_i}{\delta}\right)\right] \ldots (11)$$

Explicitly, the empirical model used to estimate the Probit and the savings capacity function is given below;

$$DS_r = SAC = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \beta_{10}X_{10} + \beta_{11}X_{11} + \beta_{12}X_{12} + \beta_{13}X_{13} + \beta_{14}X_{14} + U_i \ldots\ldots\ldots\ldots\ldots\ldots (12)$$

The explanatory variables are described in Table 1.

Table 1: description of explanatory variables

S/n	Variable	Symbol	Unit	Expected sign
1	Decision to save	DS	Dummy; 1= farmers that save	Nil
2	Savings capacity	SAC	Amount of money save/annum (naira)	Nil
3	Age (Adult > 35years)	X_1	Years	–
4	Age (youth 18-35 years)	X_2	Years	+
5	Marital status	X_3	dummy: 1 = marrıed	–
6	Farming experience	X_4	Years	+
7	Socialization	X_5	Years	+
8	Family size	X_6	Number	–
9	Dependent ratio	X_7	-	–
10	Owned farm land	X_8	Dummy; 1=own land	+
11	Farm size	X_9	Hectare	+
12	Non-farm income	X_{10}	Naira/year	+
13	Farm income (total)	X_{11}	Naira/year	+
14	Farmer's sex	X_{12}	Dummy: male =1	+
15	Education (≤ 12 years)	X_{13}	Years	+
16	Education (> 12 years)	X_{14}	Years	+

Source: Prepared by the authors. Note, dependent ratio = Children less than 15 years plus

3. Results and Discussion

Determinants of the decision to save and savings capacity of tomato farmers

The Heckman's two-step method was employed to analyze the factors influencing the decision to save and the savings capacity of small-scale tomato farmers. In the first step, the dependent variable was represented by a binary variable, with a value of one for farmers who chose to save and zero for those who did not. The subsequent step involved estimating the savings capacity function. Additionally, the value of lambda was utilized to address any potential selection bias in the sampling process.

The results of the Heckman two-step selection estimates are presented in Tables 2 and 3. It is important to note that these estimates were simultaneously determined but separated for the purpose of clarity in explanation. Furthermore, the slope coefficients in the selection equation were determined after the two-step estimation (post-estimation). The empirical findings revealed a Wald chi2 (14) value of 22.50, which is statistically significant at a 10% probability level. This suggests that the Heckman two-step selection model estimation is appropriate and exhibits a good fit. The coefficient of lambda (inverse mill ratio) is also statistically significant at a 5% probability level, indicating a relationship between the error terms of the selection and outcome equations. This confirms the presence of sample selection bias during the sampling process. Moreover, these results validate the use of the Heckman two-step selection model, which effectively addresses and eliminates the issue of sample selection bias in the estimation procedures. The statistically significant nature of the lambda coefficient further implies that if the household savings capacity function had been estimated without considering the decision of tomato farmers to save, a sample selection bias would have occurred among tomato farmers in the study area. Additionally, the negative values of lambda and rho indicate a negative relationship between the desire or decision to save and the savings capacity of tomato farmers. In other words, an increased desire to save does not lead to an increase in the savings capacity of tomato farmers in the region. Alternatively, the decision to save is not dependent on an increase in savings capacity.

(a) Determinants of the decision to save (first-step or selection equation)

The estimation of the probit model indicated that the likelihood of saving among tomato farmers in the region is negatively influenced by factors such as youthful age (18-35 years), family size, and family dependent ratio. Therefore, an increase in these variables would result in a decrease in the probability of saving among tomato farmers.

An increase in the age of tomato farmers within the range of 15-35 years is associated with a decrease in the likelihood of saving by 0.0053 units. This indicates that the propensity to save diminishes among young tomato farmers. This outcome may be linked to the high demand for resources among youths and their tendency towards extravagant lifestyles. Additionally, many young farmers may view tomato production as a temporary or transitional job, leading them to not prioritize long-term savings. Furthermore, the

CC BY NC ND

perception of agricultural work as a low-status occupation among youths in the area could also contribute to this trend. Furthermore, the energetic nature of youth, which is typically focused on investment rather than saving, during this active period of life may also play a role. This finding aligns with the results of Lidi et al. (2017).

Table 2: First Step estimation (Selection equation)

Variable	coefficient	Std. error	Z-value	Prob.	Slope
Constant	-0.874	1.431	-0.611	0.5413	-
Age (Adult > 35years)	0.018	0.010	1.754*	0.0877	0.0031
Age (youth 18-35 years)	-0.030	0.010	-3.028**	0.0035	0.0053
Marital status	-0.201	0.358	-0.563	0.5735	0.0370
Farming experience	0.108	0.034	3.129***	0.0018	0.0188
Socialization	0.057	0.012	4.956***	0.0000	0.0099
Family size	-0.013	0.002	-8.733***	0.0000	0.0023
Dependent ratio	-0.139	0.048	-2.910***	0.0107	0.0242
Owned farm land	0.418	0.129	3.230***	0.0010	0.0705
Farm size	0.323	0.679	0.475	0.6347	0.0561
Non-farm income	1.81e-06	1.01e-06	1.789*	0.0810	3.148e-07
Farm income	1.98e-06	1.01e-06	1.952*	0.0510	3.441e-07
Male farmers	0.602	0.360	1.673*	0.0943	0.1123
Education (≤ 12 years)	0.081	0.025	3.313***	0.0009	0.0141
Education (> 12 years)	0.041	0.011	3.736***	0.0001	0.0071

Note: This step was generated simultaneously with the second step. The slopes are post estimation estimates. Asterisks *, ** and *** signify 10%, 5% and 1% significant level respectively.

Furthermore, an increase in the size of a family would result in a decrease of 0.0023 units in the likelihood or inclination of tomato farmers to save. This outcome indicates that as the family size of tomato farmers grows, their inclination to save diminishes. This finding is unsurprising as an increase in family size leads to higher daily consumption expenses for the family, thereby limiting the farmers' ability to save. This finding aligns with the research conducted by Akpan et al. (2011) and Nwosu et al. (2020).

The coefficient of the dependent ratio, which stands at 0.0242, exhibits a negative correlation and is statistically significant at a 1% probability level. A one-unit increase in the dependent ratio is likely to result in a reduction of approximately 0.0242 units in the likelihood of tomato farmers saving in the region. This result suggests that a high dependent ratio discourages the desire to save among tomato farmers. This finding is in line with expectations, as a high dependent ratio is associated with increased household expenditure, which in turn reduces the propensity for farm household savings.

On the contrary, the outcomes indicated that adult farmers (> 35 yearrs), membership in social organizations, farming experience, ownership of farm land, farm income, non-farm income, gender, and farmers' education are positively and significantly correlated with the likelihood of saving among tomato farmers. This suggests that an increase in these factors would also increase the likelihood of saving among tomato farmers. For instance, a one-unit increase in adult farmers would lead to a 0.0031 increase in the likelihood of saving. This implies that the desire or decision to save among adult farmers, particularly those over 35 years old, is influenced by household needs and preferences. Household savings are often used to address unexpected financial obligations within the farm household. Therefore, the household head typically prioritizes saving to meet the family's precautionary needs. These findings are consistent with previous studies by Lidi et al. (2017) and Balcha et al. (2022).

Furthermore, the coefficient for membership in social organizations is positive and statistically significant at a 1% probability level. A one-unit increase in years of membership in a farm social organization would result in a 0.0099 unit increase in the likelihood of saving. Joining a social organization as a tomato farmer enhances the probability of saving a portion of farm income. Increased socialization provides tomato farmers with access to more information, while group cohesion fosters confidence and a propensity to save. This finding is supported by Akpan et al. (2011).

The positive and significant coefficient of farming experience indicates that an increase in tomato farmers' experience would lead to a higher probability of saving. This increase in experience is associated with improved managerial capacity, enabling farmers to better navigate risks and uncertainties in tomato production. Additionally, as farmers gain more experience, they become more confident in decision-making, further

enhancing their propensity to save. This finding is supported by Akpan et al. (2011).

In addition, the variable "owned farm land" shows a significant positive correlation with the decision to save. An increase in the number of farmers owning land is linked to a higher probability of saving. Ownership of farm resources is believed to strengthen the decision-making process related to saving, as it reduces farm expenses and expands profit margins, particularly for small-scale farmers. Furthermore, owning farm resources helps mitigate the impact of farm risks, thereby influencing farmers' decision to save. This result is corroborated by Odoh et al. (2020), Nwosu et al. (2020), and Mazengiya et al. (2022).

Moreover, the coefficients of farm income and non-farm income are also positive and significant at conventional probability levels. Farmers with higher aggregate income are more likely to save for precautionary reasons, such as addressing farm risks and meeting family needs. This finding is consistent with the Keynesian absolute income hypothesis and the permanent income hypothesis, which suggest that the decision to save increases as household disposable income rises. This result is supported by Akpan et al. (2011), Lidi et al. (2017), Lusaya and Mulunda (2022), and Sisay (2023).

The positive and statistically significant coefficient of gender suggests that an increase in the proportion of male farmers in the region leads to a higher likelihood of saving. This can be attributed to the fact that tomato production requires time, resources, and physical strength, qualities that are often associated with male farmers in the region. Additionally, male farmers are typically the primary decision-makers in farming households in the region. These findings align with the research conducted by Balcha et al. (2022).

Furthermore, the coefficient of years of formal education (≤ 12 years and > 12 years) demonstrates a significant positive relationship with the probability of saving. One possible explanation for this result is that education enhances farmers' knowledge and understanding of production techniques, as well as exposes them to more income-generating opportunities. Therefore, farmers with a higher level of formal education are more likely to make the decision to save. This finding is supported by the studies conducted by Akpan et al. (2011), Lidi et al. (2017), Mazengiya et al. (2022), and Sisay (2023).

(b) Determinants of tomato farmers savings intensity or capacity (outcome equation)

The findings indicated that individuals in the younger age group (18-35 years), those who are married, have larger family sizes, and higher dependent ratios tend to have lower savings capacity. This suggests that an increase in these factors leads to a decrease in the ability to save money.

The adverse impact of youthful age (18-35 years) on the saving capacity of tomato farmers in the region is evident from the negative and statistically significant coefficient at a 5% probability level. An increase in youthful age among tomato farmers is associated with a decrease in saving capacity. The decline in saving desire among youth farmers, as observed in the previous step, contributes to this adverse relationship with savings capacity in the outcome equation. This trend can be attributed, in part, to the inadequate orientation that youths received regarding participation in agricultural activities. Consequently, many youths engaged in agricultural production lack full commitment due to the perceived low earnings, laborious work, low societal status in comparison to other professions, among other factors. This deduction finds support in the research conducted by Lidi et al. (2017) and Nwosu et al. (2020).

The marital status of tomato farmers exhibits a negative correlation with their saving capacity. An increase in the marital status of tomato farmers leads to a decrease of N59910 in their annual savings. This outcome aligns with expectations, as a significant portion of married farming households in the region tend to have higher consumption expenditures that limit their ability to save. This finding is corroborated by the studies of Nwosu et al. (2020) and Balcha et al. (2022).

The household size coefficient exhibits a negative and statistically significant relationship at a 10% probability level. This finding indicates that a one-unit increase in household size would lead to a reduction of N2132 in aggregate savings per year. The results demonstrate that tomato farmers with larger households experience a decrease in their savings or saving capacity. This outcome is expected, as an increase in household size corresponds to higher household expenses and the added burden of dependent family members. Consequently, the ability to save within the household is constrained. These findings align with previous studies conducted by Lidi et al. (2017) and Mazengiya et al. (2022).

The negative slope coefficient of the dependent ratio is also significantly associated with the saving capacity of tomato farmers. This implies that a one-unit increase in the dependent ratio of the household results in an average decrease of N160893 in the saving capacity of tomato farmers in the region. This suggests that tomato farmers with higher dependent ratios in their households experience a reduction in their saving capacity. This result is consistent with expectations, as an increase in the dependent ratio reflects higher household expenses and subsequently diminishes the

ability to save. Saliya (2018) also reported a similar finding.

Contrary to this, the variables such as adult age (>35 years), farming experience, membership in a social organization, owned farm land, farm size, non-farm income, farm income, number of male farmers, farmers with less than 12 years of formal education, and those with more than 12 years of formal education exhibit a significant positive association with the saving capacity of tomato farmers in the region. Specifically, the coefficient of age (adult group, > 35 years) shows a positive and statistically significant relationship at a 1% probability level. This implies that an increase in the age of adult farmers by one unit would lead to a rise in the saving capacity by N4216. The findings indicate that adult tomato farmers tend to save a higher proportion of their farm income compared to youth farmers. This trend can be attributed to the precautionary savings motive prevalent in adult households, as they are more likely to save for unforeseen future events. This aligns with the research of Lidi et al. (2017) and Balcha et al. (2022).

Table 3: Second step estimates (outcome or saving function)

Outcome model				
Variable	**coefficient**	**Std. error**	**Z-value**	**Prob.**
Constant	328142	442260.00	0.742	0.4581
Age (Adult > 35years)	4215.83	1258.57	3.350***	0.0003
Age (youth 18-35 years)	-3704.79	1662.00	-2.229**	0.0398
Marital status	-59910.40	12966.00	-4.621***	0.0000
Farming experience	19166.00	11447.90	1.674*	0.0979
Socialization	26503.40	11365.30	2.332**	0.0327
Family size	-2131.65	1105.20	-1.929*	0.0489
Dependent ratio	-160893.00	95886.00	-1.678*	0.0970
Owned farm land	30895.60	12557.00	2.460**	0.0271
Farm size	-11751.10	204087.00	-0.058	0.9541
Non-farm income	0.5206	0.1174	4.435***	0.0000
Farm income	0.1695	0.1007	1.683*	0.0930
Male farmers	-132880.00	165149	-0.805	0.4210
Education (≤ 12 years)	4505.04	13273.30	1.982**	0.0443
Education (> 12 years)	6172.23	3258.68	1.894*	0.0582
Lambda (inverse mill ratio)	-510204.00	210563.00	-2.423**	0.0296
rho	-1.000	Wald chi(14)	22.500	
Sigma	510204	Prob.>chi2	0.067	

Note: This step was generated simultaneously with the first step. The asterisks *, ** and *** signify 10%, 5% and 1% significant level respectively.

Moreover, the slope coefficient of farming experience is positively related to saving capacity. This suggests that an increase in farming experience by one unit corresponds to a N19166 increase in saving capacity. Experienced farmers are often more willing to take risks, enabling them to navigate challenging situations on the farm to generate income. Additionally, experienced farmers are more inclined to save for potential risks in the future. Furthermore, an experienced tomato farmer is likely to embrace innovative practices that enhance farm income generation and can make strategic farm management decisions to boost income and saving capacity. These results are consistent with the findings of Akpan et al. (2011), Odoh et al. (2020), and Isiorhovoja et al. (2020).

Membership in a social organization is positively correlated with the saving capacity of tomato farmers. Socialization plays a crucial role in building social capital and creating opportunities for increased access to productive resources, ultimately leading to higher farm income and a culture of saving. The research suggests that for each additional year of membership in an organization, there is an average increase of N26503 in the saving capacity of farmers. Enhanced socialization facilitates information sharing, enabling farmers to improve their farm income and saving capacity.

Formal education also has a significant positive impact on the saving capacity of tomato farmers. The study indicates that as the number of years of formal education increases (≤ 12 years and > 12 years), so does the saving capacity of farmers. Longer periods of formal education are associated with a greater likelihood of adopting innovations in farming practices. Furthermore, improving education levels enhances farmers' analytical skills and provides them with better access to markets for inputs and outputs, as well as financial and non-financial incentives like credit, information, training, and research opportunities. Therefore, enhancing the educational background of

tomato farmers contributes to the development of their management skills, leading to increased income and saving capacity. This finding is supported by previous studies conducted by Akpan et al. (2011), Lidi et al. (2017), Hailu and Geta (2020), Odoh et al. (2020), Isiorhovoja et al. (2020), and Sisay (2023).

The saving capacity of tomato farmers in the region is significantly influenced by their farm income. As farm income increases, so does the saving capacity of these farmers. This is because higher farm income provides them with the necessary financial resources to invest in modern technology, equipment, and inputs that can enhance productivity and resource efficiency. For example, by adopting precision farming techniques, automation, and other advanced technologies, farmers can optimize resource utilization and increase both production and farm income. Additionally, increased farm income enables farmers to access training programs, extension services, and research initiatives that enhance their technical skills. It is important to note that these findings align with the Keynesian absolute income hypothesis. This validates the research conducted by Akpan et al. (2011), Lidi et al. (2017), Hailu and Geta (2020), Odoh et al. (2020), Lusaya and Mulunda (2022), and Sisay (2023).

Furthermore, the coefficient of non-farm income also has a significant positive impact on the saving capacity of tomato farms. This implies that diversifying sources of farm income through non-farm activities can provide farmers with financial stability and resilience. By engaging in non-farm activities, farmers can invest in modern technologies, equipment, and training that improve production and farm income. Moreover, non-farm income can serve as an additional source of financing for farm activities, enabling farmers to afford inputs, machinery, and infrastructure that enhance farm efficiency and income. This result affirms the postulate of Keynesian absolute income hypothesis. It is consistent with the research conducted by Akpan et al. (2011), Lidi et al. (2017), Hailu and Geta (2020), and Lusaya and Mulunda (2022).

The test of multicollinearity

The multicollinearity occurs when the explanatory variables correlated with each other. This is a common econometric problem of the cross sectional analysis. Variance Inflation Factor (VIF) and the tolerance factors were used test for the multicollinearity in the results. The estimates of the VIF and the tolerance factors are presented in table 5. The result of the VIF results revealed that, for each explanatory variable, the VIF was less than 10 unit which is the threshold mark. This implies that the problem of multicollinearity was not significant, hence the results are unbiased and sufficient.

Table 4: Test of multicollinearity of explanatory variables

Variable	Variance Inflation Factor (VIF)	Tolerance factor
Age (Adult > 35years)	7.740	0.1292
Age (youth 18-35 years)	7.264	0.1377
Marital status	1.285	0.7782
Farming experience	1.215	0.8230
Socialization	1.550	0.6452
Family size	1.566	0.6386
Dependent ratio	1.092	0.9158
Owned farm land	1.147	0.8718
Farm size	1.178	0.8489
Non-farm income	1.838	0.5441
Farm income	1.529	0.6540
Male farmers	1.300	0.7692
Education (≤ 12 years)	1.420	0.7042
Education (> 12 years)	1.367	0.7315

Note: the minimum value of VIF is 1.0. However, any VIF > 10.0 shows possible multicollinearity issue. The VIF(i) = 1/(1 - R(i)^2), where R(i) is the multiple correlation coefficient between variable i and the other independent variables in the model.

The tolerance factors is less than unity for each explanatory variable and is within the range of insignificant presence of multicollinearity.

4. Conclusion

Small-scale agriculture plays a crucial role in the agricultural system of sub-Saharan Africa. The sustainability of smallholder farming relies heavily on the ability of farmers to mobilize savings. Unfortunately, the financial and credit management systems have not been effective in providing the necessary financial support to rural farmers. As a result, farmers have turned to saving as a means of ensuring financial security during times of risk and uncertainty. Given the current challenges such as poverty, malnutrition, price volatility, farm insecurity, and high

youth unemployment, the need for saving mobilization among rural farmers has become even more pressing. This study specifically examined the saving mobilization practices of small-scale tomato farmers in southern Nigeria. The Heckman two-step method was employed, with maximum likelihood estimates in the first step and Ordinary Least Squares (OLS) estimates in the second step. The estimated parameters were found to be unbiased, efficient, and consistent. Diagnostic statistics supported the use of the Heckman model and indicated that farmers' decision to save was correlated with their saving capacity. Probit estimates highlighted that factors such as age (18-35 years), marital status, family size, and dependency ratio had a negative impact on the likelihood of saving among tomato farmers. Conversely, factors such as age (>35 years), membership in social organizations, farming experience, land ownership, farm income, non-farm income, gender, and education level were identified as positive determinants of saving capacity among tomato farmers. The subsequent analysis indicated that being in the age range of 18-35 years, being married, having a larger family size, and having a high dependent ratio were all factors that negatively impacted the saving capacity of tomato farmers. Conversely, being older than 35 years, having experience in farming, being a member of a social organization, owning farm land, having a larger farm size, having non-farm income, having farm income, having a higher number of male farmers, and having more years of formal education were all factors that positively influenced savings capacity. It is suggested that tomato farmers in the area should focus on enhancing their formal education, participating in social organizations, and diversifying their sources of income in order to improve their decisions to save and their saving capacity. It is highly advisable to implement the adult education programme for tomato farmers in the region as a way of enhancing their savings mobilization. Additionally, collaborating with local organizations will significantly improve the savings mobilization for tomato farmers.

COMPLIANCE WITH ETHICAL STANDARDS

Acknowledgements

The tomato farmers we interviewed during our research were greatly appreciated by the authors. Additionally, we extend our heartfelt gratitude to the staff of the agricultural development Programme in Akwa Ibom State for their unwavering cooperation.

Compliance with Ethical Standards

a) Authors' Contributions

Authors contributed equally to this paper.

b) Conflict of Interest

The authors declare that there is no conflict of interest.

c) Ethical approval:

For this type of study, formal consent is not required.

REFERENCES

Adebayo, C. O., Yusuf, O, & Imonikhe, G. A. (2010). Analysis of savings mobilization determinants among rural households in Kogi State, Nigeria. *Journal of Agriculture, Forestry and the Social Sciences (JOAFSS), 8*(2), 139-148.

Adeosun, K. P., K. K. Salman, N. A. Chukwuone, C. O. Ume, C. A. Chukwuone & C. N. Ezemaaa, (2022). "Factors Influencing Fruits And Vegetables Consumption among Pregnant Women: Evidence from Enugu State, Nigeria," *International Journal on Agricultural and Food Systems, 24* (1), 1-23. doI: 10.3280/ecag2022oa12293.

Adewale, A. T., Lawal O. A., Aberu. F., & Toriola A. K. (2022). Effect of Credit to Farmers and Agricultural Productivity in Nigeria. *East Asian Journal of Multidisciplinary Research (EAJMR), 1*(3), 377-388.

Adisa, B. O., M. Famakinwa, K. A. Adeloye, & A. O. Adigu, (2022). Crop farmers' coping strategies for mitigating conflicts with cattle herders: Evidence from Osun State, Nigeria. *Agricultura tropica et subtropical*, 55 OV, 191–201.

Aidoo-Mensah, D. (2023). Determinants of savings frequency among tomato farmers in Ghana. *Cogent Economics and Finance, 11*(1). https://doi.org/10.1080/23322039.2023.2196862.

Akpan, S. B., & Okon, U. E. (2019). Vegetable Consumption Paradox: Has Domestic Consumption Match the International Recommended Minimum Standard in Nigeria? *International Journal of Advances in Agriculture Sciences*; Vol. 4; Issue 3; pp. 1 – 7.

Akpan, S. B., Antia, E. J., & Nkanta, V. S. (2022). Sustainable technical efficiency: evidence from vegetable (waterleaf: Talinum triangulare) production in southern Nigeria. *Journal of Agribusiness and Rural Development, 66*(4), 297–309. http://dx.doi.org/10.17306/J.JARD.2022.0153.

Akpan, S. B., E. J. Udoh, & A, E. Aya, (2011). Analysis of saving determinants among agro-based firm workers in Cross River State, Nigeria: A simultaneous Equation approach. *Research on Humanities and Social Sciences, 1*(3), 1-11.

Akpan, S. B., Nkanta, V. S., & Udoh, E. J. (2023a). Labour Preferences among Small-Scale Arable Crop Farmers in Akwa Ibom State, Southern Nigeria. *Muş Alparslan University Journal of Agriculture and Nature,*

3(2), 77-90. https://doi.org/10.59359/maujan.1264820.

Akpan, S. B., Offor, O. S., & Archibong, A. E. (2020). Access and demand for credit among small scale agro-based processors in Uyo agricultural zone, Akwa Ibom State, Nigeria. *Nigerian Journal of Agriculture*; Volume 51, Number 1, Pg. 132-141.

Akpan, S. B., Patrick, I. V., & Essien, C. A. (2024b). The attainment of the united nation Sustainable Development Goal (SDG) number two: assessment of some indicators in Nigeria. *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, 24* (1); 25-38.

Akpan, S. B., Udoh, E. J., & Nkanta, V. S. (2023b). Agricultural Credit Policy and Livestock Development in Nigeria. *Problems of World Agriculture, volume 23*(3): 45-60. DOI: 10.22630/PRS.2023.23.3.11.

Akpan, S., B., Essien, C., A., Patrick, I., V., & Nkanta, V., S. (2024a). The Impact of Credit Policy Environment on Poultry Production in Nigeria. *Muş Alparslan University Journal of Agriculture and Nature,* *4*(1), 30-41. https://doi.org/10.59359/maujan.1402657.

Ali, L., Khan, M.K.N. & Ahmad, H. (2020). Education of the Head and Financial Vulnerability of Households: Evidence from a Household's Survey Data in Pakistan. *Soc Indic Res 147*, 439–463. https://doi.org/10.1007/s11205-019-02164-2

Amurtiya, M., & K. A. Adewuyi, (2020). Analysis of Tomato production in some selected local government areas of Kano State, Nigeria. *Proceedings of the 3rd INFER Symposium on Agri-Tech Economics for Sustainable Futures* 21st – 22nd September 2020, Harper Adams University, Newport, United Kingdom, page 80-88.

Aristei, D., F. Perali, & L. Pieroni, (2007). "Cohort, Age and Time Effects in Alcohol Consumption by Italian Households: A Double-hurdle Approach," *Empirical Economics*, DOI 10.1007/s00181-007-0142-5.

Asfaw D. M., (2021). Analysis of technical efficiency of smallholder tomato producers in Asaita district, Afar National Regional State, Ethiopia. *PLoS ONE 16*(9): e0257366. org/10.1371/journal.pone.0257366.

Balcha, B. D., Feyissa, G. F., & Jekamo, D. M. (2022). Determinants of Households Saving: The Case of Shashamene Town, West Arsi Zone, Oromia, Ethiopia. *Journal of Finance and Economics, 10*(1), 20-28.

Bello, B., & Abdullahi, M. M. (2021). Farmers–Herdsmen Conflict, Cattle Rustling, and Banditry: The Dialectics of Insecurity in Anka and Maradun Local Government Area of Zamfara State, Nigeria. SAGE, 11 (4), 1-12. https://doi.org/10.1177/21582440211040117.

Bolarinwa, O. K., O. O. Olubanjo, A. O. Otunaiya & A. O. Idowu, (2024). Technical efficiency of vegetable production among wetland farmers in southwest Nigeria. *Badeggi Journal of Agricultural Research and Environment, 06*(01): 39 – 46.

Campestrini L.H., P. S. Melo, L. E. P. Peres, R. C. Calhelha, I. C. Ferreira & S. M. De Alencar, (2019). New variety of purple tomato as a rich source of bioactive carotenoids and its potential health benefits. *Heliyon*. 2019;*5*:e02831. doi: 10.1016/j.heliyon.2019.e02831.

Central Bank of Nigeria (CBN) Statistical Bulletin (2024). Avaialable at: https://www.cbn.gov.ng/documents/statbulletin.asp.

Flood, L., & U. Gråsjö (1998) Regression Analysis and Time Use Data A comparison of Microeconometric Approaches with Data from the Swedish Time Use Survey (HUS), *Göteborg University, School of Economics and Commercial Law, Working Papers in Economics*, No 5.

Fowowe, B. (2020). The effects of financial inclusion on agricultural productivity in Nigeria. *Journal of Economics and Development*, DOI 10.1108/JED-11-2019-0059.

Greene, W. (2000). Econometric Analysis, 4th ed. Macmillan, New York.

Hailu, M., & Geta, E. (2020). Determinants of Household Saving in Dire Dawa City, Eastern Ethiopia. *Journal of Economics and Sustainable Development, 11*(21); 48-52.

Heckman, J. (1979). "Sample Selection Bias as a Specification Error," *Econometrica*, *47*:1 (153-161).

Isiorhovoja, R. A., Ebewore, S. O., & Nwachi, S. (2020). Farmers' attitude and behavior toward savings in Ika south local government area of delta state, Nigeria. *Asian Journal of Agriculture and Rural Development, 10*(1), 406-419.

Lawal, M., Salihu, I. T., Tsado, J. H., Umar, I. S., & Abdullahi, A. (2021). Factors influencing women participation in saving mobilization scheme in Benue State, Nigeria. *Journal of Agripreneurship and Sustainable Development (JASD), 4* (4), 216-222.

Lidi, B. Y., Bedemo, A., & Belina, M. (2017). Determinants of Saving Behavior of Farm Households in Rural Ethiopia: The Double Hurdle Approach. *Journal of Economics and Sustainable Development, 8*(19), 33-42.

Lusaya, S., & Mulunda, N. (2022). Factors determining household savings in Zambia: A logit regression model from the micro-economic perspective. *World Journal of Advanced Research and Reviews, 13*(01), 520–533

Mazengiya, M. N., Seraw, G., Melesse, B., & Belete, T. (2022) "Determinants of rural household saving participation: A case study of Libokemkem District, North-west Ethiopia".*Cogent Economics & Finance, 10*:1, 2127219, DOI: 10.1080/23322039.2022.2127219.

Mu'azu, A. U., & Lawal, M. (2017). The impact of agricultural financing on agricultural output in Nigeria: an empirical analysis. *Journal of Agriculture and Environment, 13*(1), 13-26

Norbert, S., Y. Kaka & A. Gona, (2023). Analysis of Tomato (Solanum lycopersicum L) Value Chain in Kebbi State, Nigeria. *Direct Res. J. Agric. Food Sci, 11*(8), 217-223.

Nwosu, E. O., Anumudu, C. N., & Nnamchi, C. E. (2020). Microeconomic determinants of household savings in Nigeria. *Journal of International Development, 32*(2), 150–167. https://doi.org/10.1002/jid.3440.

Obalola, T. O., Audu, R. O., & Danilola, S. T. (2018). Determinants of Savings among Smallholder Farmers in Sokoto South Local Government Area, Sokoto State, Nigeria. *Acta agriculturae Slovenica, 111* - 2, 341 – 347.

Odoh, N. E., Nwibo, S. U., Eze, A. V., & Igwe, E. O. (2020). Farmers Income and Savings Pattern in Benue State, Nigeria. *Journal of Agricultural Extension*, *24* (1), 128-137.

Raaijmakers, I., H. Snoek, B. Maziya-Dixon & T. Achterbosch, (2018). Drivers of Vegetable Consumption in Urban Nigeria: Food Choice Motives, Knowledge, and Self-Efficacy. *Sustainability, 10*, 4771; doi: 10.3390/su10124771.

Sadiq, M. S., Singh, I. P., & Ahmad, M. M. (2023). Labour-use efficiency of rice farmers in Nigeria's north-central region. *Muş Alparslan University Journal of Agriculture and Nature, 3*(2), 50-61. https://doi.org/10.59359/maujan.114400.

Saliya, A. Y. (2018). Determinants of urban household saving behavior in Ethiopia: A survey study in Mekelle City. *Üniversitepark Bülten, 7*(2), 82–95. https://doi. org/10.22521/unibulletin.2018.72.1

Sisay, K. (2023). Rural households saving status and its determinant factors: Insight from southwest region of Ethiopia. *Cogent Economics & Finance 11*: 2275960 https://doi.org/10.1080/23322039.2023.2275960.

Snoek, H. M., I. Raaijmakers, O. M. Lawal & M. J. Reinders, (2022). An explorative study with convenience vegetables in urban Nigeria-The Veg-on-Wheels intervention. *PloS one,17*(9),e0273309. https://doi.org/10.1371/journal.pone.0273309.

Strzelecka, A., & Zawadzka, D. (2023). Savings as a Source of Financial Energy on the Farm—What Determines the Accumulation of Savings by Agricultural Households? Model Approach. *Energies* 2023, *16*, 696. https://doi.org/10.3390/en16020696.

Ubon A. Essien, U.C. Ibekwe, S. B. Akpan, & N. G. Ben-Chendo (2016a). Determinants of Informal credit Delinquency among Food Crop Farmers in rural Niger delta of Nigeria. *Review of Agricultural and Applied Economics*; *19* (1); Pp. 50 – 55.

Udemezue, J. C., & Kanu, N. A. (2019). Challenges of Nigerian agricultural sector in the twenty first century: The case of nomadic insurgence and terrorist sects. *Universal Journal of Agricultural Research*, *7*(2), 117–124. http://www.hrpub.org.

Umoren, A. A., & Akpan, S. B. (2021). "Relationships among Non-Performing Loans, Macroeconomic and Banks' Specific Variables in Nigeria's Economy: ARDL Model Approach." *IOSR Journal of Economics and Finance (IOSR-JEF)*, *12*(06), pp. 27-35.

Umoren, A. A., Akpan, S. B., & Udoh, E. J. (2016b). Analysis of Empirical Relationship among Agricultural Lending, Agricultural Growth and Non-Performing Loans in Nigerian Banking System. *Economy*, Vol. 3, No. 2, 94-101.

Umoren, A. A., Aloysius C. N., & Sunday B. A. (2016). Empirical Analysis of Non- Performing Loans Trend and Growth Rate in Nigerian Banking

System. *Journal of Finance & Banking Studies 5*(3): 57-69.

Umoren, A. A., Eyo, E. O., & Akpan, S. B. (2018). Investigating the nexus between Non-Performing Loans in the Nigerian Banking System and Lending to Micro-Small Medium Enterprises. *International Journal of Contemporary Research and Review*; Volume 09, Issue 6; Pp. 20778 – 20791.

Wieliczko, B., Kurdyś-Kujawska, A., & Sompolska-Rzechuła, A. (2020). "Savings of Small Farms: Their Magnitude, Determinants and Role in Sustainable Development. Example of Poland" *Agriculture 10*, no. 11: 525. https://doi.org/10.3390/agriculture10110525.

Yahya, L. O., & Ogunyemi, E.O. (2024). Human Empowerment and Financial Resource Utilisation as a Panacea for Poverty Eradication in Nigeria. *Educational Perspectives, 12*(1), 186-198.

Yamane, T., (1967). Elementary Sampling Theory, Volume 1: Pp. 371– 390, Engle wood Cliff: Prentice Inc.