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FACTORS INFLUENCING RURAL HOUSEHOLDS' INVOLVEMENT IN INDIGENOUS BLACK-SOAP ENTERPRISE IN OYO STATE: IMPLICATIONS FOR SUSTAINABLE EMPLOYMENT GENERATION

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ABSTRACT
Historically, black soap was a prominent indigenous enterprise in Oyo State, Nigeria where it was taken as a means of livelihood for the resource poor rural households, but gradually, becoming less popular within the rural populace. This study identified the crucial factors, the constraints faced by rural households in the production of black soap and the characteristics of the enterprise Primary data were elicited from 210 members of rural households involved in black-soap business using interview schedule that was well validated. Data collected were summarised using descriptive statistics including percentages, means and standard deviation while factor analysis was used to identify key factors affecting rural households' involvement in black-soap enterprise. The results revealed that the mean age of respondents was 53.8 ± 15.5 years. Majority (96.2%) were females and majority (94.8%) inherited their skills from older family members. The identified characteristics of the enterprise include its compatibility with the local culture (mean = 3.88) and reliability as a source of income (mean = 3.71). Associated constraints include inadequate capital (mean = 2.20), drudgery operation (mean = 1.98) and lack of credit facilities (mean = 1.84). Factors influencing involvement include production regularity (19.9%), personal characteristics (15.4%), external influence (6.4%) and household strength (4.8%). It was concluded that the identified factors were germane to the involvement of rural households in the indigenous black soap enterprise.
Keywords: Black soap; indigenous; involvement; rural households

INTRODUCTION

Poverty is largely a rural phenomenon in Nigeria and according to Nigerian National Bureau of Statistics (2021), 84.6 percent of Nigerians living below the international poverty line of $1.90 as at 2018/2019 were rural dwellers. Sasu (2022) also reiterated that poverty mostly affect members of rural households. Even in the oil producing rural areas of Nigeria that is characterised with various economic activities of the oil and gas industries, rural poverty is still predominant (Ukpong *et al*., 2019). Entrepreneurship is a reliable alternative to tackle the menace of unemployment that often led to poverty (Anekwe *et. al.*, 2018). Rural entrepreneurship has great potentials in aiding the development of rural areas (Nwankwo and Okeke, 2017) while indigenous entrepreneurship is one of the effective ways to promote economic prosperity and reduce the problem of poverty (Ali and Ali, 2013). Development of indigenous entrepreneurship can enhance employment generation and technological development in Nigeria. This implies that the indigenous people, as custodians of indigenous knowledge, have the ability to identify and utilise local context-based solutions that are capable of bringing development to the society if adequately employed (Olutayo *et al*., 2017; Aluko, 2018). Unfortunately, because the producers of indigenous knowledge are home-grown, with little or no recognition, their knowledge is often underrated and considered inferior.

Alao *et al.* (2017) identified black soap making as a homegrown income generating activity that enables producing households to be self-sufficiency and reduces rural poverty in Nigeria while contributing more than two-third of their monthly oncome (Alabi and Makinde, 2022). In the context of the traditional beliefs, black soap is considered as an enterprise meant for the women only (Ogunbor, 2016). Umar *et al.* (2016) and Alao *et al.* (2017) reported that black- soap enterprise has contributed immensely to the livelihood of women in rural households. The major processes involved in black soap making include production of ash water, production of base oil and the soap (Alabi and Makinde, 2022). Jolayemi (2016) observed that the enterprise is going into extinction as the younger generation are not showing willingness to take over from the ageing household members. These observations necessitated this research. The study described the socioeconomic characteristics of rural households' members involved in black-soap enterprise; examined black-soap enterprise unique characteristics, constraints facing the enterprise and isolated factors influencing rural households' involvement in the enterprise. Knowing these factors could assist in forestalling the extinction of the enterprise and enhancing its potential for sustainable rural employment and income generation especially among rural women and youth.

METHODOLOGY

The study area was Oyo State, Nigeria. The State is located on latitude 7° 30′ 0″ N and longitude 4° 30′ 0″ E. It has a land mass of 27,249 square kilometres and a population of 5,5 91,589 people. The State is characterised with dry season that lasts from November to March, wet seasons from April to October and relatively high humidity. The study

population were all rural households who were involved in various activities of the black soap enterprise such as: sourcing for the raw materials (ash and palm kernel nut), production of base oil, production of ash water and making of the soap. Respondents for the study were selected through a four-stage sampling procedure. Firstly, the seven Local Government Areas (LGAs) leading in black-soap enterprise were purposively selected. At the second stage, a total of fourteen communities leading in black-soap enterprise activities were selected purposively from the 7 LGAs. The third stage was the selection of households involved in black-soap enterprise activities from every selected community using snowball technique which gave a total of 210 households. The final stage was the selection of one volunteer member from each of the 210 households who constituted the respondents for the study and participated in the interview. Well validated and structured interview schedule was used to collect primary data which was analysed by using SPSS software version 22. Descriptive statistics including frequencies and percentages as well as means and standard deviation were used to summarise the data collected. Enterprise characteristics was measured on a 5-point scale by asking the respondents to indicate whether they strongly disagreed (1 points), disagreed (2 points), undecided (3 points), agreed (4 points) or strongly agreed (5 points) to eight characteristics of black-soap enterprise. The maximum and minimum obtainable scores were 40 and 8 respectively. The grand mean was generated to separate the characteristics that were more germane to the enterprise from those that were least. Constraints affecting the enterprise were also measured using a 4-point Likert-like scale (3=very severe, 2=severe, 1=less severe, 0=not at all). Factors influencing rural households' involvement in black-soap enterprise were isolated using factor analysis. Principal component analysis and varimax rotation were used to group the variables. The factors that were retained were determined using Kaiser's criterion; hence, factors that were retained were those that their Eigen values were greater than one. The following criteria employed by Famakinwa *et al*. (2019) were used to name the factors:

i. The subjective interpretation of researcher's experiences from literature
ii. Using the synonyms of the variables that have the highest loading on each factor.
iii. Name the factor based on the similarity of the features of the contributing variables
iv. Jointly interpret the meaning of the variables that have positive and high loading on each factor.

RESULTS AND DISCUSSION

Socioeconomic characteristics

Table 1 shows that majority (96.2%) of the respondents were females which implies that the enterprise was female dominated. This result agrees with Oluwalana *et al.* (2016) that majority of black-soap producers were female with few males involving in it as minor occupation. Respondents mean age was 53.83 ± 15.47 years with only few (17.1%) belonging to the age bracket of 40 years and below. This implies that the majority of these entrepreneurs were older people and shows the need to improve on the indigenous methods of operating the enterprise so as to encourage younger hands to key into it thereby, preventing it from going into extinction. The finding disagrees with Umar *et al.* (2016) that those actively engaged in black-soap business as their livelihood choice were between the age group of 26 - 45 years while it agrees with Oluwalana *et al.* (2016) that the average age of the people engaged in black-soap was 53.7 years. Many (64.8%) of the respondents were married in line with Umar *et al*. (2016) that majority of rural households' members in black-soap business were married. Marriage is associated with responsibilities of providing for the needs of households' members especially the children. This may be one of the reasons why married people easily get involved in various livelihood activities including black soap enterprise. Almost half (49.0%) of the respondents had no formal education while the mean years of schooling was 1.9 ± 1.1 years indicating low literacy level that sets a limitation on the job opportunities they can engage in. The finding aligns with Oluwalana *et al*. (2016) and Umar *et al.* (2016) that most of the people involved in black-soap enterprise had no formal education. This observation may have negative implication on the development of the enterprise because it enhances job performance. Results also show that all (100%) of the respondents belonged to the Yoruba ethnic group. This implies that the enterprise is purely indigenous because it is dominated by the predominant indigenous people of the study area. The finding is supported by Spotlight on Inclusive Trade (2021) which stated that an indigenous enterprise is the one that is owned and managed by the indigenous people. Table 1 shows further that majority (94.3%) of the respondents inherited their skills from their parents, mother- in-law and relations. This implies that the enterprise is lineage specific and being inherited or passed down from one generation to another. The finding agreed with (Ogunbor, 2016) who stated that black soap business is an indigenous entrepreneurship and its often passed from older generation to the younger. About half (51%) of the sample indicated that their household size was between 6-10 persons. This is relatively large but could be an advantage to the

enterprise in terms of labour supply. The finding is in tandem with Umar *et al.* (2016) that household size of black-soap entrepreneurs is between 6 – 10 persons and that they form the source of labour needed in the multiple activities of the enterprise.

Table 1: Selected socioeconomic characteristics of respondents

Variables	Frequency	Percentage	Mean	Standard deviation
Sex				
Male	8	3.8		
Female	202	96.2		
Age				
20 years and below	7	3.3		
20 – 40 years	29	13.8	53.83	15.47
41 – 60 years	93	44.3		
61 – 80 years	77	36.7		
Above 80 years	4	1.9		
Marital status				
Single	22	10.5		
Married	136	64.8		
Divorced	11	5.2		
Widowed	41	19.5		
Years spent in education				
Not attended school	103	49.0		
1 - 6	57	27.1	1.94	1.08
7 - 12	35	16.7		
Above 12	8	3.8		
Ethnicity				
Yoruba	210	100		
Means of acquiring skills				
Through parents/family	198	94.3		
Others	12	5.7		
Household size				
≤ 5	86	41.0		
6-10	107	51.0	7.0	4.0
11 and above	17	8.0		

Characteristics of black-soap enterprise

Based on the cut-off point of 3.0, results in Table 2 reveals that the following characteristics of black-soap enterprise identified by respondents were very important to their involvement in the enterprise and its development. These includes, enterprise compatibility with the local culture (mean = 3.88), reliability as a source of income (mean = 3.71), cost effectiveness compared with other indigenous enterprises (mean = 3.70), visibility in the locality (3.67), use of localised raw materials (mean = 3.53), its divisibility in operation (mean = 3.37), simplicity of learning (3.22) and relative advantage over other enterprises (mean = 3.17). The findings imply that compatibility of the enterprise with the culture of the people will enhance its acceptability in the locality and promote its patronage. Also, the ability of the enterprise to provide a reliable source of income for the entrepreneurs, ability to yield greater return on relatively minimum investment and the use of locally available raw materials; simpleness to learn and its perceived relative advantage would increase the potential for enterprise growth and development if well-harnessed by relevant stakeholders. The finding agrees with Ukwendu (2019) that black soap production can be done easily with little capital and simple technology.

Constraints faced in production of black soap

Results in Table 3 show that inadequate capital (mean = 2.20) was the most severe constraint identified by the respondents to be limiting their involvement in black-soap enterprise. This was followed by drudgery operation (mean = 1.98), lack of credit facilities (mean = 1.84) and inadequate sources of water (mean = 1.61). On the other hand, constraints like time consuming activities involved (mean = 1.45), lack of training on improved technology (mean = 0.63) and marketing problem (0.55) were less severe while lack of successor (mean = 0.05) and inadequate transportation (mean = 0.04) were not severe. The implication of the finding is that those constraints that were identified to be severe could be responsible for the lack of growth and development of the enterprise despite its age long existence. This is because the combination of inadequate business capital, non-availability of credit facilities and drudgery operation could serve as discouragement (to younger people in particular)

from seeking employment opportunities in the enterprise. This finding is in support of Umar *et al.* (2016) that the major problem facing black-soap producers was financial inadequacy.

Table 2: Selected characteristics of black soap enterprise

Enterprise characteristics	Mean	Rank
Compatibility with local culture	3.88	1st
Reliability as an income source	3.71	2nd
Cost effectiveness	3.70	3rd
Visibility in the locality	3.67	4th
Localised raw materials	3.53	5th
Divisibility in operation	3.37	6th
Simplicity in learning	3.22	7th
Relative advantage over others	3.17	8th

Grand mean: 2.33

Table 3: Constraints affecting production of black soap

Constraints	**Ranked Mean**	**Standard deviation**
Inadequate capital	2.20	1.14
Drudgery of operation	1.98	1.31
Lack of credit facilities	1.84	1.19
Lack of sources of water	1.61	1.05
Time consuming activities involved	1.45	1.38
Lack of training on improved technology	0.63	0.89
Marketing problem	0.55	1.14
Scarcity of raw materials	0.32	0.83
Availability of raw materials	0.15	0.49
Labour intensive	0.07	0.35
Lack of successors	0.05	0.33
Inadequate transportation	0.04	0.23

Factors influencing rural households' involvement in black-soap enterprise

The results in Table 4 show that seven (7) factors with eigen values greater than 1were isolated as done by Adetunji (2020) and considered to be influencing rural households' involvement in black-soap enterprise in Oyo State, Nigeria. The factors extracted were named as stated in Table 7. The first factor was called "production regularity" and it accounted for 19.9% variation; the second was "personal characteristics" and accounted for 15.4% variation; the third was "community features" with 13.3% variation; the fourth was "income" with 9.0% variation; the fifth was "threats predisposition" with 6.2% variation; The sixth was "external influence" with 6.4% variation and the last was "household strength" with 4.8% variation. All the extracted factors accounted for 74.1 percent of the variance implying that unknown variables not captured in this study accounted for the remaining 25.9 percent.

Table 4: Analysis of principal components, initial eigen values and percentage variation in involvement of rural households in black-soap enterprise by each extracted factor

Names of factors	**Eigen value**	**% Variation**	**Cumulative var %**
Production regularity	4.589	19.954	19.954
Personal Characteristics	3.536	15.372	35.327
Community features	3.056	13.289	48.616
Income	2.070	9.001	57.616
Threat predisposition	1.419	6.170	63.786
External influence	1.271	5.527	69.313
Household strength	1.105	4.803	74.116
Others (not identified)	<1.000	25.884	100.000

Factor one: Production regularity

Results in Table 5 show that the factor has six loading variables with two of them positively loaded, namely: frequency of production (L = 0.800) and time dedicated to the enterprise (L = 0.743). It was named after the variable with the highest positive loading as stated in criterion two in the methodology. It implies that, the more frequent the production activities, the more the time that will be dedicated to the enterprise and consequently, the higher the level of rural households' involvement in the enterprise and vice-versa.

Factor two: Personal characteristics

Table 5 shows that five loading variables were identified with the factor and three of them were positively loaded, namely, age of the respondents (L = 0.914), years spent in the enterprise (L = 0.845) and marital status (L = 0.675). It was named based on the similarity of the features of contributing variables as stated in criterion three. This implies that, age of the entrepreneurs, their years of experience in the enterprise and their marital status are the important personal characteristics affecting their involvement in the black-soap enterprise.

Factor three: Community features

Table 5 reveals that the factor was defined by six positive loading variables. These were: climatic conditions (L = -0.863), reasons for involving in the enterprise (L = 0.743), infrastructural facilities (L = 0.716), willingness to continue (L= 0.619), number of workers (L= 0.533) and community attitude (L = 0.442). It was also named based on the similarity of the features of contributing variables. The climatic condition of the community, availability of infrastructural facilities and workers as well as favourable community attitude to black soap enterprise could sustain the willingness of rural entrepreneurs to continue in the enterprise and enhance their level of involvement.

Factor four: Income

Table 5 shows that total income from all sources (L = 0.830) and income from black-soap (L = 0.590) were the two loading variables that defined this factor. It was named after the variable with the highest positive loading and the similarity of the features of contributing variables as stated in criteria two and three. This implies that when the income from black soap enterprise accounted for a significant percentage of the total income of the entrepreneurs from all the livelihood sources, it could encourage higher level of involvement in the enterprise.

Factor five: Threat predisposition

Table 5 reveals that five loading variables which include three positively loaded identified the factor. They were constraints (L = 0.791), sex (L = 0.491) and willingness to continue (L = 0.426). it was named by given joint interpretation to the meaning of the variables with positive high loading as stated in criterion four. The implication is that the constraints associated with the enterprise could serve as a threat that will affect the entrepreneurs' willingness to continue, more so, that they were mainly of female gender who are susceptible to threat.

Factor six: External influence

Table 5 shows further that five loading variables out of which two positively loaded, defined the factor. They were religion (L = 0.765) and number of workers (L = 0.491). Compatibility of black soap enterprise with the belief system of the people of the indigenous community and readily availability of labour will promote involvement in the enterprise.

Factor seven: Household strength

Table 5 reveals that household size (L= 0.854) was the only variable with positive loading out of the two that defined the factor. It was named after the variable with the highest positive loading as stated in criterion two. It implies that since the enterprise is household based in nature, ability of the household members to provide relevant assistances in form of labour, financial and moral supports could strengthen involvement in the enterprise.

Knowing these factors have implications for sustainable employment generation especially in the rural areas. Relevant stakeholders including the government and non-governmental development agencies could leverage on the identified factors in their efforts to providing enabling environment that could enhance the growth of black-soap and other indigenous enterprises. For instance, efforts to improve production frequency could include provision of modern equipment that would eliminate drudgery associated with the enterprise and making necessary facilities available within the rural communities. When frequency of production is enhanced, there will be increase in the income of the entrepreneur which could attract others to find employment in black soap, thereby, minimising the problem of unemployment that usually led to rural poverty and migration.

CONCLUSION

Based on the findings, the study concluded that production regularity, personal characteristics of the entrepreneur, community features, income, threats predisposition, external influence and household strength were factors affecting rural households' involvement in black soap enterprise. It is therefore recommended that relevant stakeholders should leverage on these factors to providing enabling environment, capable of harnessing the hidden entrepreneurial opportunities in black soap enterprise for sustainable employment generation, thereby, assisting to minimise the problem of unemployment that usually led to rural poverty and migration.

Table 5: Factor analysis showing variables contributing to involvement in black-soap enterprise

Variables	L	L^2	Λ
Production regularity			
Means of acquiring skills	-0.898	0.806	
Frequency of production	0.800	0.640	
Time dedicated to the enterprise	0.743	0.552	3.100
Enterprise characteristics	-0.723	0.523	
Community attitudes	-0.638	0.407	
Willingness to continue	-0.415	0.172	
Personal characteristics			
Age	0.914	0.835	
Years spent in the enterprise	0.845	0.714	2.937
Years of formal education	-0.786	0.618	
Marital status	0.675	0.456	
Initial capital	-0.560	0.314	
Community features			
Climatic conditions	0.863	0.745	
Reasons for involving in the enterprise	0.743	0.552	2.672
Infrastructural facilities	0.716	0.513	
Willingness to continue	0.619	0.383	
Number of workers	0.533	0.284	
Community attitude	0.442	0.195	
Income			
Total income from all sources	0.892	0.796	1.530
Income from black soap	0.856	0.733	
Threats predisposition			
Constraints	0.791	0.626	
Indigene	-0.559	0.312	1.590
Sex	0.491	0.241	
Willingness to continue	0.426	0.181	
Association membership	-0.480	0.230	
External influence			
Number of workers	0.491	0.241	
Religion	0.765	0.585	1.086
Association membership	-0.510	0.260	
Household strength			
Association membership	-0.419	0.176	0.905
Household size	0.854	0.729	

L = Loading value $\quad$ $\mathbf{L^2}$ = Square of loading

λ = Summation of the square of loading

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IMPACT OF FADAMA III ADDITIONAL FINANACING (AF) DEVELOPMENT PROJECT ON RICE YIELD, INCOME AND CHALLENGES TO PARTICIPATION IN PLATEAU STATE, NIGERIA

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ABSTRACT
The study assessed the impact of the Fadama III Additional Financing (AF) Development project on rice farmers' yield, income, and challenges to participation. A total of 259 respondents (participants and non-participants) were selected through a multistage sampling technique from rice-producing communities. Using Propensity Score Matching (PSM) methods, results showed that participants recorded an average rice yield of approximately 2,600 kg/ha, significantly higher than the 1,500 kg/ha of non-participants reflecting a yield increase of over 1,090 kg/ha across different matching algorithms. Similarly, income among participants averaged between ₦1,020,000 and ₦1,423,000, significantly exceeding the non-participants' income range of ₦661,557 to ₦941,557, with income gains of up to ₦481,442. Despite these benefits, several constraints hindered participation, with security challenges reported by 86.9% of respondents as the most critical barrier, followed by inadequate land access (68.7%) and poor transportation (64.5%). Other notable challenges included high technology costs, inadequate startup funds, and climate change effects. The study recommends targeted interventions such as improving rural security, land reforms, infrastructural development, affordable technology dissemination, and expanded farmer training and credit access to enhance the effectiveness and inclusiveness of the Fadama III AF project.
Keywords: Yield, Income, Fadama III Additional Financing, Propensity Score Matching, Rice Farmers

INTRODUCTION

Nigeria has long tried to tackle rural poverty and boost food security through initiatives like Operation Feed the Nation and the National Accelerated Food Production Project (Akarowhe, 2018). Yet, poverty levels in rural areas remain stubbornly high, undermining household well-being (Awojobi, 2019). In response, the Fadama projects were introduced. Fadama I and II focused on water management and community-driven agricultural support, while Fadama III expanded to address broader development goals. Recognizing that poverty persisted, stakeholders launched the Fadama III Additional Financing (AF) project, a decisive step to extend impact and reach more farmers (Ifeanyi, 2019). Fadama III AF focused on four key components:i. Capacity building for farmers' groups., ii. Development of small-scale rural infrastructure. iii. Support for production and marketing of priority value chains rice, sorghum, tomatoes, and cassava. iv. Effective project coordination and management (Ifeanyi, 2019).

Rice, as a staple crop, received special attention under Fadama III AF, with initiatives designed to boost yields, improve market access, and enhance incomes key steps toward tackling poverty and improving food security. Rice is a critical staple and cash crop in Nigeria, cultivated across multiple ecologies such as rainfed upland, rainfed lowland, irrigated, and flood-prone areas (Adewale *et al*., 2023). It remains one of the fastest-growing food staples, especially in urban centers, contributing significantly to national food security and dietary energy intake (Ojo and Musa, 2023). Despite its importance, smallholder rice farmers face numerous challenges, including climate variability, limited access to quality inputs, poor infrastructure, and market inefficiencies (Okoro *et al*., 2023). The Fadama III Additional Financing (AF) project strategically prioritized rice within its value chains, focusing on capacity building, infrastructure improvements, and enhanced market access to boost productivity and incomes (World Bank, 2023). Early evaluations indicate that the Fadama project has helped increase yields and improve livelihoods among participating farmers, underlining the value of targeted interventions in transforming rural agriculture (Adewale *et al*., 2023; Ojo and Musa, 2023).

Since the Fadama project has shown only small changes so far, this study takes a closer look at how the Fadama III AF project has influenced rice farming and poverty reduction in Plateau State, Nigeria. It aims to reveal both the wins and the struggles, helping to guide smarter decisions for the future.

The specific objectives were to;

i. Evaluate the impact of the Fadama III AF Project on the yield of rice farmers.
ii. Assess the effect of the Fadama III AF Project on the income of rice farmers.
iii. Identify the constraints to participation in the Fadama III AF Project in the study area

METHODOLOGY

Plateau State, nestled in Nigeria's North-Central region, stands out for its breathtaking highlands, cool climate, and vibrant cultural mosaic. Covering around 30,913 km², the state's name is drawn from the Jos Plateau a spectacular tableland rising between 1,200 and 1,800 meters above sea level (NIMET, 2020; Plateau State Government, 2023). Its capital, Jos, is a bustling hub for administration and trade, known for its dynamic markets and lively atmosphere.

The region's temperate weather, with average temperatures ranging from 18°C to 25°C and annual rainfall between 1,100 mm and 1,600 mm, creates fertile ground for diverse crops like potatoes, maize, rice, and an array of vegetables (Plateau State Ministry of Agriculture, 2023). Historically, Plateau's economy was shaped by tin and columbite mining, but agriculture now dominates, providing livelihoods for the majority of residents (National Bureau of Statistics, 2023).

This study used a multi-stage sampling approach to select respondents. In the first stage, six local government areas (LGAs) Shendam, Langtang North, Langtang South, Kanam, Kanke, and Pankshin were purposively selected from the Southern and Central Zones of Plateau State, due to their high rice production and prioritization under the Fadama III Additional Financing (AF) project (Fadama III AF Fact Sheet, 2015).

In the second stage, ten rice-producing communities Kalong, Shimankar, Shebyer, Zamko, Nasarawo, Sabon-gida, Kafel, Gaddi, Kabwir, and Lonkat were randomly selected from the chosen LGAs. Within these communities, farmers were proportionally sampled based on their population sizes, resulting in a total sample size of 259 participants and non-participants farmers combined. This was determined using Cochran's formula for finite populations to ensure adequate representation and statistical power (Yamane, 1967; Israel, 2023).

Data collection involved a structured questionnaire, field observations, and key informant interviews to capture both quantitative and qualitative information. Descriptive statistics including means and frequencies were used to profile farmer characteristics and identify participation constraints (Field, 2018).

To evaluate the impact of the Fadama III AF project on rice yield and income, Propensity Score Matching (PSM) was applied to address selection bias. Specifically: (i) Simple Mean Difference compared average outcomes between participants and non-participants. (ii) Nearest Neighbor Matching (NNM) matched each participant with a similar non-participant based on their propensity score.(iii) Radius Matching Method (RMM) paired each participant with non-participants within a defined radius of the propensity score, improving precision and reducing bias (Caliendo and Kopeinig, 2008).

The Average Treatment Effect on the Treated (ATT) was calculated as the difference in outcomes between participants and their matched counterparts. Given the challenge of estimating the counterfactual outcome in non-experimental settings, robust matching methods like NNM and RMM were essential to ensure reliable results (Rosenbaum and Rubin, 1983). Through this multi-stage sampling design and robust analytical framework, the study offers credible insights into the Fadama III AF project's effects on rice farmers' productivity and income in Plateau State.

RESULTS AND DISCUSSIONS

Impact of participation in the Fadama III AF project on rice farmers' yield

Table 1 presents the estimated impact of the Fadama III Additional Financing (AF) project on rice farmers' yield using three econometric matching algorithms: Simple Mean (SM), Nearest Neighbor Matching (NNM), and Radius Matching Method (RMM). Across all methods, rice farmers who participated in the Fadama III AF project recorded significantly higher yields compared to non-participants.

Under the Simple Mean (SM) approach, participants had an average yield of 2,572.25 kg/ha, while non-participants had 1,481.75 kg/ha, resulting in a yield difference of 1,090.54 kg/ha. The estimated selection bias is 838.29, and the t-statistic of 17.57 indicates high statistical significance ($P < 0.01$).

The Nearest Neighbour Matching (NNM) method further refines the estimate by pairing similar individuals. Here, participants recorded a yield of 2,700.26 kg/ha versus 1,603.67 kg/ha for non-participants. The difference in yield is 1,096.52 kg/ha, with a smaller bias of 404.07, and a t-statistic of 17.23, also highly significant.

The Radius Matching Method (RMM) produced similar results: participant yield was 2,603.17 kg/ha, non-participant yield was 1,511.76 kg/ha, yielding a difference of 1,091.40 kg/ha. The associated bias was 428.15, and the t-statistic of 13.36, again significant at $P < 0.01$.

The results suggest that participation in the Fadama III AF project had a positive and statistically significant impact on rice yield, regardless of the matching algorithm used. The consistent yield differential across all methods confirms the program's effectiveness in enhancing rice production among beneficiaries.

This finding aligns with earlier studies (Illo *et al*., 2015; Lawal, 2013; Olaolu *et al.,* 2013; Ogwumba and Okechukwu, 2014), which documented positive impacts of Fadama interventions on crop yields across Nigeria. More recently, Badiru (2024) and Daily Trust (2023) have also highlighted notable yield increases in rice production among project beneficiaries, underscoring the ongoing relevance of targeted agricultural support programs.

Table 1: Impact of Fadama III AF project on rice farmers' yield

Algorithm	Participants	Non-participants	Difference	Bias	t-stat
SM	2,572.25	1,481.75	1090.538	838.293	17.565
NNM	2,700.26	1,603.67	1096.523	404.067	17.230
RMM	2,603.17	1,511.76	1091.401	428.153	13.359

*Significant at P<0.01 probability level

Impact of the Fadama III AF Project on rice farmers' income

Table 2 presents the estimated effect of the Fadama III Additional Financing (AF) project on the income of rice farmers using three statistical matching algorithms: Simple Mean (SM), Nearest Neighbor Matching (NNM), and Radius Matching Method (RMM). The data show that participants consistently earned significantly higher income than non-participants across all methods, with all differences statistically significant at the 1% probability level (P < 0.01).

The Simple Mean (SM) approach estimates that participating farmers earned an average of ₦1,423,000, compared to ₦941,557.75 for non-participants. The income difference is ₦481,442.25, with a small bias of ₦48,144.25 and a t-statistic of 16.057, indicating a strong and statistically significant effect of project participation on income.

With the Nearest Neighbour Matching (NNM) method, participants earned ₦1,060,000 while non-participants earned ₦780,000, resulting in a difference of ₦280,000. The bias is ₦23,000, and the t-statistic of 17.501 confirms the reliability and significance of the estimate.

The Radius Matching Method (RMM) shows that participants had an average income of ₦1,020,000, compared to ₦661,557.00 for non-participants. The resulting income gain of ₦358,443.00 also reflects a meaningful impact, with a bias of ₦58,442.25 and a t-statistic of 17.549, again highly significant. The results confirm that the Fadama III AF project has been successful in improving rice farmers' livelihoods, thereby contributing to poverty reduction and enhanced rural welfare

These findings align with earlier studies by Tijani *et al*. (2014), who reported that Fadama-supported farmers consistently achieved higher incomes than non-participants due to better access to inputs, credit, and extension services. Recent studies, such as Badiru (2024) and Daily Trust (2023), also highlight the continued success of Fadama III AF interventions in boosting farmers' income and resilience.

Table 2: Impact of Fadama III AF project on rice farmers' income

Algorithm	Participants (₦)	Nonparticipants (₦)	Difference (₦)	Bias	t-stat
SM	1,423,000.00	941,557.75	481,442.25	48,144.25	16.057***
NNM	1,060,000.00	780,000.00	280,000.00	23,000.00	17.501***
RMM	1,020,000.00	661,557.00	358,443.00	58,442.25	17.549***

***Significant at P<0.01 probability level**

Constraints to participation in Fadama III AF project

The study revealed several constraints that hindered effective participation in the Fadama III AF project in the study area, with security challenges ranking highest (86%). Other significant constraints included inadequate land for large-scale rice production (68%), high technology costs (64%), insufficient start-up funds (57%), and climate change (52%). Notably, security challenges were a major concern, with farmers reporting destruction of boreholes by suspected herdsmen, disrupting water access. These findings align with Obianefor (2018), who identified similar challenges in dry season rice farming, including high input costs, bird attacks, and cattle menace. Addressing these constraints, particularly security challenges, is essential to enhance participation in the Fadama III AF project and improve rice production in the study area.

CONCLUSION AND RECOMMENDATIONS

The study assessed the impact of the Fadama III Additional Financing (AF) project on rice farmers' productivity and income, alongside the constraints affecting participation. Results from the Propensity Score Matching (PSM) models including Simple Mean (SM), Nearest Neighbor Matching (NNM), and Radius Matching Method (RMM) revealed a statistically significant and positive impact of the project on both rice yield and income. Participants recorded higher average yields and income levels than non-participants across all estimation methods, confirming the effectiveness of the Fadama III AF intervention in enhancing agricultural outcomes for rice farmers. However, despite these positive outcomes, the study also identified several key constraints limiting broader participation in the project. Security challenges, limited access to arable land, poor transportation infrastructure, high cost of technology, and inadequate funding were among the

top-ranked barriers. These findings highlight the need for comprehensive strategies that address both economic and structural limitations faced by farmers in rural areas

Table 3: Constraints to Participation in Fadama III AF project

Variables	Percentages	Rank
Security challenges	86.9	1st
Inadequate land for massive rice production	68.7	2nd
Inadequate access to means of transportation	64.5	3rd
High cost of technology	57.9	4th
Inadequate funds for start up	52.9	5th
Climate change	45.2	6th
Inadequate training of farmers on improved rice technology	38.2	7th
Late supply of inputs	34.7	8th
Lack of extension agents	28.6	9th
Inadequate market infrastructures	25.9	10th
Difficulty in obtaining loan	23.2	11th
Inadequate improved processing and milling machinery	21.2	12th

Multiple Response Allowed*

To enhance the effectiveness and inclusiveness of the Fadama III Additional Financing (AF) project, the study recommends targeted interventions to address the structural and institutional barriers faced by rice farmers. Strengthening rural security is critical to ensure farmers' safe access to land and project facilities. Improving land tenure systems and expanding access to cultivable land particularly for smallholder and female farmers will support increased participation and productivity. Equally important is the need for substantial investment in rural infrastructure, especially road networks and transportation systems, to reduce logistical bottlenecks that hinder access to inputs and markets.

Moreover, promoting affordable agricultural technologies and improving access to finance through farmer-friendly credit schemes will empower farmers to adopt modern practices. The government and development partners should prioritize capacity building by scaling up farmer training and increasing the number of extension agents to deliver timely and relevant advisory services. Additionally, timely supply of quality inputs and enhancement of processing and market infrastructure will ensure a more integrated and efficient value chain for rice production. These recommendations, if implemented, can significantly improve the sustainability and impact of agricultural development programs like Fadama III AF.

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FARMERS' PROPENSITY TO USE REALITY TELEVISION SHOWS FOR INFORMATION ON CLIMATE-SMART AGRICULTURE STRATEGIES IN SOUTHWESTERN NIGERIA

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ABSTRACT
Reality Television Show (RTS), an emerging variant of entertainment education, is renowned for its popularity amongst audiences all over the world, making it a great medium for conveying targeted educational messages to specific audiences. However, it is yet to be exploited for disseminating agriculture-related concepts such as Climate-Smart Agriculture (CSA). Therefore, this study examined farmers' propensity to use RTS for information on CSA strategies in southwestern Nigeria. A multi-stage sampling procedure was used to select 121 farmers for this study. Using interview schedule, data were collected on farmers' socioeconomic characteristics, sources of information on climate change and CSA, awareness of RTS, perceived constraints and propensity of its use for information on climate-smart agriculture strategies. Data were analysed using descriptive (frequencies, percentages, means) and inferential (PPMC) statistics at p=0.05. Farmers were mostly male (55.4%), smallholders (1.6±1.3ha) and aged 44.9±12.7years. Most of the farmers (66.0%) used television as a source of information, however, none of them (0.0%) were aware of any Nigerian RTS used to promote agriculture. The most severe perceived constraints to the use of RTS were poor network reception ($\bar{x}$=161.2), unstable power supply ($\bar{x}$=160.3), lack of sponsorship ($\bar{x}$=156.2), sustainability of the show ($\bar{x}$=154.6) and language barrier ($\bar{x}$=147.1). Majority of the farmers (69.4%) had a high propensity to use RTS for information on CSA. Farmers perceived constraints (r = -0.196) significantly correlated with their propensity to use RTS for information on CSA. Agricultural development communicators should focus on utilising this Entertainment-Education format in promoting climate-smart agriculture.
Keywords: Reality television show, Entertainment education, Climate-smart agriculture, Farmers.

INTRODUCTION

The impact of climate change is increasing all over the world, and agriculture remains one of the most vulnerable sectors to its effects. Africa's vulnerability to climate change, the resultant low food production and hike in food prices demand a comprehensive, sustainable approach that will mitigate the effects of climate change while supporting agricultural productivity. Climate-smart agriculture is an approach that seeks to meet this need through its three-pillar objective of building resilience of agricultural and food security systems to climate change at multiple levels, reducing greenhouse gas emissions from agriculture, including crops, livestock and fisheries and increasing agricultural productivity to support equitable increases in farm income, food security and development (Food and Agriculture Organisation, 2013). Climate-smart agriculture is not a specific technology or set of new universally applied practices such as organic agriculture, rather it entails location-specific assessment of the food security, adaptation and mitigation benefits of diverse agricultural technologies and practices in order to identify those which are most suitable for a given agro-ecological and socioeconomic situation, either at the micro level (individual farmer), community or national level (FAO, 2018). Studies have reported a low awareness of the principles of climate-smart agriculture among farmers in Nigeria (Terdoo and Adekola, 2014; Chinedum, Tambi and Bangali (2015)) and this necessitates the development of knowledge platforms that will support information and technology sharing with relation to climate-smart agriculture.

Narrative storytelling, which is at the core of entertainment-education (EE), has long been used to effectively disseminate social messages to target audiences. Through the infusion of educational contents with a good dose of entertainment, the EE genre has been used to inspire and spur audiences to action on specific issues. Various studies (Chinedum *et al*. 2015, Ladigbolu, 2017; Oresanya, 2021; Olajide *et.al*., 2022) have documented the use of EE to address health, agricultural, political and environmental issues.

An emerging variant of EE is the Reality Television Show, an entertainment genre that portrays unscripted, real-life situations (either current or historical events and scenarios) and features an unknown cast of individuals who are not professional actors but 'ordinary', everyday people (Roberts, 2015). It uses a host to run the show or a narrator to tell the story and/or set a stage of events about to unfold. Reality Television Show is notable for its popularity because of its perception as being 'real' than its scripted counterparts (dramas and soap operas). An example worth mentioning is the show *Big Brother* that is syndicated all the world. As such, it possesses tremendous potential for conveying educational messages to specific target audience. Reality television show is being used to disseminate messages on agricultural technologies and agribusiness in diverse parts of the world [*Farmers Apprentice* (UK), *Kwanda* (South Africa), *Don't lose the plot* (Kenya), *Shamba Shape Up* (Kenya, Tanzania and Uganda)]. However, the use of reality

television show for targeted messages especially in relation to climate action and climate-smart agriculture strategies is yet to be explored in Nigeria. Although previous studies (Ladigbolu, 2017, Oresanya, 2021; Olajide *et.al.*, 2022) have looked into the use of EE format and specifically soap opera for sourcing agricultural information, there is dearth of information on farmers' inclination towards the use of reality television shows for sourcing climate-smart agriculture strategies. Therefore, this study investigated farmers' propensity to use reality television show for information on climate-smart agriculture in southwestern Nigeria. Specifically, the study:

i. described the socio-economic characteristics of farmers;
ii. examined farmers' sources of information on climate change and climate-smart agriculture;
iii. ascertained farmers' awareness of the use of Reality Television Show for climate smart agriculture;
iv. ascertained farmers' perceived constraints to the use of Reality Television Show for information on climate-smart agriculture; and
v. established farmers' propensity to use Reality Television Show for information on climate-smart agriculture.

The study hypothesis is as follows: There is no significant relationship between farmers' perceived constraints and their propensity to use reality television shows for information on climate-smart agriculture.

METHODOLOGY

This study was carried out in the southwestern agro-ecological zone of Nigeria, which lies between longitudes 2º 31' and 6º 00' E and latitudes 6 º 21' and 8 º 37' N. The region has a total land area of 79, 665 km^2, consisting of six states—Ekiti, Lagos, Ogun, Ondo, Osun and Oyo—with an estimated population of 32,483,140 (National Bureau of Statistics, 2012). A multistage sampling procedure was used to select farmers through the Agricultural Development Programme (ADP) structure. At the first stage, three states (Oyo, Ogun and Lagos); representing 50% of the states in the region were purposively selected due to the predominance of media houses in these states. At the next stage, 50% of the ADP zones from each of the selected states were randomly selected, resulting in six zones. From the selected zones in each state, 20% of the blocks were randomly selected, giving a total of seven blocks. Furthermore, 20% of the cells in each selected block were randomly selected, making a total of ten extension cells. Afterwards, purposive sampling technique was used to select registered arable crop farmers who own or have access to television to give 201 farmers. At the final stage, 60% of the farmers were randomly selected resulting in 121 farmers.

Farmers' propensity to use reality television show was measured with 20-item statements generated from the key principles of an effective education posited by Kiptot *et al* (2016) as well as the entry points for initiating CSA practices analysed in terms of the three fundamental objectives of climate-smart agriculture (productivity, adaptation and mitigation) [FAO, 2018]. To obtain a quantitative measure of farmers' propensity, respondents were provided with response options of 'Very willing,' 'Partially willing,' and 'Not willing' assigned scores of 2, 1, and 0 respectively. The maximum score obtainable was 40, while the minimum score was 0. Afterwards, an index of scores was generated and mean score (29.5±10.9) was used to categorise the respondents as having either high or low propensity to use reality television show for information on climate-smart agriculture strategies. Data were analysed using both descriptive (mean, percentages) and inferential statistics (Pearson's Product Moment Correlation analysis).

RESULTS AND DISCUSSION

Farmers' socioeconomic characteristics

Results presented in Table 1 show that a greater percentage of the farmers were male (55.4%) and married (83.5%) with a mean age of 44.9±12.7 years, suggesting that the field of agriculture is still quite male dominated. This corroborates the report of Funom and Soyemi (2020) that most smallholder farmers in Niger State, Nigeria are male and married. There was an even distribution of farmers having primary education (33.1%) and secondary education (33.1%), with just a few having tertiary education (15.7%). In addition, 93.4% of the farmers travelled outside their home and community. Having a form of education as well as a predisposition to travel position farmers for better access to information and could incline them towards the use of Reality Television Shows. This is because cosmopoliteness has been strongly associated with adoption of new media. According to Funom and Soyemi (2020), cosmopolites who are more inclined to travel more extensively, particularly outside their locality, use more diverse media sources. Most of the farmers (62.0%) cultivated crops on less than 2 hectares of land with an average farming experience of 21.1±14.5 years. This is an indication that the farmers are smallholder farmers, as specified by Oresanya (2021) and Oresanya and Olajide (2023) but have appreciable farming experience.

Table 1. Distribution of farmers by their socio-economic characteristics

Characteristics	Category	Frequency	Percentage	Mean
Age	Less than 25 years	5	4.1	44.9±12.7
	25-35 years	26	21.5	
	36-45 years	32	26.4	
	46-55 years	36	29.8	
	Greater than 55 years	22	18.2	
Sex	Male	67	55.4	
	Female	54	44.6	
Marital status	Single	13	10.7	
	Married	101	83.5	
	Divorced	1	0.8	
	Separated	2	1.7	
	Widowed	4	3.3	
Level of education	No Formal Education	22	18.2	
	Primary Education	40	33.1	
	Secondary Education	40	33.1	
	Tertiary Education	19	15.7	
Cosmopoliteness	Never	8	6.6	
	Weekly	33	27.3	
	Monthly	33	27.3	
	Twice a Year	17	14.0	
	Once a Year	30	24.8	
Farm size	Less than 2 hectares	75	62.0	1.6±1.3 ha
	2-4 hectares	40	33.1	
	More than 4 hectares	6	5.0	
Years of farming experience	Less than 15 years	40	33.1	21.1±14.5 years
	15-25 years	44	36.4	
	Greater than 25 years	37	30.6	
	Total	**121**	**100.0**	

Farmers' sources of information on climate change and climate-smart agriculture

Figure 1 shows that over three-quarters of the farmers sourced their information from radio (84.3%), fellow farmers (81.0%), and family and friends (78.5%), while almost two-thirds used television (66.1%) and extension agents (66.1%) with very few (16.5%) using the Internet as their source of information. The implication of this is that even a considerable proportion of farmers regularly use television as their source of information, radio, fellow farmers, friends and family still represent the major means by which farmers obtain information on climate change and other agriculture-related issues. This is consistent with the findings of Badiru, Oyebode and Oladosu (2022) who reported radio, family members, friends and neighbours as farmers' major sources of information on agriculture. The considerable proportion of farmers making use of mobile phones (46.3%) as source of information could encourage the integration of multimedia platforms (such as radio shows, mobile phone messages, and Internet videos, e.g. YouTube) for the reinforcement of educational messages disseminated via reality television shows in order to enhance its effectiveness.

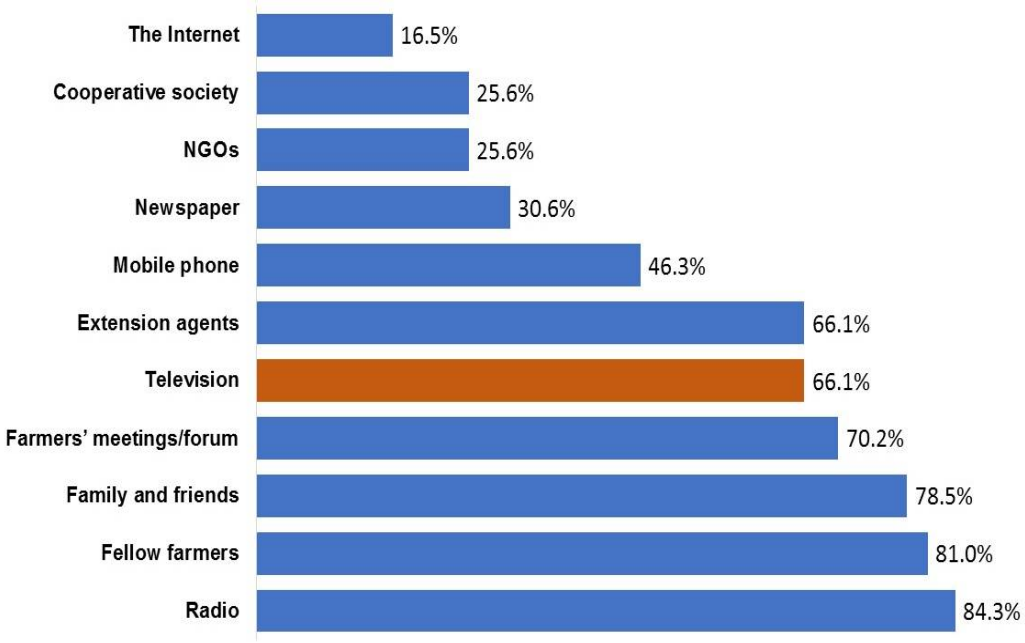

Figure 1. Distribution of farmers by sources of information on climate change and climate-smart agriculture

Farmers' awareness of the use of reality television shows for agricultural development

From the information in Table 2, it is clear that most farmers are not aware of reality Television Show and its use for promoting agriculture, as 69.4% of them had never heard of reality television show. A greater percentage (73.6%) had never watched any Nigerian reality television show and none (100.0%) knew of any Nigerian reality show used to promote agriculture. While reality television as an entertainment genre is not a recent phenomenon, its use as an EE medium for community and agricultural development is an evolving trend particularly in developing countries. Reality television shows, such as *Shamba Shape Up* and *Don't Lose the Plot* are already being used in East Africa to promote agriculture. These shows are aired both locally through indigenous television stations and globally via the Internet. Perhaps, the low usage of the Internet among the farmers could be a contributor to their low awareness.

Farmers perceived constraints to the use of reality television shows

As shown in Table 3, poor network reception ($\bar{x}$=161.2), unstable power supply ($\bar{x}$=160.3), lack of sponsorship ($\bar{x}$=156.2) and sustainability of the show ($\bar{x}$=154.6), and language barrier ($\bar{x}$=147.1) were regarded as severe constraints to the use of reality television show for sourcing information on climate-smart agriculture whereas uninteresting reality television series ($\bar{x}$=129.7) and using unpopular actors in the show ($\bar{x}$=81.0) were not seen as serious constraints. This is consistent with several studies (Attah *et al.*, 2020; Olajide and Ladigbolu 2022a; Olajide and Ladigbolu 2020b) that have identified erratic power supply, poor television signals, language barrier among other severe constraints hindering the use of television for sourcing agricultural information. Moreover, majority of farmers (60.3%) were of the opinion that the constraints to the use of reality television shows for sourcing information on climate-smart agriculture are high.

Table 2. Distribution of farmers by awareness of the use of reality television show for agricultural development

Variables	Category	Frequency	Percentage
Have you heard of reality television show?	No	84	69.4
	Yes	37	30.6
Where did you hear about the reality television show? *	Radio	6	5.0
	Television	30	24.8
	Newspaper	4	3.3
	Family and friends	3	2.5
	Internet	2	1.7
Since when have you known about reality television show?	Never	84	69.4
	6-10 years	21	17.4
	11-15 years	16	13.2
Have you ever watched a Nigerian reality television show?	No	89	73.6
	Yes	32	26.4
How often do you watch reality television show?	Never	89	73.6
	Rarely	12	9.9
	Sometimes	16	13.2
	Always	4	3.3
	Total	**121**	**100.0**
What kind of activities or development issue(s) did the Nigerian reality show you watched promote?	Entertainment	18	14.9
	Health	3	2.5
	Talent hunt	25	20.7
	Social values	6	5.0
	Agriculture	0	0.0
Do you know any kind of Nigerian reality television show used to promote agriculture?	No	121	100.0
	Yes	0	0.0
	Total	**121**	**100.0**

***Multiple responses (n=121)**

Table 3. Distribution of farmers by perceived constraints to the use of reality television show for climate-smart agriculture

Constraint	Not a constraint	Mild constraint	Severe Constraint	Weighted score
Poor network reception	10.7	17.4	71.9	161.2
Unstable power supply	15.7	8.3	76.0	160.3
Lack of sponsorship	15.7	12.4	71.9	156.2
Lack of sustainability of the show	13.2	19.0	67.8	154.6
Language barrier	15.7	21.5	62.8	147.1
Unrelatable climate-smart agricultural information	11.6	41.3	47.1	135.5
Unfavourable time of broadcast	9.9	47.1	43.0	133.1
Uninteresting RTV series	11.6	47.1	41.3	129.7
Unpopular actors in the show	49.6	19.8	30.6	81.0
Constraint category	**Frequency**	**Percentage**	**Mean ± SD**	**Index**
Low	48	39.7	12.6±4.5	0-12.5
High	73	60.3		12.6-18
Total	**121**	**100.0**		

Weighted mean score =139.9

Farmers' propensity to use reality television shows for information on climate-smart agriculture

Results in Table 4a show that more than two-thirds of the farmers (69.4%) had a high propensity to use reality television shows for sourcing information on climate-smart agriculture. As shown in Table 4b, most of the farmers were very willing to watch reality television shows to source information on climate-smart practices such as the use of higher-yielding, drought/salinity-tolerant, short duration crop for terminal drought escape (76.9%), rainwater harvesting and supplemental

irrigation of dry land crops (66.1%), improved scheduling and application of small-scale irrigation water (52.1%), effective soil fertility management(54.5%) and the use of renewable energy such as bioenergy and solar energy as energy sources for crop production (69.4%). The respondents were still willing to watch reality television shows even if they do not have a personal television (66.1%) on the condition that the shows are credible (78.5%), compatible with their cultural values (77.7%), stimulate group discussion with their fellow famers (81%) and the climate-smart strategies promoted are easy to use (75.2%). However, they were not willing to watch if the time of broadcast is not primetime (92.6%). This is consistent with the findings of Olajide *et al.;* (2022) that farmers listed proper timing of shows as one of the important factors considered when choosing a television agricultural show to watch. This suggests that any reality television shows targeted at the farmers must be aired during periods when farmers would be home from the farm.

Table 4a Farmers' level of propensity to use reality television shows for information on climate-smart agriculture strategies

Propensity category	Frequency	Percentage	Mean ± SD	Index
Low	37	30.6	29.5±10.9	0-29.4
High	84	69.4		29.5-58
Total	**121**	**100.0**		

Table 4b Distribution of farmers by their propensity to use reality television show for information on climate-smart agriculture strategies

Statements	Not willing	Partially willing	Very willing
How willing are you:			
To watch reality TV shows on climate-smart agriculture with other farmers if you don't have a personal television?	17.4	16.5	66.1
To watch a live series of a fellow farmer's farm being improved on?	12.4	17.4	69.4
To watch reality TV shows on climate-smart agriculture if fellow farmers don't use it?	9.9	33.9	56.2
To watch reality TV shows on climate-smart agriculture if it is compatible with your cultural values?	14	8.3	77.7
To watch reality TV shows on climate-smart agriculture if the time of broadcast is not primetime?	92.6	4.1	3.3
To watch reality TV shows on climate-smart agriculture if there is a way to ask further questions pertaining the topic of each episode?	13.2	10.7	76.0
To watch reality TV shows on climate-smart agriculture if it stimulates group discussion with your fellow farmers?	13.2	5.8	81.0
To watch reality TV series focused on addressing both climate-smart agriculture and non-farm issues affecting you?	12.4	19.0	68.6
To watch reality TV shows on climate-smart agriculture if it is humorous?	15.7	38.0	46.3
To watch reality TV shows for information on climate-smart agriculture if the episodes are short (within 20-30 minutes)?	12.4	24.8	62.8
To continue using reality TV shows to source information if the climate-smart agriculture promoted are easy to use?	11.6	12.4	75.2
To continue to watch if the climate-smart agriculture promoted is credible?	12.4	9.1	78.5
To watch reality TV shows for information on the use of higher-yielding, drought/salinity-tolerant, short duration crops for terminal drought escape?	10.7	12.4	76.9
To watch reality TV shows for information on rainwater harvesting and supplemental irrigation of dry land crops?	11.6	22.3	66.1
To watch reality TV shows for information on improved scheduling and application of small-scale irrigation water?	12.4	35.5	52.1
To watch reality TV shows for information on how to effectively manage soil fertility?	13.2	32.2	54.5
To watch reality TV shows on the use of on-farm trees as shelterbelts and windbreaks in preventing floods?	11.6	28.9	59.5
To watch reality TV shows for information on strategies that increase tree cover and reduce deforestation that causes climate change?	12.4	10.7	76.9
To use reality TV shows for information aimed at educating farmers on crop insurance?	11.6	38.8	49.6

Statements	Not willing	Partially willing	Very willing
To watch reality TV shows for information on the use of renewable energy such as bioenergy and solar energy as energy sources for your crop production?	11.6	19.0	69.4

Relationship between farmers perceived constraints and their propensity to use reality television shows for information on climate-smart agriculture

Table 5 shows that there was a negative correlation between farmers perceived constraints (r = -0.196) and their propensity to use reality television shows for information on climate-smart agriculture. This denotes that farmers are less enthusiastic about using this medium as long as the constraints remain formidable.

Table 5. Relationship between stakeholders perceived constraints and their propensity to use reality television shows for information on climate-smart agriculture

Variables	r-value	p-value
Propensity vs. farmers perceived constraints	-0.196	0.031

Field survey (2018) NS = Not significant (p> 0.05)

CONCLUSION

Based on the findings of this study, farmers in southwestern Nigeria are eager to use reality television shows for information on climate-smart agriculture despite their low awareness of its use in agricultural development. The extent of their willingness is contingent on their perceived constraints to the use of the medium. The challenges of poor network reception, unstable power supply, language barrier, lack of sponsorship and sustainability of reality television shows would have to be addressed for effective use of reality television shows for information on climate-smart agriculture.

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ASSESSMENT OF SOIL FERTILITY PRACTICES AMONG ARABLE CROP FARMERS IN OYO STATE, NIGERIA

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ABSTRACT
Sustaining soil fertility is critical for ensuring food and livelihood security for present and future generations. Inadequate Soil Fertility Management Practices (SFMP) among arable crop farmers have reduced crop yields and it threatens food production and farmers' livelihoods. This study assessed the SFMP among arable crop farmers in Oyo State. A four-stage sampling procedure was used to select 240 farmers and data were collected through questionnaires. Mean, charts, frequency counts, Chi square and Pearson Product Moment Correlation were used for analysis. The results showed that the majority of farmers were male (72.5%), married (83.3%) and Christian (75.3%), with an average age of 52 ± 9.42 years and a mean of 11± 5.23 years of education. Over half (51.7%) of respondents reported significant benefits from SFMP use. Utilisation of SFMP was high (50.8%) among farmers. Mulching ($\bar{x}$=2.72), minimum tillage ($\bar{x}$=2.59) and crop rotation ($\bar{x}$=2.40) were most adopted practices. Key benefits include increased crop yield ($\bar{x}$=194.9), higher income ($\bar{x}$=194.9) and reduced crop failure ($\bar{x}$=191.7). The main constraints were inadequate supply of inputs ($\bar{x}$=2.84), limited agricultural land ($\bar{x}$=2.79) and insufficient finance ($\bar{x}$=2.68). Years of farming experience (r = 0.183) significantly influenced SFMP use, with farming experience (β = 0.223) and educational attainment (β = 0.107) being key predictors of utilisation. It is recommended that policies and interventions should focus on improving farmers' access to inputs, finance and extension education to enhance sustained adoption of soil fertility practices.
Keywords: Soil Fertility, Soil Management Practices, Arable crops, Sustainable Agriculture, Crop yield.

INTRODUCTION
Effective soil management is fundamental to sustainable farming practices. According to Alemu (2019), a farmer's success largely depends on efficient soil management and the climatic conditions of the area. Proper soil management enhances the agricultural value of land and prevents environmental and soil deterioration, which can lead to unsustainable land use (Zaman, 2023).

The growing population in developing countries has intensified the demand for agricultural produce, driving land use and the adoption of technologies to increase agricultural output (Bellon-Maurel *et al*. 2022). However, these efforts to meet food, wood, and other resource demands often result in biodiversity destruction. Over-cropping and the use of inappropriate technologies and farming practices exacerbate unsustainable land use among farmers (Greentumble, 2016). Factors such as biodiversity loss, climate change, and land degradation, driven by population pressure, poverty and inadequate agricultural practices, pose significant challenges to sustainable production in developing countries (Mafiana *et al*. 2022).

Maintaining soil fertility is essential for food and livelihood security for current and future generations. Soil fertility management involves practices to preserve or improve soil fertility (Akinbode *et al.*, 2024). Traditionally, farmers managed soil fertility through crop rotation, bush fallowing, and shifting cultivation. However, due to reduced land availability from population growth and urbanisation, these practices are becoming less viable (Iderawumi *et al*. 2022). Contemporary soil fertility management techniques now include organic fertilizers, minimum tillage, and crop residue management (Havlin and Heiniger, 2020).

Historically, research primarily focused on determining the appropriate types and amounts of fertilizers for specific soil types and agroecological zones, emphasising external inputs and costly technologies. This approach often overlooked the knowledge and resources of farmers. In response, research has shifted towards Integrated Soil Fertility Management (ISFM), which combines traditional practices with external inputs like mineral fertilizers. Kugedera *et al*. (2023) highlighted ISFM techniques such as the use of manure, compost, crop rotation, intercropping, mulching, reduced tillage, and appropriate application of mineral fertilisers to sustainably improve soil fertility.

Despite Nigeria's substantial land area for arable crop production, which is critical for staple food production, productivity remains low (Nwuba and Okoli, 2022). To meet the food security needs of Nigeria's growing population, enhancing soil fertility management among arable farmers is essential. Therefore, this study assesses the extent of soil fertility management practices among arable crop farmers in Oyo State. Previous studies have largely focused on technical fertiliser recommendations, often neglecting the

socioeconomic factors, indigenous knowledge, and the integration of traditional and modern practices such as Integrated Soil Fertility Management (ISFM) (Ojediran *et al.*, 2023; Owolabi *et al*. 2024). This study fills this gap by investigating the level of utilisation, constraints, and benefits of soil fertility practices among arable crop farmers, providing evidence-based insights for targeted interventions and policy recommendations.

The specific objectives of the study were to; describe the socio-economic characteristics of the arable crop farmers; determine the extent to which respondents make use of soil fertility management practices; examine the benefits derived by respondents in the use of soil fertility management practices and identify constraints encountered by respondents to the use of soil fertility management practices

The hypothesis tested was: Ho1 – There is no significant relationship between selected socio-economic characteristics and the extent of soil fertility management practice usage

METHODOLOGY

The study was conducted in Oyo State, southwestern Nigeria, with Ibadan as its capital. The state covers a land area of approximately 28,454 square kilometers, situated between latitude 7°N and 9°N and longitude 3°E and 5°E, and is bordered by Kwara, Osun, Ogun, and the Republic of Benin. Oyo's tropical climate includes a wet season from April to October, with rainfall between 1,200 mm and 1,500 mm, and a dry season from November to March, with temperatures from 25°C to 35°C. Its vegetation ranges from tropical rainforests in the south to savannah in the north, supporting diverse agriculture, with crops such as maize, cassava, yam, plantain, and vegetables. Rivers like Ogun and Oba enhance irrigation and water supply. Oyo State's population exceeds 8 million, primarily Yoruba-speaking, with rural areas focused on subsistence and commercial farming, while urban centres drive trade and services. The state's extensive agricultural activity and varied farmer population make it a fitting location for examining soil fertility management practices, addressing both land use intensification challenges and opportunities for adopting advanced agricultural techniques.

Data for this research were gathered through the use of structured questionnaire. Oyo State comprises thirty-three Local Government Areas (LGAs), which have been officially organised into four Agricultural Zones under the Oyo State Agricultural Development Programme (OYSADEP). These zones are Ibadan/Ibarapa, Oyo, Saki/Iseyin and Ogbomoso. For administrative efficiency, the Ibadan/Ibarapa zone consists of fourteen LGAs/Blocks, while Oyo and Ogbomoso zones each have five LGAs/Blocks, and the Saki/Iseyin zone comprises nine LGAs/Blocks.

In the first stage of the sampling procedure, a simple random sampling technique was employed to select 70% of the four agricultural zones in the study area. This resulted in the selection of three zones. In the second stage, two blocks were randomly selected from each selected zone were randomly selected, totaling six blocks. In the third stage, one cell was selected from each of these blocks, resulting in six cells. Subsequently, simple random sampling was used to select two villages from each cell, from which 20 arable crop farmers were randomly chosen per village. This process yielded a total sample size of 240 respondents.

Data were obtained using a structured questionnaire administered through face-to-face interviews to collect information on variables like socioeconomic characteristics, extent of use of Soil Fertility Management Practices, benefits derived, constraints faced in the use of SFMP in the study area. Frequency, percentage, standard deviation and the mean. Chi-square and PPMC were used to analyse the data. Benefits derived by respondents were measured on a 3-point Likert- type scale of not at all, to a lesser extent and a larger extent with scores of 0, 1 and 2 assigned respectively. The mean score was computed and used to categorise benefits derived into high and low categories using the 'above and below the mean' criterion. Constraints to the adoption of soil fertility management practice was measured using three point scale of 'Not a constraint', 'minor constraint' and 'major constraint' with scores of 0, 1, and 2 respectively. A weighted score was obtained for each constraint option and used to identify the major constraints affecting the adoption of soil fertility management practices in the study area. The extent of use of soil fertility management practices was measured as not at all, to a lesser extent and a larger extent, with scores of 0, 1, and 2 assigned respectively. An index score of the level of use of soil fertility management was computed and used to categorise the level of utilisation as either high or low.

RESULTS AND DISCUSSION

Socioeconomic characteristics of the respondents

The age distribution of the respondents as shown in Table 1 indicates that 35% were between the age range of 50 and 59 years, 29.2% were between the age of 40 and 49 years and 28.3% were between the age of 60 and 69 years. With the mean age at 53±8.71 years, majority of the respondents were in their active and productive age during which they could withstand the rigor required for farming operations. This result is in line with the findings of Ashimolowo *et al.* (2023) that people in their active ages tend to perform their tasks effectively and efficiently as they painstakingly endure the stress

and rigors of exerting and fatigue-laden assignments. Farming activities was dominated by men as 72.5% of the respondents were males while females accounted for the remaining 27.5%. Which implies that the majority of crop farmers were male. The results also show that 83.3% of the respondents were married, 12.5% were divorced and 3.3% were single. This indicates that the majority of the farmers that were involved in arable crop production were married. This could be because this category of people has more responsibilities than the unmarried, so the need to be involved in income-generating activities becomes necessary to meet up with the challenges of meeting family responsibilities. Results further reveal that 94.2% attained between 5 and 15 years of formal education, while 5% attained between 16 and 26 years of education. With the mean years of formal education at 7.6±4.76 years, it shows that majority of the respondents had fair level of formal education and were fairly literate. The literacy level of respondents could enhance better understanding of the importance of SFMP. Oyelere *et al*. (2020) stated that the literacy level of the respondents is a very important variable as it influences the ability to properly comprehend new techniques and methods required to bring about positive changes to the knowledge, attitude, skill and aspiration of the respondents. It is expected that they perform and operate more effectively, efficiently and know more about natural resources and environmental sustainability than those who had no formal education. Most (84.2%) of the respondents had farming as their primary occupation, which is a characteristic of the rural environment.

Table 1: Socioeconomic characteristics of the respondents.

Variable	Frequency	Percentage	mean
Age			
30-39	16	6.7	5±8.71
40-49	70	29.2	
50-59	84	35.0	
60-69	68	28.3	
>69	2	0.8	
Sex			
Male	174	72.5	
Female	66	27.5	
Marital Status			
Married	200	83.3	
Single	10	4.2	
Divorce	30	2.5	
Years of formal Educational			
1-6	120	50.0	7.6±4.76
7-12	86	35.8	
>12	34	14.2	
Primary Occupation			
Farmers	202	84.2	
Traders	26	10.8	
Civil servant	12	5.0	
Tribe			
Christianity	176	73.3	
Islamic	62	25.8	
Tribe			
Yoruba	216	90.0	
Hausa	22	9.2	
Igbo	2	0.8	
Monthly Income			
30,000-70,000	216	90.0	55,600.00±15527.36
71,000-111,000	10	8.3	
112,000-120,000	2	1.7	
Farming Experience			
1-10	88	36.7	24±11.12
11-20	111	42.2	
>20	41	17.1	

Source: Field Survey, 2023.

More (73.3%) respondents were Christians while 25.8% practice Islam and 8% were traditional worshipers. This implies that Christianity was the dominant religion in the study area with Yoruba (90.0%) as the major tribe. The table also shows that 90% of the respondents earn between ₦30,000 and ₦70,000 monthly, 8.3% earn between ₦71,000 and ₦111,000 and 1.7% earn between ₦112,000 and ₦120,000 with monthly mean income of 55,600 ±15527.36. This result suggests a high income for respondents, and it suggests that respondents were able to sustain their families. The mean years of experience was 24±11.12 years, suggesting that members were more experienced in their livelihood activities, which may have broadened their knowledge and put them in good position to adopt and make use of SFMP to improve their productivity.

The extent of use of soil fertility management practices by the respondents

The extent of use of Soil Fertility Management Practices (SFMP) among respondents indicates that mulching is the most frequently employed method, with a majority of respondents (75.0%) using it every season, resulting in a mean score of ($\bar{x}$ = 2.72). This suggests that mulching is highly favoured due to its effectiveness in maintaining soil moisture and improving soil fertility. The second most commonly used practice is zero tillage, with a mean score of ($\bar{x}$ = 2.42), indicating that over half of the respondents (51.7%) of the respondents employed this method every season. Minimum tillage helps in reducing soil erosion and preserving soil structure, making it a vital practice in sustainable farming.

Crop rotation ranks third in usage with a mean score of ($\bar{x}$ = 2.34), where 62.5% of the respondents adopt this practice once every two seasons. This method is essential in preventing soil depletion and managing pest and disease cycles. Ridging ($\bar{x}$ = 2.28), is the fifth most used practice, though 57.5% applied it only once in two seasons. The consistent use of these SFMPs reflects their importance in enhancing soil fertility, although the varying levels of adoption suggest that some practices may be less accessible or require more resources, influencing their extent of use among the farmers. The data in Table 5 was further summarised to high and low extent of use. It reveals that majority (50.8%) had a high extent of use of SFMP while 49.2% had a low extent of use of SFMP.

Table 2 Distribution of respondent by their extent of use of Soil Fertility Management

SFMP	Not at all	Once in two seasons	Every season	Mean	Rank
Mulching	3.3	21.7	75.0	2.72	1st
Minimum tillage	10.0	38.3	51.7	2.42	2nd
Crop rotation	1.7	62.5	35.0	2.34	3rd
Ridging	7.5	57.5	35.0	2.28	5th
Mineral fertilizer	5.8	65.0	29.2	2.23	4th
Bush fallowing	1.7	75.0	23.3	2.22	6th
Organic manure (Poultry, cow and decomposed plants)	6.7	68.3	25.0	2.18	7th
Use of cover crop	5.8	76.7	17.5	2.12	8th
Planting of leguminous crop	9.2	70.8	20.0	2.11	9th
Organic manure and mineral fertilizer	20.0	50.0	30.0	2.10	10th
Compost	11.7	73.3	15.0	2.03	11th

Source: Field Survey, 2023

Table 3 Distribution of respondents based on the Level of use of soil fertility management practices

Level of use of SFMP	Frequency	Percentage
Low	118	49.2
High	122	50.8
Total	240	100.0

Source: Field survey, 2022

Benefits derived from the use of soil fertility management practices

The most significant benefit derived by respondents from the use of Soil Fertility Management Practices (SFMPs) was an increase in crop yield (194.9). This suggests that the implementation of SFMPs is highly effective in boosting agricultural productivity, which is critical for both subsistence and commercial farmers. The increase in crop yield directly translates to an increase in income (194.9), which also ranked highest among the benefits (Table 4). This outcome reflects the economic advantage of adopting SFMPs, as higher crop yields typically lead to greater financial returns for farmers, enabling them to improve their livelihoods.

Furthermore, the reduction in crop failure (191.7) as a key benefit emphasises the role of SFMPs in enhancing crop resilience and stability, reducing the risks associated with unpredictable climatic conditions and poor soil health. This benefit is particularly important in ensuring consistent agricultural output, which is vital for food security and income stability. Enhancing family food security (184.9) was also highlighted as a major benefit, underscoring the impact of SFMPs on household nutrition and well-being. By securing adequate food production, these practices contribute to reducing hunger and malnutrition among farming families. These findings align with the research of Aghabeygi *et al.* (2024), who also found that the use of soil management practices, such as mineral fertilizers, crop rotation, and organic manures, significantly increased farming productivity.

Table 4 Distribution of the respondent based on the benefits derived from the use of SFMP

Benefits derived	Larger extent	Lesser extent	Not at all	Weighted score	Rank
Increase in crop yield	95.8	3.3	8.0	194.9	1st
Increased income	95.8	3.3	8.0	194.9	1st
Reduce crop failure	91.7	8.3	0.0	191.7	2nd
Enhance family food security	85.8	13.3	8.0	184.9	3rd
Improve the health of soil	85.0	13.3	10.0	183.3	4th
Promote sustainability of farmland	79.2	20.8	0.0	179.2	5th
Reduce misuse of harmful chemicals on soil	70.8	28.3	8.0	169.9	6th
Encourage the involvement of youth in farming	59.2	35.8	5.0	154.2	7th
Reduce environmental pollution	6 1.7	35.0	3.3	153.6	8th
Reduce poverty	31.7	51.7	16.7	115.1	9th

Source: Field Survey, 2023

Constraints encountered by respondents in the use of soil fertility management practices

The analysis of constraints faced by respondents in the use of Soil Fertility Management Practices (SFMP) as shown on Table 5 reveals that the most significant barrier is the inadequate supply of necessary inputs ($\bar{x}$ = 2.84). This highlights the substantial difficulty farmers face in accessing essential inputs required for effective soil fertility management. This is followed by inadequate availability of agricultural land ($\bar{x}$ = 2.79), indicating the pressure on land resources, suggesting that many farmers may struggle with land scarcity. Inadequate finance ($\bar{x}$ = 2.68) emerges as the third most critical constraint. Limited financial resources can significantly hinder farmers' ability to invest in necessary soil management practices, leading to reduced soil fertility and lower crop yields. The implication is that without sufficient funding, farmers may not adopt the necessary practices to maintain soil health. This aligns with the findings of Arifalo and Ilesanmi (2022), who identified inadequate funding as a major constraint faced by farmers in adopting sustainable soil management practices in Oyo State, Nigeria.

Table 5 Distribution of respondents based on constraints encountered to the use of SFMP

Constraints	Mean	Rank
Inadequate supply of necessary inputs	2.84	1st
Inadequate availability of agricultural land	2.79	2nd
Inadequate finance	2.68	3rd
Shortage supply of human labour	2.56	4th
High cost of soil management practices	2.52	5th
Transportation problem of fertility inputs	2.02	6th
Lack of knowledge of SFM utilisation	1.58	7th

Source: Field Survey, 2023

Relationship between respondents' socio-economic characteristics and extent of use of Soil Fertility Management Practices

Years of farming experience ($r = 0.183$, $p < 0.05$) shows a significant positive correlation with the extent of SFMP usage. This implies that farmers with more experience are more likely to employ effective soil fertility management practices, likely due to their accumulated knowledge and practical understanding of the benefits. This supports the findings of Daudu *et al*. (2017), that farmers with more years of farming experience tend to adopt more soil fertility management practice than those with few years of experience. Other variables such as sex, marital status, religion, age and educational attainment do not have a significant association with the extent of SFMP usage. This suggests that these demographic factors do not play a crucial role in

determining how frequently or extensively farmers adopt soil fertility management techniques.

Table 6: Chi-square and correlation analysis between some selected socio-economic characteristics and the extent of soil fertility management practices

Variable	Chi-square value	df	p-value	r- value
Sex	0.828	1	0.363	
Marital status	0.362	2	0.164	
Religion	2.957	2	0.228	
Age			0.110	0.147
Educational attainment			0.707	0.351
Years of farming experience			0.047	0.183
Monthly income			0.457	-0.69

Source: Field Survey, 2020

CONCLUSION AND RECOMMENDATIONS

The study underscores the importance of Soil Fertility Management Practices (SFMPs) in boosting agricultural productivity, economic stability, and food security. Key benefits of SFMPs include increased crop yield, increased income, reduced crop failure and improved family food security, demonstrating their role in sustainable agriculture. However, challenges such as inadequate inputs, limited land access, financial constraints, and labour shortages hinder the full utilisation of SFMPs. To overcome these barriers, it is recommended that the Ministry of Agriculture improves input availability, the Land Use Committee enhances land access, financial institutions offer better credit facilities, and agricultural departments invest in machinery and farmer education on SFMPs.

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HONEY MARKETING AND DISTRIBUTION CHANNELS AMONG RURAL BEEKEEPERS IN OYO STATE, NIGERIA

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ABSTRACT
The study assessed honey marketing and distribution channels among rural beekeepers in Oyo, State, Nigeria. A two-stage sampling procedure was used to select 235 respondents for the study. The primary data was obtained through interview schedule. The obtained data were analysed using descriptive statistics frequency counts, means and percentages. The results revealed that the mean age of the respondents was 55.8 years. Most (58.7%) of the respondents had formal education of 16 years and above. The average household size was 5 persons. It was further revealed that the main source of marketing information was fellow beekeepers (49.4%), followed by association (45.5%). Also, 98.3% of the respondents sold their honey to the consumer while 66.0% do not package the honey before selling. Respondents (100.0%) expressed their willingness to embrace honey value addition. It is therefore concluded that most of the beekeepers sold their honey directly to the consumers at the farm gate, and the main source of marketing information is through other beekeepers. Training of beekeepers on value addition by extension agents and other stakeholders was recommended.
Keywords: Honey, farm gate, channel, value-addition, economic-diversification.

INTRODUCTION

Beekeeping is an age-long practice known in many areas of the world. It started in the Middle East and today, many farmers in urban and rural areas practice beekeeping alongside their farming and non-farming occupations. There are diverse reasons for keeping bees; one of the main reasons is an economic diversification strategy (Ibrahim *et al*., 2021 and Patel *et al*., 2021). Thus, it contributes to the livelihoods and economic sustainability of the practitioners. Beekeeping is a very profitable and viable enterprise (Ugbe *et al*., 2024). Honey production is the main reason why most farmers keep bees in Nigeria (Feketéné *et al*., 2024). Alabi and Anekwe (2023) stated that honey production is still at its developmental stage in Nigeria, though its awareness dates to early 1950s.

Honey is the natural sweet substance produced by honeybees through the conversion of nectar collected from plants. Bees collect, process, deposit, and stock the produced honey in the cell of honeycombs to mature (Yang *et al*., 2025). It contains sucrose (fructose and glucose), vitamins, minerals and pollen, together with small amounts of miscellaneous compounds. The composition varies; it is a subject of which plant the bees collected the nectar from. It is worth knowing that honey is being produced through regurgitation process by the worker division of the bees. Other products of bees are propolis, royal jelly, bee wax, pollen grain, bee venom among others.

Typically, marketing and distribution of agricultural produce follow different channels depending on the nature of the produce. The channels are the established paths that produce follows from the producers to the end-users. Mostly, there are three possible paths between producers and the end-users (producers – end-users, producers – wholesalers, and producers – retailers). This distribution channel is significant due to its roles in the smallholders entering or remaining in the production system (Villacis *et al.*, 2024).

As earlier established, involvement of farmers in beekeeping is mostly based on economic interest, however, marketing channels play a pivotal role in the realisation of this interest. It significantly affects income of the farmers (Mmbando *et al*. 2015). Hence, careful selection is being made in the choice of the channel. There are different factors that determine the choice of channel to be used by farmers. These include – characteristics of the markets, channels' ability to reach wider end-users, cost of transportation, proximity, availability of off-takers, trustworthiness of the actors and market familiarity. Other factors include farmers' level of education and market related information (Magesa *et al*., 2014; Mmbando *et al*., 2015; Romero and Wollni, 2018; Pham *et al*., 2019; Mgale and Yunxian, 2020).

Although, honey production is known to the country for long period of time, data relating to the quantity, methods of production, quality of the honey and distribution channels are still scanty. Also, there is glaring fact that there is a lack of confidence in the quality of honey being circulated and marketed in the country. Thus, it on this basis that this work assessed the distribution of honey from the production angle. Therefore, the study identified the socio-economic characteristics of beekeepers and the sources of marketing information. Also, the marketing and distribution channels utilised among the respondents and the practices of value addition were examined.

METHODOLOGY

The research was conducted in Oyo State, Nigeria. The State is one of the six states in southwest Nigeria. It is situated on the longitude 6.5^0 and 9^0N, and between latitude 3^0 and 5^0. The State estimated population is around 8 million (National

Population Commission, NPC, n.d.). It has its capital at Ibadan. The State experiences rainy and dry seasons with relative humidity that favours agricultural activities. The wet season is usually between April and October while the dry season is between November and March. The State has average daily temperature between 25^0 C and 35^0C. Oyo State is one of the major producers of honeybee in Nigeria alongside other agricultural activities. Beekeepers in the state usually keep *Apis Mallifer* species (Azeez, 2022).

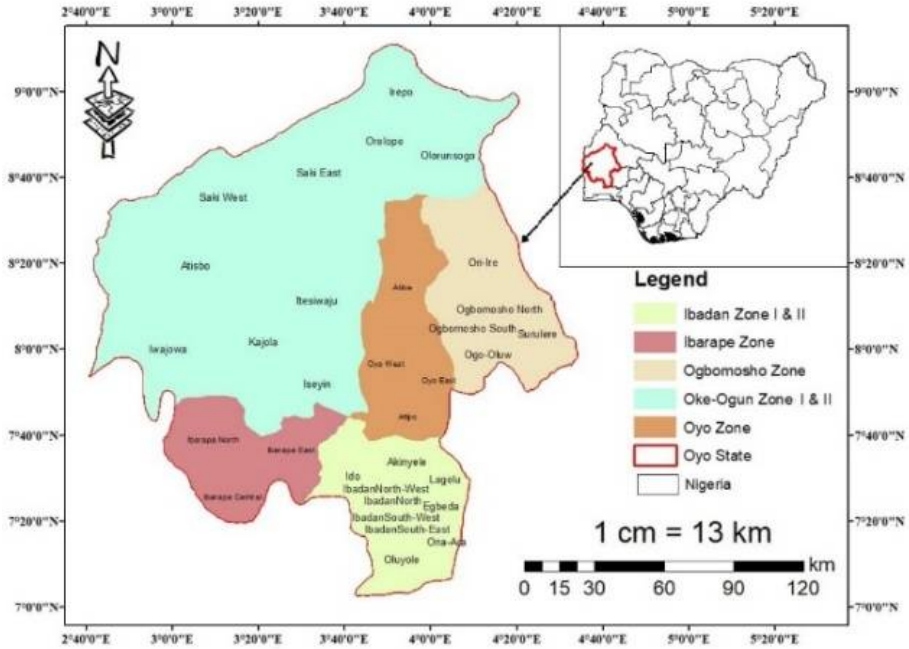

Figure 1: Map of Oyo state showing the beekeepers' zones

Sampling procedure and sample size

The population of the study comprised all the active members of the Federation of Beekeepers' Association of Nigeria (FEBKAN), Oyo State. Two-stage sampling procedure was used in the selection of the respondents. The first stage involved purposive selection of all the seven zones of FEBKAN because of the presence of active beekeepers in all the zones, while the second stage involved random selection of 50% of registered active members from each zone. Thus, 235 beekeepers were selected across the zones (Oke-Ogun I = 48, Oke-Ogun II = 42, Ibarapa = 25, Oyo = 47, Ibadan I = 23, Ibadan II = 25 and Ogbomoso= 25). Data were elicited through interview schedule and analysed using descriptive statistics – frequency counts, percentages, mean. Respondents' honey marketing information sources were obtained with three (3) possible sources with responses of selected/yes = 1 and not selected/no = 0. The frequency and percentage of sources selected by the respondents were computed. The approach was used for the marketing and distribution channels as well; Yes = 1 and No = 0.

RESULTS AND DISCUSSION

Socioeconomic characteristics

The results revealed that the mean age of respondents was 55.8years. Table 1 reveals that most (34.5%) of the respondents were within 46 – 55 years age group. The age distribution suggests that the respondents were still in their middle age and capable of active participation in beekeeping activities. This is in line with the findings of Kareem (2016) and Usman *et al.* (2016) where it was observed that the respondents were within the middle ages. Similarly, this is corroborated by the view of Kamau *et al.* (2018), where it was revealed that majority of the respondents were middle aged. The results established that 76.6% of beekeepers in the study area were male while 23.4% were female. The observation is in line with the findings of Famuyide et.al. (2014), Usman et. al. (2016) and Kareem (2016) where it was observed that male dominated beekeeping activities. It can be deduced that the nature of the beekeeping activity informed the gender disparity. Furthermore, 88.9% of the beekeepers were married. This is inconsonant with the findings of Kareem (2016) and Usman et.al. (2016) where many of the respondents were married. More so, it was revealed that most (58.7%) of the respondents had tertiary education, while only 1.7% had no formal education. Majority (46.8 %) of the respondents practiced beekeeping for health and

social reason, while 41.7 practiced it for economic reason.

Table 1: Socio-economic Characteristics of the Respondents (n = 235)

Variables	Classification	Means	Frequency	%
Age (Yeas)	35 – 45		46	19.6
	46 – 55		81	34.5
	56 – 65	55.8	69	29.4
	66 – 75		39	16.6
Gender	Male	-	180	76.6
	Female		55	23.4
Marital Status	Married	-	209	88.9
	Unmarried	-	26	11.1
Educational Levels	No formal		4	1.7
	Primary		41	17.4
	Secondary		52	22.1
	Tertiary		138	58.7
Household size	1 – 5	5	151	64.3
	6 – 10		71	30.2
	≥11		13	5.5
Hives owned	1 – 20	30	113	48.1
(Apiary size)	21 – 40		80	34.0
	41 – 60		29	12.3
	61 – 80		10	4.3
	81 – ≥100		13	1.3
Years of Experience	1 – 5	12	37	15.7
	6 – 10		72	30.6
	11 – 15		36	15.3
	16 – 20		86	36.6
	≥ 21		4	1.7
Income (N) from	≤50, 000	125,000	115	49.0
Beekeeping Only	50,001 – 100,000		13	37.9
	100,001 – 150,000		89	5.6
	150,001 – 200,000		7	3.1
	≥200,001		11	4.7
Reason for	Income	-	98	41.7
Keeping Bee	Health/Social		110	46.8
	Hobby		27	11.5

Sources of marketing information

Table 2 reveals that the main (49.4%) source of marketing information was fellow beekeepers, followed by association (45.5%). Whereas other sources like Agricultural Development Project (ADP) were not adequately served as sources of information to the respondents. This indicate that most of the information on beekeeping were given through fellow farmers. Whereas government institution like ADP was not adequately disseminating agricultural information. The finding is in consonant with the findings of Azeez (2022) and Kareem (2016) where it was observed that beekeeper source their information mainly from fellow beekeepers.

Table 2: Sources of Marketing Information

Source of Information	Frequency	Percent
Fellow beekeepers	116	49.4
Government	12	5.1
Association	107	45.5
Total	**235**	**100**

Marketing channel utilised

Table 3 indicate that most of the respondents sold their hives products directly to the consumers while only 1.7% sold to the retailers. There is ready market for honey products and most customers do not even get enough honey. More so, most of the respondents preferred to sell to consumers because of the quantity produced which is small. The production

rate is minimal, and it can be consumed by people within the locality where it is being produced. Likewise, consumers preferred to by directly from the beekeepers to ensure the originality of the honey. Furthermore, the Table indicate that all the beekeepers processed their honey and other hives products before selling to the consumers. Honey is sold in semi-refined stage by 89.4% of the respondents, while 10.6% of the respondents sold their product as packaged honey. This indicates that most of the beekeepers do not add value to their product. Also, 66.0% of the respondents do not package their product while 34.0% of the respondents packaged the product before selling. The Table also show the willingness of the respondents to be involved in value addition, as all the respondents showed their readiness to adopt value addition initiatives.

Table 3: Marketing and Distribution Channels

Channels	Frequency	%
Consumers	231	98.3
Retailers	4	1.7
Processing		
Yes	235	100
Selling forms		
Semi-Refined	210	89.4
Packaged honey	25	10.6
Packaging		
Yes	80	34.0
No	155	66.0
Willingness on value addition		
Yes	235	100

CONCLUSION AND RECOMMENDATIONS

Based on the findings of the study, it is concluded that most of the beekeepers were within active ages. The beekeeping is predominantly dominated by male. Most of the beekeepers sold honey and other hives products directly to consumers who were referred by fellow beekeepers. Also, the primary source of honey marketing information is through other beekeepers. Similarly, large proportion of the honey was sold out without value addition or packages. Most of the respondents were willing to learn how to carry out value addition. It is therefore recommended that government institutions should be developed to disseminate timely and credible agricultural information. Likewise, training on value addition and packaging should be organised for the beekeepers in the study area by relevant institutions.

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EFFECTS OF LIVELIHOOD INCOME DIVERSITIFICATION ON FOOD SECURITY STATUS AMONG FARMING HOUSEHOLDS IN KATCHA LOCAL GOVERNMENT AREA OF NIGER STATE, NIGERIA

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ABSTRACT
The study assessed the effects of livelihood income diversification on food security status among farming households in Katcha Local Government Area of Niger State, Nigeria. Five wards were purposively selected using multistage sampling procedures and eighty respondents were selected for the study. Data was obtained using questionnaires and analysed using descriptive statistics and logit regression model. The study revealed that the respondents had a mean age of 35 years. They were young and active, ready to contribute towards household food security in the study area. About 93.8% were male and 21.39% female with 95.0% married with mean household size of 15 persons. The respondents were educated with 69% ranging from primary, secondary and tertiary education. The mean farm size was 1ha with 75% acquired through inheritance and the mean annual income was ₦2,074,999:00K. The livelihood income diversifications were Pottery 90.0%, hunting 60.0% and trading 57.5%. The food security status was 92.5% food secure while 7.5% food insecure. The analysis further revealed that the determinants of food security that were positive and significant at 5% include: educational level, annual income; farm size and livelihood income diversification. Thus, household size was significant but negatively at 5%. This means as the household size increases there will be decreases in household food security. The constraints to income diversification were cultural norms 91.25%, lack of credit facilities 88.75% and lack of market 78.75%. The respondents should form cooperative societies, and Government should establish extension stations in the rural areas were offered as recommendations.
Keywords: Livelihood, Diversification, Income, Food, Security

INTRODUCTION

The concept of food security has evolved over the years and is now considered to be more than just access to food. To measure the quality of any food taken, there are classes of essential nutrients, which must be combined in appropriate proportion to ensure an adequate food intake. These include carbohydrates, proteins, fats and oil, vitamins and minerals (Ifeoma and Agwu, 2014). Food is a basic necessity of life and is regarded as the basic means of sustenance. Therefore, an adequate food intake in terms of quantity and quality is key to a healthy and productive life. Foods serve as important vehicles for transporting nutrients into the body and bringing about a healthy state, hence the need for food to be taken in the right quality and quantity. According to the Food and Agriculture Organisation (FAO, 2018), food security exists when all people, at all relevant times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for a vibrant, active and healthy life.

In Nigeria, the most populous country in Africa, households are food insecure, especially the rural farming households. The nation has the biggest number of hungry individuals or food unreliable families in the entire West-Africa sub-area and is positioned 103rd out of 119 countries on the Global Hunger index of 31.1 in 2018 (FAO, 2018). Several evidence have suggested that majority of the world's food insecure live and work in the rural areas (IFAD, 2011). This indicates that reducing rural food insecurity is very important to reducing overall food insecurity. Given the role of agriculture in the Nigerian economy, food insecurity and poverty could be attributed to the poor performance of the agricultural sector, which in turn, creates problems of food availability and accessibility at the household and national levels (Oluwatayo,2012). Food insecurity status in Nigeria is multifaceted, arising from climate change, poor agricultural practices, and inadequate infrastructural development. Additionally, insecurity has further worsened the situation by disrupting food supply chains and increasing food prices.

Nigeria has great agricultural potentials and abundant natural resources for all round development; however, most indicators of the economic well-being are still very low. Food insecurity and poverty are still widespread across different parts of the country. Food insecurity situation in Nigeria is worsening with the passage of time due to the wide gap between the national supply and demand for food (Salawu and Hassan,2021). Food security is a major challenge that affects many rural communities, particularly farmers who rely on agriculture for their livelihoods. Katcha Local Government Area (LGA) is one of the communities

that faces food security challenges. It is on this premise that the study assessed the effects of livelihood income diversification on food security of farming households in Katcha Local Government Area of Niger State, Nigeria. The specific objectives were to: describe the socio-economic characteristics of farming households, identify the livelihood income diversification, determine the food security status of the farming households, examine the determinants of food security and identify the constraints to livelihood income diversification.

METHODOLOGY

The study was conducted in Katcha Local Government Area, Niger State. The area is located between latitudes 8^0 37" N 6^0 4E and longitudes $7^0$35'' N, 9^0 29'' E. This area covers 1,681km^2 and has a population of over 122,176 people and 139 districts. It is a Nupe kingdom which comprises of 10 wards namely: Katcha, Edotsu, Gbakogi, Bakeko, Sidi Saba, Dzwafu, Badeggi, Bisanti, Essa and Kateeregi. Other minority tribes include Hausa, Yoruba and Igbo among others. The climate is influenced by the Sudan-Sahel ecological zone, with variations including droughts, dust storms, and floods. It experiences a tropical climate characterised by seasonal rainfall, high temperatures, wind, and humidity. There are two distinct seasons namely wet and dry seasons, with the wet season from April to October and the dry season from November to March. Temperature fluctuations are minimal, with a maximum of 33°C in March and a minimum of 25.6°C in December. The region is mainly agrarian and relies heavily on rainfall, with an annual average of 1095 mm. The crops cultivated in the area includes rice, groundnut, sorghum, melon and cassava (Ahmed, 2012).

Multistage sampling procedures were used to select respondents for the study. In the first stage five wards namely: Katcha, Dzwafu, Essa Badeggi and Bakeko were purposively selected based on the number of farmers in each ward (Onoja *et al.*,2022). The second stage involved the selection of two villages from each of the selected wards to make a total of ten (10) villages. In the third stage, convenience selection of eight (8) farming households from the selected villages to make a total of eighty (80) farming households as the sample size for the study (Table 1).

Table 1: Sample size and location of the study area

SN	Wards	Villages	Number of Farmers
1.	Katcha	Echegi, Katcha	16
2.	Dzwafu	Egbanti, Dzwafu	16
3.	Essa	Dagba, Essa	16
4.	Badeggi	Babah, Badeggi	16
5.	Bakeko	Mudagu, Bakeko	16
		Total	**80**

Source: Field survey data, 2023

Both Primary data and secondary information were used for this study. A structured questionnaire was used to obtain primary data with the help of extension agents from Katcha Local Government. Primary data were obtained on socioeconomic characteristics of the respondents, livelihood income diversification, food security status, determinants of food security and constraints to livelihood income diversification. The secondary information on the number of farmers in each ward using journal.

Descriptive statistics such as frequency, percentage and mean were used to achieve objectives i, ii, and v., Food Security Index (FSI) was used to achieve objective iii and Binary Logit Regression was used to achieve objective iv.

Food Security Index (FSI): The food security index was estimated as per capita food expenditure for individual households divided by two-third of mean per capita monthly food expenditure of all households. Households were then classified into their food security status as food secure and food insecure households based on the food security index. The formula is given as:

$$FSi = \frac{\text{per capita food expenditure for ith household}}{\frac{2}{3}\text{ mean per capita food expenditure of all households}}$$

Where:
FSI = Food security index
FSI ≥ 1 food secure ith household
FSI < 1 food secure ith household

Binary Logit Regression Model: This was used to estimate the determinants of food security. The food security status of households, which is bivariate, taking the value of 1 for food secure households and 0 for food insecure households was used as the dependent variable. These are specified explicitly in the model as: $FSI = \beta 0 + \beta\ 1X1 + \beta\ 2X2 + \beta\ 3X3 + \beta\ 4X4 + \beta\ 5X5 + \beta\ 6X6 + \beta\ 7X7 + \beta\ 8X8 + \beta\ 9X9 + \beta 10X10 + U$
Where:
FSI = Food security index
β 0 = Constant
X1 = Age (years)
X2 = Sex (male = 1, female = 0)
X3 = Marital status (married =3, single =2, widow =1)

X4 = Household size (no)
X5 = Educational level (years)
X6 = Livelihood income diversification source (no)
X7 = Cooperatives Membership (yes =1, no =0)
X8 = Annual income (₦)
X9 = farm size (ha)
U= Error term

RESULTS AND DISCUSSION

Socioeconomic characteristics

Results in Table 2 revealed that 62.5% of the farming household heads were within the age range of 30 – 49 years with mean age of 35 years. This implies that the farming households in the study area were young and energetic to participate effectively in both farm and non-farm activities as well as diversify their livelihoods to increase their income and positively enhance their food security status. According to Dary and Kuunibe (2012), young people are more likely to take advantage of opportunities in the non-farm sector, but the likelihood of participation decreases with age. The result also showed that 93.8% of the farming household heads were male while 95.0% were married (Table 2). This implies that non-farm activities were practiced mostly by married male farmers to sustain the family. Most women's chances of participating in non-farm economic activities decrease when they get married (Dary and Kuunibe, 2012).

Table 2: Distribution of Respondents according to Socio-economic Characteristics (n = 80)

Variables	Frequency	Percentage	Mean
Age (in years)			
10-19	8	10.0	
20-29	14	17.5	
30-39	30	37.5	35 years
40-49	20	25.0	
>49	8	10.0	
Sex			
Male	75	93.8	
Female	5	6.2	
Marital status			
Married	76	95.0	
Single	1	1.3	
Widow	3	3.8	
Household size (in persons)			
5-14	42	52.5	
15-24	36	45.0	15 persons
25-34	2	2.5	
Educational status			
Adult education	25	31.3	
Primary education	28	35.0	
Secondary education	24	30.0	
Tertiary education	3	3.8	
Farm size (in hectares)			
0.5-1.5	57	71.2	
1.6-2.6	19	23.8	1ha
>2.6	4	5.0	
Farm source			
Purchased	9	11.3	
Inheritance	60	75.0	
Government	11	13.8	
Annual income (₦)			
100,000-1,099,999	50	62.5	
1,100,000-2,099,999	23	28.8	**₦2,074,999:00K**
2,100,000-3,099,999	6	7.5	
3,100,000-4,099,000	1	1.3	
Frequency of extension visits			
Yes	48	60.0	
No	32	40.0	

Source: Field survey data, 2023.

The result further revealed that farmers had fairly large household size with the mean of 15 persons. This suggests that the likelihood of having enough food decreases with household size. An increase in more people to feed in turn, lowers per capita income, expenditure, and food consumption (Adebayo,2012; Adepoju and Adejere, 2013).

Table 2 also showed that 68.8% of the respondents had formal education (Table 2) which invariably would assist in selecting economically viable activities that will contribute towards improving their household food security. The result revealed further that 71.2% of the respondents had farmland between 0.5 and 1.5 hectares with a mean farmland of 1hectare. Also, 75.0% of the farmland was acquired through inheritance. This obviously indicated that the farming households are small scale farmers with the mean annual income of ₦2, 074,999.00K attributed to remittances acquired from non-farm activities. The result indicated that 60.0% of the farming households had contact with extension services. Layan and Silva (2020) found that Agricultural extension services (AES) had a significant positive impact on farmers' knowledge, yield, and income.

Livelihood income diversification activities

The contribution of most cultivating families in assorted livelihoods for economical provincial business can't be over underscored. According to Oni and Fashogbon (2013), "means of making a living" are the various activities and resources that enable people to live. The first definition of diversification is "an increase in the number of sources of income or the balance among the different sources. Livelihood income diversification activities are tasks essential to everyday life that are conducted over one's life span to earn a living. It is also a productive activity for which time is spent. The results presented in Table 3 showed the distribution of farming households' livelihood income diversification activities in the study area. Pottery, ranked 1st, hunting ranked 2nd, trading ranked 3rd driving ranked 4th, butchering ranked 5th and bricklayer ranked 6th. This implies that the farming households engaged in different livelihood income diversification activities in order to increase income generation and enhance household food security. This is in line with Kuku-shittu *et al.* (2018) who rtot farmers diversified into different profitable livelihood activities to increase their gross earnings for better standard of living and household family food security.

Table 3: Distribution of Farming Households' Livelihood Income Diversification Activities

Activities	*Frequency	Percentage	Rank
Pottery	72	90.0	1st
Hunting	48	60.0	2nd
Trading	46	57.5	3rd
Driving	45	56.25	4th
Butchery	24	30.0	5th
Bricklayer	6	7.5	6th

Source: Field survey data, 2023.
*Multiple responses

Food Security Status of Farming Households

Food security index was used to classify the farming households into food secure and food insecure households in a bid to establish the food security status of the individual households. The food security index was estimated as per capita food expenditure for individual households divided by two-third of mean per capita monthly food expenditure of all households. Households were then classified into their food security status as food secure and food insecure households based on the food security index A food secure household is therefore, that whose monthly food expenditure per capital is at least two-third of the mean per capital monthly food expenditure. On the other hand, a food insecure household whose monthly food expenditure per capital is less than two-third of the mean monthly per capita food expenditure. The mean per capita food expenditure per month was estimated to be ₦48,462.82. The calculated food security index was ₦32,308.55. Table 4 showed that the food security index was ₦32,308.55. This implies that all farming households whose monthly food expenditure per capital is equal to or above ₦32,308.55 were regarded as being food secure. The finding further indicated that 92.5% of the farming households were food secure while 7.5% were food insecure. This implies that more than half of the farming households in the study area are food secure. This result corroborates Jabo *et al.*, (2014) who reported that most farming households in Nigeria are food secure.

Table 4: Distribution of Farming Households according to their Food Security Status

Variables	Frequency	Percentage
Food secure	74	92.5
Food insecure	6	7.5
Total	80	100
FSI = ₦32,308:55		

Source: Field survey data, 2023

Determinants of food security status of farming households

Table 5 shows the determinants of security status of farming households using Binary Logit regression model. The R^2 was 0.725, which implies that all the explanatory variables included in the model explained approximately 73% of the variability in food security status of households in the study area. The respondents' household size (α= -0.0961), educational status (α= 0.5874), livelihood income diversification activities (α= 0.5386), annual income (α= 0.2470) and farm size (α= 0.2469) are significantly ($p<0.05$) related to household food security.

The finding revealed that household size has a coefficient of -0.09617. This implies that there is an inverse relationship between household size and food security. In other words, an increase in family size would lead to a decrease in household food security status. Specifically, an increase in household size decreases the probability of household being food secure by 0.09617. This is in agreement with Adebayo (2012) and Adepoju and Adejere (2013) who found that an increase in one family member increases the chances of a household becoming food insecure by indirectly reducing income per head, expenditure per head, and per capita food consumption. This may be attributed to the fact that household size exerts more pressure on consumption than it contributes to production (Kim, 2011).

The coefficient of years of formal education has a positive relationship with household food security. Specifically, the probability of being food secure is increased by 0.58743 for households whose heads had higher level of formal education. This suggests that, increase in years of formal education increases the likelihood of households to be food secure. This is as expected, because the level of education should positively affect the income earning capacity and efficiency of managing households' food resources. The result coincides with those of, Adebayo (2012), Adepoju and Adejere (2013), and Oni and Fashogbon (2013**)**.

The livelihood diversification activities of household are positively related to the food security status. This implies that, increase in the livelihood activities increases the possibility of a household becoming food secure by 0.5386. Therefore, households involved in diverse activities tend to be more food secure than those who are into fewer activities. This is because diversification is one of the livelihood strategies that provide additional income to rural household. It enhances household economy and food security by providing additional income, decrease food deficit and also minimises the sales of farm produce that should be consumed. Alternative income sources outside farming provide food security for household livelihood. This is in line with the *a priori* expectation and the findings of Aidoo *et al*. (2013), Awotide *et al. (*2012), and Frimpong and Asuming-Brempong (2013), that alternative income sources provide food security for household livelihood.

Annual income has a positive and significant ($p<0.05$) relationship with food security. This signifies that for a unit rise in income, the level of food security will increase by 0.24698. This implies that, an increase in household income increases the possibility of a household becoming food secure. This is due to the fact that remittances contribute to household income possibly increase per capita food expenditure and consequently improve household food security status. This finding corroborates Asogwa and Umeh (2012) and Adepoju and Adejere (2013) studies who revealed that, households with access to remittances have a lower probability of being food insecure.

The coefficient of farm size was positive and statistically significant at the 5% level. This means that as a household's farm size increases, food security tends to increase. Specifically, the probability of being food secures increases by 0.2469 for every hectare increase in farm size. That is, households with larger farm sizes tend to be more food secure than those with smaller sizes. This can be attributed to the greater efficiencies in the use of resources associated with the large farms than those with small farms. Consequently, small farm holdings may result to low productivity, low income, and food insecurity among the farm households. This outcome is consistent with the finding of Asogwa and Umeh (2012) who opined that household food security increases with increase in farm size under cultivation.

Table 5: Logit Regression estimates of Determinants of Food Security

Variables	Coefficients	z-value	p-value
Age	-0.04841	-0.960	0.467
Sex	0.76059	1.158	0.216
Marital status	0.78105	0.643	0.765
Household size	-0.09617*	-1.954	0.037
Educational status	0.58743*	2.152	0.041
Livelihood income diversification	0.53862*	2.845	0.031
Farm size	0.71949*	3.148	0.029
Annual income	0.24698*	1.863	0.048
Constant	2.8762	1.794	0.481

Source: Field survey data, 2023. Level of significant = 5%

Constraints to Livelihood Income Diversification

Table 6 reveals that the farmers had constraints related to cultural norms(91.25%), lack of knowledge (88.75%), lack of market (88.75%), lack of awareness (83.75%), lack of credit facilities (78.75%) lack of information (76.25%), lack of infrastructure (52.50%) and lack of capital (50.0%). This implies that cultural norms and lack of credit facilities were the most severe constraints to livelihood income diversification by farmers in the study area.

Table 6: Constraints to Livelihood Income Diversification

Constraints	*Frequency	Percentage
Cultural norms	73	91.25
Lack of knowledge	71	88.75
Lack of credit facilities	71	88.75
Lack of awareness	67	83.75
Lack of market	63	78.75
Lack of information	61	76.25
Lack of Infrastructure	42	52.50
Lack of Capital	40	50.0
Total		**100**

Source: Field survey data, 2023. *Multiple responses

CONCLUSIONAND RECOMMENDATIONS

The findings from the study revealed that the farmers had mean age of 35 years, male and married. This implies that a typical farmer in the study area is still young and energetic to participate effectively in both farm and non-farm activities so as to increase their income which may positively influence their food security status. The farmers were small-scale using a small farm acquired through inheritance. The farmers were involved in pottery, trading and bricklayers as their non-farm activities to diversify their income to sustain family food security. The respondents in the study area were food secured. The determinants found to be significant to food security status includes household size, educational status, livelihood income activities, annual income and farm size. The constraints to livelihood income diversification were cultural norms and lack of credit facilities.

The recommendations derived from the study are as follows:

1. The farmers should be encouraged to form cooperative societies to make funds available for their farming activities.
2. Government should establish extension service stations for sensitization of the farmers on cultural norms and its implications to modern farming.

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VIEWERSHIP OF NAIJA FARMER REALITY TELEVISION SHOW AMONG AGRICULTURAL UNDERGRADUATES IN OYO STATE, NIGERIA

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ABSTRACT
Advocacy for the use of the entertainment industry to stimulate youths' interest in agriculture has been gaining momentum globally. Nigeria's agriculture ministry recently launched an initiative in that regard using the reality television format. There is however, scarcity of information on the success of the initiative. This study, therefore, investigated the viewership of Naija Farmer Reality show among agricultural undergraduates in Oyo State. A multistage sampling procedure was used to select 280 undergraduate students for the study. Information was garnered on personal characteristics, awareness, viewership, and constraints affecting viewership of Naija farmer reality show. Data was analysed using frequency counts, percentages, Chi-square and Pearson's Product Moment Correlation (PPMC) at 0.05 significance level. Findings indicated that the majority (64.6%) of the students were between the ages of 19 and 24 years. Most (53.6%) were female, single (92.2%) and unaware of the show (58.2%), while majority (57.9%) did not view the show. Among those that watched, 59.8% knew about it on social media, 89.9% preferred watching it on YouTube and 50.7% had wide viewership. While inability to purchase data was a major constraint (weighted score of 78.2) to viewership of the programme. It was deduced that students were not aware of Naija Farmer Reality Show hence, did not view it. Although those that did, prefer to watch on YouTube channel. Therefore, subsequent editions of the show should be publicised by the producers among agricultural undergraduates by exploring all social media platforms and popular streaming platforms to boost viewership of the show.
Keywords: Naija Farmer, Viewership, Reality television show

INTRODUCTION

The mass media explosion that began in the 1950s has dramatically changed the environment in which young people are raised. Electronic media provide the young ones with a variety of new learning opportunities and broaden the range of events the young people experience. Young people are nowadays easily influenced by their environment. Whether it is television, friends, family members, or just plain strangers, everyone and everything has an impact on youths (Prot, Anderson, Gentile, Warburton, Saleem, Groves, and Brown, 2015). Mass media have, in recent times, taken a bold and positive step towards enhancing educational development in the country. They have made it easy for all classes of students; agriculture students inclusive, to receive education outside of the four walls of their classrooms. Students can easily look up practical videos, or even more explanatory videos of what had been taught in the classrooms for more understanding. Another vital role of mass media to students is entertainment and empowerment.

According to Badiru, (2023); Ladigbolu and Olajide, (2018), one of the emerging strategies that have been deployed for various use in health, environmental education as well as agricultural development is the Entertainment-Education (EE) and associated genre like soap opera and reality television shows. Some earliest examples of reality television being used to promote agricultural development in Nigeria since 2016 are Naija Farmer, Corporate Farmers, the Agropreneur, the FarmHouse, and the Face of Agric. It is worthy of note that all these reality shows were created to educate, inform, inspire and empower young entrepreneurs to pursue careers in agriculture while improving knowledge and skills of the existing farmers in agricultural practices, (Oresanya and Olajide, 2023; Ogwu *et al*, 2023 and Olaniran, 2021).

The Naija Farmer Reality TV show, a creation of the Federal Ministry of Agriculture and Rural Development in conjunction with Nigeria Television Authority (NTA), Startimes, Radio, Television and Theatre Workers Union of Nigeria (RATTAWU) and other stakeholders, is a 24-hour Reality Show for a period of 3 months. It was packaged with reality entertainment and progress made in the agricultural sector for youth empowerment. The show commenced on 29th, November 2020, with the intention to transform over 1 million unemployed Nigerian youths to agribusiness owners within the space of 10 years and by extension lift over 20 million youths out of poverty, (FMARD, 2020; Business Day, 2020 and IITA, 2019). The show included trainings, training visits to agricultural institutes like IITA, as well as contests among the participants.

Therefore, it is expected that the show would by now (three years after) be popular among Nigerian youths who were its target audience since inception. According to Olaniran, (2021), gender and age can influence viewership of reality shows. This suggests that the "Naija Farmer Reality Show" ought to be well known among agricultural undergraduates in Oyo State if things worked according to plans. Naija Farmer Reality Show is a classic example of how mass media are being put to use to provide opportunities for agricultural undergraduates, from

learning to mentorship, as well as empowerment and employment creation. One would expect that this show would interest agricultural undergraduates the most, since they are the category who might be thinking about taking up careers in the field of agriculture upon graduation. The show has the potentials to equip them with the reality of things outside school, as they could relate well with the characters of the show.

Despite the potential benefits embedded in watching this reality television show for promoting agricultural development, it is not ascertained if the target audience really watch the show. There is therefore, a gap in understanding Naija Farmer Reality Show viewership status of agricultural undergraduates in Oyo State. Therefore, this study aims to investigate the viewership of Naija Farmer Reality Show among agricultural undergraduates in Oyo State, Nigeria. It is in this context that the following objectives guided this study;

The specific objectives were to:

1. describe the personal characteristics of the students,
2. examine the awareness of Naija Farmer Reality show among undergraduate students;
3. ascertain the viewership of Naija Farmer Reality show;
4. identify the constraints to respondent's viewership of the Naija Farmer Reality show.

The hypothesis of the study was stated that there is no significant relationship between the personal characteristics of the students and viewership of Naija Farmer Reality show.

METHODOLOGY

The study was carried out in Oyo State which is one of the six states in the south-western geopolitical zone of Nigeria. The state comprises 33 Local Government Areas and has a land mass of about 27,249 square kilometres and a coordinate of 8.157°N and 3.0147°E. According to the National Bureau of Statistics projection of 2016 the state has a population of 7,840,864 people, (NBS, 2017). Oyo State has an equatorial climate with dry and wet seasons and relatively high humidity. The average annual rainfall is between 800 and 1500mm, while average daily temperatures range between 25°C and 35°C, almost throughout the year. The vegetation pattern is that of rain forest in the South and guinea savannah in the North. Thick forest in the South gives way to grassland interspersed with trees in the South. There are several research institutes, universities, colleges of agriculture and education as well as polytechnics in Oyo State, some of which offer several agricultural courses.

The population for this study comprised all 2023 agricultural undergraduates in Oyo State, Nigeria. A multistage stage sampling procedure was used to select respondents for the study.

The eleven universities in the state were stratified into Federal Government, State Government and privately-owned strata however, privately-owned institutions were not selected for this study because many of them do not offer Agriculture as a course of study. In all, there were seven private universities, two state universities and one Federal university. The first stage involved purposive selection of the Federal and one state-owned university. Therefore, University of Ibadan, Ibadan and Ladoke Akintola University of Technology (LAUTECH), Ogbomosho were selected because both offered agriculture as a course of study. The second stage involved purposive selection of all 300 and 500 level undergraduate students from the selected universities. This selection was due to the fact that 300 and 500 level students are considered to have stayed long enough studying agriculture to arouse their interest in the reality show. This, coupled with the fact that at these levels, the students are expected to be stationed on campus unlike their 400 level counterparts that would have been posted for their Industrial Training (IT). So, in all 2,850 (1600 and 1250 from 300 and 500 level) and 1,500 (300 and 500 level) registered students from Faculty of Agriculture LAUTECH and University of Ibadan in year 2023 constituted the sampling frame.

The last stage involved selection of 7% of students in each university using a simple random sampling technique. This gave a total of 105 students from University of Ibadan and 200 from LAUTECH, giving a total sample size of 305. Although a total of 280 of the students completed the well-structured questionnaire administered to elicit information via Google forms, in relation to the study objectives, making a return rate of 92%.

Students' awareness of Naija Farmer Reality TV show was probed by asking the students to indicate if they were are of the show (Not aware-0, Aware-1), to state their means of awareness (TV-1, Social media-2 Friends and family-3), to indicate if they view the show or not (No-0, Yes-1) and finally state their preferred viewership mode (YouTube-1, Startimes-2).

While viewership of Naija Farmer Reality TV show according to this study was measured among those that indicated that they view the show, this was done by requesting the students to state the extent to which they view the Naija farmer reality show. They were provided with three response options of a little of the show (viewing for less than 10 days), half of the show (viewing for about 45 days), above half of the show (viewing for more than 45 days). A score of 1 was assigned to response option "a little of the show", 2 was assigned to "half of the show" while 3 was allotted to "above half of the show" response

options. The maximum obtained score was 3, and the minimum score was 1 while the obtained mean score was 1.71. Using this mean score as benchmark, extent of viewership was categorized as high and low. All score of respondents that were below 1.71 mean score were adjudged a limited viewership and all respondents with mean score of 1.71 and above were adjudged to have a wide viewership of Naija Farmer Reality TV show.

Data collected were analysed with the aid of percentages, weighted score, frequency distribution, Chi-square and Pearson's Product Moment Correlation (PPMC) at 0.05 significance level.

RESULTS AND DISCUSSION

Personal characteristics of the respondents

The results in Table 1 show that most (64.6%) of the respondents were between the ages of 19-24 years, female (53.2%), single (93.2), 300 level students (71.4%) and from Agricultural Economics department (27.5%). The high female population of students is contrary to the notion that females do not engage in agriculture unlike males.

Table 1: Distribution of respondents by personal characteristics

Variables	Frequency	Percentage
Age ($\bar{x}$=23.16±2.220)		
19-24 years	181	64.6
25-30 years	99	35.4
Sex		
Male	131	46.8
Female	149	53.2
Marital status		
Single	261	93.2
Married	19	6.8
Level of study		
300	200	71.4
500	80	28.6
Course of study		
Agricultural Economics	77	27.5
Agricultural Extension and Rural Development	55	19.6
Agronomy	51	18.2
Animal Science	59	21.1
Crop Protection and Environmental Biology	38	13.6

Source: Field survey, 2023

Students' awareness of Naija farmer reality show

Table 2 reveals that 57.9% of students were not aware of the Naija farmer reality show. Out of the respondents that were aware of the show, Table 2 shows that the majority (59.8%) found out about the show on social media, 75.4% did not view the Naija farmer reality show, while among those that viewed the show majority (89.9%) preferred to view the Naija farmer reality show on YouTube. This implies that most of the agricultural undergraduates in Oyo State were not of the known about the Naija farmer reality show in the study area. First off, these results are in consensus with the findings of Ladigbolu and Olajide (2018), who confirm that many people were not aware of any Nigerian EE genre like soap operas and reality TV show used to promote agriculture. This could be because the show is not popular among agricultural undergraduates or that the show was only publicised on YouTube channel instead of streaming it on every other social media.

Meanwhile, the preferred viewership mode of YouTube is not in line with the existing knowledge and submissions of Osman, Muhammed, and Mu-Azu, (2023); Badiru, Ladigbolu, and Adebayo, (2022) that radio and television are still the most effective communication channels used for disseminating or retrieving information on agriculture. It is however, in support of a study conducted by Olaniran, (2021) that audience in urban areas have shifted from the use of old or traditional media to receive information but rather the focus is now on social media like Facebook, YouTube, Twitter especially in keeping up with their favourite shows.

Table 2: Distribution of respondents by awareness of Naija farmer reality show

Variables	Frequency	Percentage
Awareness of Naija farmer reality show		
Yes	118	42.1
No	162	57.9
Total	280	100.0
Means of awareness		
On television	13	11.1
Social media	70	59.8
From a friend/ relative	34	29.1
Total	118	100.0
Viewership of the show		
Yes	69	24.6
No	211	75.4
Total	280	100.0
Preferred viewership mode		
YouTube	62	89.9
Startimes	7	10.1
Total	69	100.00

Source: Field survey, 2023

Viewership of Naija farmer reality show

Table 3 reveals that 49.3% of the students indicated that they viewed Naija farmer reality show to a little extent (viewing for less than 10 days), however overall, there was a wide (50.7%) viewership among the respondents. It can therefore be inferred that Naija Farmer Reality Show enjoyed wide viewership among the few agricultural undergraduates that viewed the show and many of them viewed only a small part of the show. This could be attributed to a number of factors, irregular power supply, lack of fund to purchase data and busy school schedule among other factors. Although, this result is in consonant with the findings of Anorue, Obayi, Onyebuchi, Alaekwe, and Etumnu, (2021) that BBNaija reality TV show has a wide viewership among undergraduate students at Imo State University, but the students only watched the show in the evenings due to school activities engagement.

Table 3: Distribution of respondents by viewership of Naija Farmer Reality Show (n-69)

Extent of viewership	Frequency	Percentage
A Little of the show	34	49.3
Half of the show	21	30.4
Above half of the show	14	20.3
Level of extent of viewership		
Wide view	35	50.7
Limited view	34	49.3

Source: Field survey, 2023

Constraints to viewership of Naija farmer reality show

Table 4 reveals that inability to purchase data was ranked first with weighted score of 78.2 as a major challenge to viewing Naija farmer reality show. This is expected as it was earlier realised that most agricultural undergraduates either prefer to make use of the internet means of ICT or they just spend more time on their gadgets. Epileptic power supply was next on the rank (64.6). The problem of irregular power supply could affect viewership of the show, especially in a situation where it was discovered that students prefer to view the show on their gadgets. In such instance, students may not have the opportunity to charge their phones. Other challenging limiting factors to viewership of the Naija farmer reality show include the show being uninteresting (61.0) and poor access to startimes cable/ subscription (42.2). However, inconvenient time of broadcast (39.7) was the least constraint among the respondents.

Table 4: Distribution of constraints to viewership of Naija Farmer Reality Show

Challenges	Not a Severe constraint	Mild constraint	Severe constraint	Weighted score	Rank
Inability to purchase data	43.2	35.4	21.4	78.2	1st
Epileptic power supply	51.8	31.8	16.4	64.6	2nd
The show is uninteresting	52.9	33.2	13.9	61.0	3rd
Poor access to StarTimes cable/ subscription	67.1	23.6	9.3	42.2	4th
Inconvenient time of broadcast	68.2	23.9	7.9	39.7	5th

Source: Field survey, 2023

Relationship between personal characteristics of respondents and viewership of Naija farmer reality show

The result of the Chi-square analysis in Table 5 reveals that there was no significant relationship between respondents' sex and viewership of Naija farmer reality show ($\chi 2$ =1.157, p=0.28). This means that being female or male had nothing to do with viewership of Naija farmer reality show. Similarly, level of study of respondents was insignificant with viewership of Naija farmer reality show ($\chi 2$= 2.857, p= 0.24). This implies that whether students were in 300 or 500 level did not have influence on viewership of Naija farmer reality show. However, course of study was significantly related to viewership of Naija farmer reality show ($\chi 2$= 14,286, p= 0.00). This association is not surprising because respondents' course of study is directly related to the Naija farmer reality show, the show aligned with their career and was tailored encourage them to boost their interest in agriculture hence, they either watched because it is related to their career, for improved developmental skills or for passion and curiosity.

Table 5: Chi-square analysis of relationship between personal characteristics and viewership of Naija farmer reality show

Variables	$\chi 2$-value	df	p-value
Age	24.014	1	0.00
Sex	1.157	1	0.28
Marital status	209.157	1	0.00
Level of study	2.857	1	0.24
Course of study	14.286	4	0.00

Source: Field survey, 2023

CONCLUSION AND RECOMMENDATIONS

The study found out that most of the agricultural undergraduates were not aware of Naija Farmer Reality Show and did not view the show. The few that watched the show did so on YouTube while, inability to purchase data was a major constraint that limited viewership of Naija Farmer Reality Show.

Development communicators in conjunction with the Ministry of Agriculture should endeavour to publicize the show among agricultural undergraduates so as to boost awareness and viewership of Naija Farmer Reality show by showing it on all social media platforms.

The organisers of the show should also explore other streaming platforms like GoTV and DSTV, as a lot of people may not be using StarTimes in Nigeria.

Success stories of agricultural graduates who have made significant contributions or achieved notable success in the agricultural industry especially through the show should be highlighted and publicised. These success stories can serve as inspiration for other youth in the agricultural sector.

The producers and presenters of Naija Farmer Reality show should put in more efforts to ensure that the show is made more entertaining by containing areas of agriculture that would arouse the interest of students and other youth, use of more technologies and more entertaining contents.

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ECONOMIC ANALYSIS OF WATERMELON PRODUCTION IN ISE ORUN LOCAL GOVERNMENT AREA OF EKITI STATE, NIGERIA

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ABSTRACT
The study examined the economic analysis of watermelon production in Ise Orun Local Government area of Ekiti State, Nigeria. A multistage sampling procedure was used to select 105 respondents for this study. A questionnaire was used for data collection and data were analysed using descriptive statistical tools such as frequency counts, percentage and mean, and budgetary analysis. The average age was 57±10.8 years, majority were males (81.0%) and married (89.5%). The major factors influencing watermelon production include storage problems (46.7%), theft (53.3%), the prevalence of pests and diseases (55.2%), land tenure (53.3%) and market price (47.6%). For one hectare of watermelon, the gross margin was ₦662,493 with a cost-benefit ratio of ₦5.79, implying that for every ₦1.00 invested in watermelon production, there was a corresponding profit of ₦5.79. Severe constraints to watermelon production include inadequate capital (75.5%), cost of labour (69.6%), theft (58.4%) and flooding (55.1%). The study recommends that the land acquisition system that makes it hard for farmers to acquire agricultural land should be reviewed to allow the farmers to have more access to land. Also, government grants and loans should be made easy to access as this will reduce the cost incurred on inputs and help provide funds for the production activities.
Keywords: Watermelon, Economic Analysis, Production, Constraints, Farmers

INTRODUCTION

Watermelon, Citrullus lanatus, is one of the most widely cultivated crops globally, with China leading the world in production (FAO, 2023). In Africa, countries like Nigeria, Kenya, and South Africa are notable producers, with Nigeria producing 1,936,111 metric tons of watermelon in 2020 (FAO, 2022). Watermelon is a valuable crop due to its nutritional benefits, medicinal properties, and economic potential.

Watermelon is indeed low in calories and rich in water, vitamins A and C, and antioxidants particularly lycopene, a carotenoid known for its potential to reduce the risk of heart disease and certain cancers (Healthline, 2022). Potassium in watermelon also helps control blood pressure and prevents strokes. The fruit's high-water content and nutritional value make it an excellent choice for hot summer days.

Watermelon production is a profitable economic activity in Nigeria, particularly in the northern regions where it is widely cultivated (NIHORT, 2021). The crop's ready market and high demand make it an attractive venture for farmers. However, production challenges, such as inadequate storage and processing facilities, lead to market gluts and price fluctuations, affecting farmers' income and confidence in continuous production (NAERLS, 2022).

Despite its potential, watermelon production in Nigeria faces several challenges. In Ekiti State, for example, production is declining due to inefficient resource management, while demand is increasing due to growing awareness of the fruit's nutritional value (Ekiti State Government, 2008). The shortfall in watermelon supply leads to price increases during off-peak periods, making it unaffordable for many households and reducing per capita consumption rates (NAERLS, 2022). Watermelon production has significant economic and nutritional benefits but addressing production challenges is crucial to ensuring food security and improving farmers' livelihoods. By adopting improved technologies and efficient resource management practices, farmers can increase productivity and income. Policymakers and stakeholders must also prioritize investments in storage and processing facilities to reduce post-harvest losses and stabilize prices.

Production of fruit crops such as watermelon has remained relatively low despite its recognized nutritional and commercial value (Muhammad and Ismail, 2021). This underproduction is particularly concerning given the increasing awareness of watermelon's health benefits and growing market demand. The gap in production levels indicates a lack of in-depth understanding of the economic viability and efficiency of watermelon farming at the local level, especially in regions like Ekiti State, where production trends show a decline despite rising consumption.

There is limited empirical data specifically focused on the profitability, resource allocation, and production constraints of watermelon cultivation in Ise Orun Local Government Area. This presents a critical knowledge gap in local agricultural planning and decision-making. Addressing this gap is essential to guide farmers, policymakers, and agricultural extension agents in promoting more efficient and profitable watermelon production systems.

Therefore, this study aimed to assess the economic analysis of watermelon production in Ise-Orun Local Government Area of Ekiti State. The objectives of the study are to:

i. describe the socio-economic characteristics of the respondents

ii. analyse the costs and returns of watermelon production
iii. identify the factors affecting the production of watermelon
iv. identify the constraints associated with watermelon production in the study area.

METHODOLOGY

The study was carried out in Ise Orun Local Government Area of Ekiti State, Nigeria which lies within the tropical zone in the rain forest region of southwestern Nigeria. Ise/Orun Local Government Area is located at approximately latitude 7.4300° N and longitude 5.5100° E. Ekiti state has 16 local government councils, with a population of about 113,754 (NPC, 2006). The area is peculiar for horticultural crop production, and a large percentage of the inhabitants are farmers. Ise Orun Local Government Area covers a land area of 432 km², according to the 2006 census

The multistage sampling procedure was used in selecting the respondents. Ise Orun Local Government Area was purposively selected, due to its high production of watermelon. In the second stage, five villages were randomly selected from the eight (8) villages within the Local Government Area which were Afolu, Kojola, Ogbese, Araromi and Ise. Finally, at the third stage, a random sampling was employed in selecting 21 farmers from each of the villages based on the sample frame provided by the ADP officials. In total, 105 farmers were randomly selected for the study.

The dependent variable: costs and returns variables were considered as cost of hired labor (₦), cost of chemical fertilizer (₦), cost of seeds (₦), coat of insecticide and herbicide (₦), cost of depreciation on farm implement (₦), yield (Kg/ha) (₦), unit price (₦).

The independent variables: factors were considered as land tenure, government policy, manual weeding, rainfall, temperature, soil type. The variables were measured on a 5-point Likert scale of strongly agree-5, agree-4, undecided-3, disagree-2 and strongly disagree-1. Constraints were considered as inadequate storage facilities, inadequate extension contact, inadequate credits, pests and diseases, high cost of labour. The variables were measured on a 3-point scale of not severe-1, moderately severe-2, very severe-3.

Data were analysed using descriptive statistical tools such as frequency counts, percentage and mean. Farm budget analysis was constructed to estimate the production costs, revenue and gross margin accruable to the farmers. The equations used in estimating the various parameters are defined below:

GM = TR - TVC ……. (1)
TC = TFC + TVC …… (2)
NP = TR-TC …….. (3)

Where:
TC = Total cost, TFC = Total fixed cost, TVC= Total variable cost
GM = Gross margin, TR = Total revenue, NP = Net profit

Depreciation on tools was calculated by the straight-line method as follows: Depreciation = (cost of purchase - salvage value)/ useful life.

RESULTS AND DISCUSSION

Socioeconomic characteristics

The result in Table 1 revealed that 61.9% of the respondents were less than 60 years old with a mean age 57±10.84 years indicating the presence of middle-aged individuals and ageing farming population. Also, the result on age implies low youth population involvement in watermelon production in the study area. Also, implies that majority of the respondents are still within the productive working age, active, agile and can withstand the demands (labour) for watermelon farming. Ndanitsa *et al*. (2021) and Mairabo (2021) reported that the age of farmers is very critical in agricultural production, and that farmers below the age of 40 years are engaged in rigorous farm work to accomplish cultural practices such as planting, weeding, and harvesting. Majority of the respondents were males (81.0%), indicating dominance of male folks in watermelon production. Also, this is due to the traditional pattern that males are dominant in the farming system in the study area and because migrant farmers are mostly of male gender (Muhammad and Ismail, 2021). Furthermore, majority of the farmers (89.5%) were married, and are therefore expected to be stable and settled in their chosen vocation, also they can help each other and utilise family labour to enhance watermelon production in the study area. Majority (68.6%) of the respondents had at least primary education, thus indicating a high level of literacy in the study area. This will also ease the problem of training farmers on how to access and effectively utilise agricultural credit obtained (Ndanitsa *et al.*, 2021). Education plays a pivotal role in enhancing livelihood opportunities, improving food security, and reducing poverty. A study by Awotide *et al*. (2021) found that higher educational attainment among smallholder farmers in Nigeria significantly increases their access to credit and adoption of improved agricultural practices, leading to better productivity and income. Similarly, Olowolafe *et al*. (2022) highlighted that educated farmers are more likely to implement effective postharvest handling techniques, thereby reducing losses and improving market access. The average years of experience in watermelon production experience was 27± 12.08 years, implying that that farmer in the study area have the necessary experience to increase their

watermelon production given a considerable level of inputs.

The mean household size was 8±2.90 persons; indicating a large household size and this might help solve the problems associated with shortage of labour in the study area. Also, large household size may serve as source of cheap and readily available farm labour depending on the compaction and very likely increased output (Ojo *et al*., 2020). Majority (73.3%) of the farmers had a farm size of 1-3ha, and 26.7% had a farm size of 4-6ha. The average farm size was 3±1.08 hectares. Although this size is relatively larger than typical subsistence farms, it still indicates that many watermelon farmers in the study area may be operating within a semi-commercial or transitional production system, characterised by limited mechanization and input use. This may reflect constraints in access to capital, technology, or extension services, which are necessary for scaling up to fully commercial farming.. Also, 28.6% inherited their land, 49.5% rented their land while 8.6% purchased their land personally. Thus, the major means of land acquisition in the study area was by rent. This indicates that most of the watermelon farmers in the study area incur certain cost for farmland which increases the cost of watermelon production. Majority of the respondents were members of the cooperative societies (62.9%) and 37.1% of the respondents were non- member of any cooperative society. This could be that most of the farmers were well informed about the benefits of membership which could help in obtaining information on how to improve and boost production or probably due to the fact that cooperative didn't have enough capacity to meet their needs (Ayanwale and Bamire, 2021). Membership of cooperative is very important as it enhances access to information on improved technologies, markets and credits for the purchase of inputs and payment of hired labour.

Table 1: Socio-economic characteristics of the respondents (n=105)

Variable	Frequency	Percentage	Mean	Std. Deviation
Age (years)				
Under 30	1	1.0		
31-35	18	17.1		
46-60	46	43.8	57	10.84
Above 61	40	38.1		
Sex				
Female	20	19.0		
Male	85	81.0		
Marital status				
Married	94	89.5		
Divorced	5	4.8		
Widow/widowers	6	5.7		
Educational status				
No formal education	33	31.4		
Primary education	55	52.4		
Secondary education	17	16.2		
Household size				
Under 5	15	14.3		
6-10	74	70.5	8	2.90
11-15	13	12.4		
Above 16	3	2.9		
Farm size(hectares)				
1-3	77	73.3	3	1.08
4-6	28	26.7		
Farmland acquisition				
Inherited	30	28.6		
Rent	52	49.5		
Gift	2	1.9		
Family land	12	11.4		
Personal	9	8.6		
Cooperative membership				
Yes	66	62.9		
No	39	37.1		

Source: Field survey, 2024

Factors affecting watermelon production.

Table 2 reveals the various factors affecting watermelon production. The majority of the farmers strongly agreed that storage of watermelon (46.7%), theft (53.3%), prevalence of pests and diseases (55.2%), land tenure (53.3%) and market price of watermelon (47.6%) are the foremost factors affecting the production of watermelon in the study area. However, some of the respondents strongly disagreed that manual weeding (61.9%), type of soil (61.0%), government polices (64.8%) affect the production of watermelon in the sense that the farmers carried out an average of two weeding in watermelon production. This is because watermelon suppresses weed growth after full establishment. Therefore, the farmers are not faced with weeding difficulty till harvesting. Watermelon may be grown on a variety of soils; therefore, the soil type cannot affect the production. Also, there is no government policy hindering the production of watermelon in the study area and land is always allocated to any interested person who would like to engage in farming (Adeoye and Balogun, 2022).

Table 2: Factors affecting watermelon production (year 2024)

Factors	SA (%)	A (%)	UD (%)	D (%)	SD (%)
Land tenure	53.3	34.3	2.9	7.6	1.9
Prevalence of pests and disease	55.2	15.2	17.1	9.5	2.9
Government policies	1.0	15.2	12.4	6.7	64.8
Manual weeding	-0.0	22.9	7.6	7.6	61.9
Duration of rainfall	54.3	26.7	9.5	8.6	1.0
Temperature	49.5	37.1	8.6	3.8	1.0
Type of soil	1.9	21.0	14.3	1.9	61.0
Storage problems	46.7	10.5	20.0	14.3	6.6
Transportation	57.1	18.1	12.4	9.5	2.9
Theft	53.3	15.2	11.4	10.5	9.5
Market price of watermelon	47.6	35.2	13.3	2.9	1.0

Note: SA-strongly agreed, A-agreed, UD-undecided, D-disagreed, SD-strongly disagreed
Source: Field survey, 2024

Costs and returns of watermelon production (year 2024)

The estimates of the budgetary analysis for watermelon are presented in Table 3. The average total variable cost (TVC) of hired labour, chemical fertilizer, seeds, herbicides/insecticide amounted to ₦87, 507 per month. From the Table, labor accounted for about 3.19% of the total production cost, while analysis of other variables shows that the percentages share of seeds (18.80%) and other costs are 35.67%, and 42.35%, respectively.

Table 3: Average costs and returns of watermelon production in the study areas (Naira/hectare) (year 2024)

	Items	Mean value (N)	Percentage of variable cost
A	**Revenue**		
	Average yield 1500@₦500	750,000.00	
B	**Variable cost**		
	Cost of hired labour	2,788.00	3.19
	Cost of chemical/fertilizer	31,210.00	35.67
	Cost of seeds	16,447.00	18.80
	Cost of herbicides	37,062.00	42.35
	Total variable cost (TVC)	87,507.00	100
C	**Fixed cost**		
	Depreciation of farm equipments (hoe, cutlass, etc)	42,074.00	
	Total cost of production		
	TC=TVC+TFC	129,581.00	
D	**Gross Margin (GM)**		
	GM=TR-TVC	662,493	
E	**Net Farm Income**		
	NFI= TR-TC	620,419	
	Return on Investment		
	Benefit cost ratio =TR/TC	5.79	

Source: Field survey, 2024

While the average total fixed cost (TFC) depreciated for farm implements amounted to ₦42, 074. Average total cost (TC) amounted to ₦129, 581. The costs and return analysis show gross margin of ₦662, 493 per ha. This when divided by a year gives a monthly income of ₦55, 207.75. The cost-benefit ratio shows a figure of 5.79, meaning for every one naira invested in Watermelon farming, an additional ₦5.79 kobo will be realized. This strong profitability implies that watermelon farming can serve as a viable means of livelihood improvement for smallholder farmers, especially in regions where land and inputs are moderately accessible. It also implies that watermelon production is a highly viable enterprise, capable of generating substantial returns on investment, consistent with the findings of Ojo *et al.* (2020), who reported similar profitability trends among watermelon farmers in Niger State.

Total variable costs (TVC): 2,788+31,210 + 16,447 + 37,062 = ₦87, 507

Total costs (TC): 87,507 + 42,074 = ₦129,581

Gross Margin (GM): 750,000 - 87,507 = ₦662,493

Cost-Benefit Ratio: 750,000 ÷ 129,581= ₦5.79kobo

Constraints of watermelon production

Table 4 shows the major constraints affecting watermelon production in the study area, ranked based on their severity as reported by the respondents. A significant majority (75.5%) of the farmers identified inadequate access to capital or credit facilities as the most pressing constraint. This underscores the critical role of financing in expanding production capacity, acquiring inputs, and adopting modern technologies. Limited access to credit has consistently been a key barrier to productivity among smallholder farmers in Nigeria, a finding supported by Awotide *et al.* (2021), who emphasised that credit constraints significantly reduce farm output and efficiency.

The second most severe constraint, as reported by 69.6% of the farmers, was the high cost of labor. Most respondents noted that they lack access to or the ability to collectively invest in labor-saving technologies such as mechanized equipment, which would otherwise lower labor costs and increase productivity. This reflects the broader issue of under-mechanization in Nigerian agriculture.

Theft (58.4%) ranked third, highlighting a security challenge for farmers, particularly during harvest. This concern affects farmers' confidence and investment in expanding production. Flooding (55.1%) was ranked fourth, with farmers reporting yield losses due to water logging and erosion. The lack of proper tillage infrastructure, drainage systems, and flood control measures worsens the impact of seasonal floods.

Other constraints including inadequate storage facilities, poor market prices, and transportation challenges were reported by 48.6% of farmers. The heavy and perishable nature of watermelon, combined with poor road infrastructure, increases post-harvest losses and transport costs. These issues are consistent with findings by Olowolafe *et al.* (2022), who reported that poor rural infrastructure and lack of preservation facilities significantly hinder the marketing of perishable crops like watermelon.

Additional but less severe constraints included the lack of improved seeds (45.2%), inadequate extension services (36.5%), and pests and diseases (24.4%). These constraints reflect systemic issues in technology dissemination, research-to-farm linkage, and pest management.

Table 4: Constraints faced by watermelon farmers in Production

Constraints	Percentage (%)	Rank
Inadequate credit facilities	75.5	1st
High cost of labour	69.6	2nd
Theft	58.4	3rd
Flooding	55.1	4th
Inadequate storage facilities	48.6	5th
Poor market price	48.6	5th
Inadequate transportation	48.6	5th
Lack of improved seeds	45.2	6th
Inadequate extension contacts	36.5	7th
Pest and diseases	24.6	8th

Source: Field survey, 2024

CONCLUSION AND RECOMMENDATIONS

It can be concluded that the majority of the watermelon farmers in the study area are relatively young and within their productive age, with the average age suggesting they are still active in farming activities. Most of the respondents were male, indicating that watermelon farming in the area is male-dominated. In addition, a large proportion of the farmers are married, which could suggest a degree of household stability that may positively influence farming decisions and labor availability. The identified factors affecting watermelon production include storage of watermelon, theft, prevalence of pests and diseases, land tenure and

market price. Findings showed that watermelon production in the study area is a profitable business. The study identified some of the constraints faced by the farmers in watermelon production which inadequate capital, lack of labour, theft and flooding. It is recommended that the land acquisition system that makes it hard for farmers to acquire agricultural land should be reviewed to allow farmers have access to land for farming purposes. Also, government grants and loans should be made easy to access as this will reduce the cost incurred on inputs and help provide funds for the production activities. There was need to find a way of improving labour availability through the provision of tractor hiring services by the cooperative society to ensure adequate labour supply.

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IMPACT OF THE ROAD TRANSPORTATION SYSTEM ON TOMATO MARKETING IN SURULERE LOCAL GOVERNMENT AREA, OYO STATE, NIGERIA

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ABSTRACT

Developing a road transportation network is crucial for enhancing Tomato's productivity. The road transportation system for Tomato marketing in Surulere Local Government Area of Oyo State, Nigeria was investigated, using a multistage sampling procedure to select 120 respondents. Data on respondents' socioeconomic characteristics, conditions of the road system, the extent of utilisation of the transportation means, effect of the road system on the marketing of tomatoes, and road system coping mechanisms embraced were collected using an interview schedule; and analysed using percentages, frequency, weighted mean score, Pearson Moment Correlation, and Chi-square at $\alpha_{0.05}$. The results showed that respondents were male (82.5%), with mean age (43.0 years), years of marketing experience (17.0 years), and annual income of (₦416,500).. The most prevailing conditions of the road system were portholes (100%) and dustiness (96.7%), while the most utilised road transportation means were a Panel van (WMS=3.73), pickup (WMS=2.59), and motorcycle (WMS=1.60). The highest impact of the road transportation system was high cost (WMS=4.36) which was high for 76.9% of the respondents. However, the coping strategies employed were sales to middlemen (WMS=2.85) and selling at ridiculous prices (WMS=2.68); which was low for 65.4%. A significant relationship existed between respondents' years of marketing experience (r=0.450), members of the Tomato marketing association (χ2=320.56), coping strategies (r=-34.48) and utilisation of the transportation means (r=0.664). The road transportation system reduced the respondent's income despite the various coping mechanisms used. The stakeholders should rehabilitate the road transportation system for hitch-free sustainable marketing of tomatoes.

Keywords: Road transportation network, coping mechanism, middlemen, sustainable Tomato marketing

INTRODUCTION

Tomatoes play a vital role in nutrition security and economic growth locally and globally due to their rich nutritional value and poverty alleviation potential (Afolabi, 2019). In Nigeria, they are a daily dietary staple, valued for their Vitamin C content and versatility in meals and drinks. Their high lycopene content also provides significant antioxidant benefits across age groups (Okuskhanova *et al*., 2020). However, in tropical regions like Nigeria, tomatoes are prone to post-harvest losses due to poor handling, inadequate packaging, and substandard transportation systems. These challenges result in up to 40% of losses after harvest, especially with the use of materials like raffia baskets (Sanusi and Dada, 2020; Kefas and Workneh, 2024; FMARD, 2020). Efficient transportation is thus essential, as it not only connects rural farmers to markets but also boosts agricultural productivity and economic interaction (Adetunji *et al*., 2021). Given the rising urban demand for tomatoes, road transport is the primary mode of distribution, accounting for over 80% of tomato distribution in sub-Saharan Africa, which remains the most viable solution (Oladapo and Fawole, 2023; Okeke *et al*., 2022).

Road transportation encompasses both the infrastructure (such as highways, trunk roads, and feeder roads) and the vehicular means (e.g., bicycles, motorcycles, tricycles, lorries, and buses) that facilitate the movement of people and goods (Adenubi *et al*., 2021; Ayuba *et al*., 2021; Wudad, 2020). In Nigeria, these systems are crucial for agricultural trade, linking rural production zones to urban markets (Oluwaseyi *et al*., 2021). Components such as roads, terminals, and garages collectively support the smooth movement of agricultural produce, especially perishable goods like tomatoes (Ibrahim *et al*., 2020). Road transport ensures door-to-door delivery throughout the value chain, thereby enhancing market accessibility and reducing rural-urban inequalities (Adeniran, 2019). Despite its importance, Nigeria's rural transport infrastructure remains largely underdeveloped, affecting the timely and quality delivery of fresh produce (Kefas and Workneh, 2024; FMARD, 2020). Poor road conditions, particularly during the rainy season, frequent vehicle breakdowns, and high transportation costs contribute to significant inefficiencies. These challenges result in post-harvest losses of up to 40% in tomato production due to delays, spoilage, and inadequate storage (Bello *et al*., 2023; Sanusi and Dada, 2020). Poor road infrastructure severely limits the movement of agricultural produce, isolating rural communities and hindering the efficient transport of crops like tomatoes to urban markets (Wudad, 2020). Additionally, security concerns such as armed robbery and high vehicle maintenance costs further hinder the reliability and safety of road transport systems (Adebayo *et al*., 2020).

According to Kefas and Workneh (2024), tomato marketing is further complicated by the crop's perishability, seasonal availability, price

volatility, and the often-remote locations of farms. Furthermore, Sanusi and Dada (2020) noted that poor handling during loading and unloading, vehicle vibrations from deteriorated roads, and insufficient storage contribute to substantial post-harvest losses. Tomatoes are frequently packed under pressure during transport, leading to bruising and spoilage. Moreover, market dynamics force the disposal or deep discounting of older stock to accommodate new arrivals, highlighting inadequate post-harvest management (Wudad, 2020). The poor state of rural road networks is characterised by potholes, mud, untarred surfaces, and inadequate bridges which increases transport costs, accelerate vehicle wear, reduces farmgate income, and discourages production expansion (Nwafor and Onya, 2019). In some cases, high transportation costs and poor road conditions compel marketers to abandon otherwise marketable produce. Addressing these infrastructural and operational deficits is essential for improving agricultural supply chains and economic development; as these constraints affects both public and private road users, impeding mobility and economic development, particularly for smallholder farmers (Olowokere and Adekunle, 2021). Therefore, investing in safe, accessible, and integrated road transport systems is essential for supporting rural tomato producers and ensuring sustainable agricultural marketing.

Building on the research background, this study assessed the impact of the road transportation system influences tomato marketing in Surulere Local Government Area, Oyo State. It examined respondents' socio-economic characteristics, conditions of the road system, the extent of utilisation of the transportation means, the effect of the road system on the marketing of tomatoes, and road system coping mechanisms embraced in the marketing of Tomatoes. The study also tested for a significant relationship between key variables and the impact of the road transportation system on tomato market dynamics.

METHODOLOGY

This study was conducted in Surulere Local Government Area (LGA) of Oyo State cited between 6°30′0″N and 3°21′0″E. The local government headquarters is Iresa-Adu in Ogbomoso and shares boundaries with Ifelodun LGA, Orolu LGA) in Kwara State, Oriire Local Government, Ogbomoso North and South LGA. The main economic activity of the residents of the towns that make up Surulere local government is farming growing arable crops like yam, Maize, and Tomatoes among others, and cultivating tree crops like cocoa and oil palm. A three-stage sampling procedure was employed to select 120 respondents using an interview schedule. The study population was all the registered Tomato Marketers in the study area. In the first stage the simple random sampling of 75% (three) of the four Districts in the LGA (Gambari/Baya; Iresadu/Arolu; Iwofin) was carried out. In the second stage, the simple random sampling of two Villages/settlements in the selected districts was done given 6 villages/settlements (Gambari/Baya (Gambari and Jabata); Iresadu/Arolu (Alagbede and Baasa); Iwofin (Araoye and Olorombo). The third stage involved the systematic random selection of 20 Tomatoes marketers in the six selected villages using the Tomatoes marketers' association register. This gave a sample size of 120 respondents. Data were analysed with descriptive (frequency counts, percentages, mean, weighted mean score) and Inferential statistics (Chi-square, PPMC at α 0.05). Respondents' socio-economic characteristics such as age, sex, primary occupation, years of marketing experience, tomatoe farm size, extension agents contact, membership of a cooperative society and annual income were measured accordingly. The conditions/nature of the road system were captured with five (5) possible road conditions with responses of yes (1) and No (0). The frequency of the conditions/nature of the road system items was ranked in descending order. The extent of utilisation of the transportation means were measured with seven (7) possible transportation means in the area with the response options of Always (3), Often (2), Rarely (1), and Never (0). The weighted mean score was calculated to assign positions to the transportation means in descending order. The effects of the road system on the marketing of tomatoes were measured with fourteen (14) possible effect of the road system on the marketing of tomatoes with response options of To a large extent (3) To a lesser extent (2), To a least extent (1), and To no extent (0). The weighted mean score was used to rank the respondents' effects of the road system on the marketing of tomatoes in descending order. The respondent's road system coping mechanisms embraced in the marketing of Tomatoes were measured with six (6) possible coping mechanisms with the response options of Always (3), Often (2), Rarely (1), and Never (0). The weighted mean score was calculated to assign positions to the coping mechanism employed in descending order.

RESULT DISCUSSION

Socioeconomic characteristics

The findings in Table 1 revealed that 82.5% of respondents were male, with a mean age of 43 years, 17 years of marketing experience, and an annual income of ₦416,500. This male dominance indicates gender disparity in tomato marketing, where men typically engage in large-scale trade, while women participate more in localised marketing (Abdulkadir *et al.*, 2024). The respondents' age suggests a youthful, economically

active group, which aligns with studies noting that younger individuals are more likely to adopt innovations in agricultural enterprises (Ayuba *et al*., 2022; Odebode *et al.*, 2023; Adeniyi and Adebayo, 2021). Years of marketing experience highlights respondents' familiarity with market trends and logistical dynamics, enhancing their capacity to navigate price fluctuations and transport challenges (Aina *et al.*, 2021; Oluwasusi *et al.*, 2021; Eze *et al*., 2022). However, the income distribution of 24.9% earning below ₦200,000 and only 15.9% above ₦1,000,000, reveals economic disparities that limit investment in critical areas like storage, transport, and market expansion (Adenubi *et al*., 2021). Additionally, Table 1 further reveals that 82.5% of respondents reported farming as their primary occupation, followed by trading (10.0%), underscoring the integration of production and marketing activities. This dual role allows marketers to reduce reliance on intermediaries, thereby enhancing profitability (Adenubi *et al*., 2021). However, most respondents (90.9%) operated on small-scale farms (≤2 hectares), with a mean of 1.5 hectares, which can constrain market supply capacity (Ayuba *et al*., 2022). Table 1 further reveals that access to extension services was high (85.0%), indicating that marketers benefit from technical guidance and logistical support, which enhances market efficiency (Kalogiannidis and Syndoukas., 2024). Furthermore, 59.2% of the respondents belonged to cooperatives, promoting collective action, bulk sales, shared transport, and improved credit access, which are the key advantages for smallholder marketers (Abdulkadir *et al*., 2024)

Table 1: socio-economic characteristic n = 120

Socio-economic characteristics	Frequency	Percentage	Mean
Age (years)			
31 – 40	62	49.6	43.0
41 – 50	45	36.0	
51 – 60	12	9.6	
> 60	01	0.8	
Sex			
Male	99	82.5	
Female	21	17.5	
Primary occupation			
Farming	106	82.5	
Trading	13	10.0	
Artisans	01	1.3	
Years of marketing experience (years)			
≤ 10	22	33.7	17.0
11 – 20	73	60.0	
> 20	25	6.3	
Tomato Farm size (hectares)			
≤ 2	109	90.9	1.5
> 2	11	9.1	
Extension Agent Contact			
Yes	102	85.0	
No	18	15.0	
Membership of a cooperative society			
Yes	71	59.2	
No	49	41.8	
Annual income			
< ₦200,000	30	24.9	₦416,500
₦200001 – ₦500000	28	23.3	
₦500001 – ₦700000	17	14.2	
₦700001 – ₦900000	21	17.5	
₦900001 - ₦1000000	5	4.2	
> ₦1000000	19	15.9	
Total	**120**	**100.0**	

Source: Field survey, 2023

Condition/nature of road transportation system

The result in Table 2 reveals a 100% prevalence of potholes across surveyed areas, indicating severe road infrastructure degradation. Potholes contribute to increased vehicle damage, higher transport costs, and longer travel times, adversely affecting tomato transportation efficiency. This aligns with Olagunju *et al*. (2021), who identified poor road conditions as

a major constraint to agricultural supply chains in sub-Saharan Africa, leading to post-harvest losses and reduced farmer incomes. Dusty roads (96.7%) and untarred roads (84.2%) were also prevalent, reflecting inadequate maintenance and unpaved surfaces. Dusty conditions pose health risks and challenge farmers in preserving produce quality, reducing market competitiveness (Ajayi and Ogunleye, 2022). The high incidence of untarred roads underscores insufficient investment in durable infrastructure, limiting rural economic growth as noted by Adebayo *et al.* (2023). Additionally, rough and slippery roads impede vehicle movement, causing delays that deter commercial transport operators from rural access, thereby isolating farmers from urban markets (Okonkwo and Oyinlola, 2020). The low presence of tarred roads (16.7%) highlights infrastructural underdevelopment and unequal public investment, further marginalising rural communities (Nwankwo *et al*., 2022).

Table 2: Nature of the road system

Conditions of the road system	Frequency*	Percentage
Portholes	120	100.0
Dusty	116	96.7
Untarred	101	84.2
Rough and slippery	90	75.0
Tarred	20	16.7

Source: Field survey, 2023; *Multiple responses

Utilisation of transportation means for Tomatoes Transportation

The result of the study as revealed in Table 3 shows that panel van (WMS=3.73) was the most commonly used transportation method for tomato marketing in the area. This was followed by pick up van (WMS=2.59) and motorcycles (WMS=1.66) which ranked 2nd and 3rd respectively. The finding suggests that panel vans are reliable for transporting goods in bulk, which is essential for agricultural marketing and ensuring timely delivery of perishable goods as opined by Eze *et al*. (2022) and Adenubi *et al*. (2021). This might be due to the greater storage space and better protection against adverse weather conditions, in panel vans which is vital for the transportation of tomatoes. The result of pick-up suggests they may serve as a secondary transportation option, suitable for smaller quantities of tomatoes. According to studies by Ayuba *et al*. (2021), pick-up trucks are more accessible in rural areas due to their affordability and versatility when compared to larger vehicles. Hence, they might not offer the same capacity or level of protection as panel vans, especially for long-distance travel. However, the result on the motorcycle that ranked third signifies its occasional use in tomato marketing. This mode is often employed for smaller, faster deliveries over shorter distances, but its low (WMS=1.66) also indicates that it is not as reliable for bulk or long-distance transportation. In rural communities, motorcycles are commonly used for rapidly transporting small quantities of goods, as noted by Kalogiannidis and Syndoukas (2024), who highlighted the importance of motorcycles in overcoming the lack of proper road infrastructure in developing nations. The result in Table 3 further shows that trucks (WMS=1.18) are seldom used for tomato marketing. This might be because trucks are typically designed for long-distance haulage, but poor road conditions and the high cost of operation can limit their use and effectiveness in rural areas as found out by Akinyemi *et al.* (2021). Furthermore, the result on the bus (WMS=0.38) as revealed in Table 3 shows that it ranked 7th and the least frequently used mode of transport.

Table 3: Utilisation of Transportation Means for Tomato Marketing

Transportation means	Always	Often	Seldom	Rarely	WMS	Rank
Panel van	73.3	26.7	0.0	0.0	3.73	1st
Pick up	10.8	50.0	26.7	12.5	2.59	2nd
Motorcycle	6.7	10.0	25.6	57.5	1.66	3rd
Taxi	0.0	17.5	19.2	63.3	1.54	4th
Tricycle	0.0	0.0	21.7	78.3	1.22	5th
Truck	0.0	0.0	17.5	82.5	1.18	6th
Bus	0.0	0.0	6.7	93.3	0.38	7th
Porterage	0.0	0.0	0.0	0.0	0.0	9th
Lorry	0.0	0.0	0.0	0.0	0.0	9th

Source: Field survey, 2023

This is not surprising, as buses are primarily intended for passenger transport, not for the bulk movement of goods. Furthermore, their schedules and routes are often not flexible enough to meet the specific demands of agricultural marketing (Abdulkadir *et al*., 2024).

Effect of the road system on tomato marketing

The result in Table 4 shows that increased transport cost (WMS=4.36) ranked first among the effects of road infrastructure on Tomato marketing. This was closely followed by the respondents' inadequate accessibility to other infrastructural amenities (WMS=4.28), with reduced marketers' income (WMS=4.06) being the third. The escalating transport costs might result from poor road conditions, increased vehicle maintenance, and extended travel times (Olawale and Fajobi, 2021). Furthermore, the study's findings in Table 4 suggest that poor road infrastructure hampers access to other critical amenities such as storage facilities, processing units, and markets. This is in tandem with the result findings of Ajayi and Ogunleye (2022) that infrastructural inadequacies in rural areas hinder farmers' capacity to fully utilise agricultural innovations and technologies. The reduction in the marketers' income as revealed in Table 4 implies that many farmers are forced to sell their tomatoes at farm-gate prices to middlemen, which are often significantly lower than market prices. Adebayo *et al.* (2023) highlight that farm-gate sales account for a major share of agricultural transactions in Nigeria, which reduces the marketers' bargaining power and further weakens rural economies. It should be noted that discouragement on the part of Agro-investors (WMS=2.05) and reduction in productivity (WMS=1.53) were minor effects of the road infrastructures on the marketing of Tomatoes. Hence, this implies that the conditions of the road were not a threat to the business of Tomatoe's agro-investors and the productivity of Tomatoe farmers in the area. The outcome of this research contradicts the findings of Olawale and Fajobi, (2021) that poor road transportation system discourages investment in agriculture and rural development, as businesses face challenges in logistics and supply chain management.

However, it is worth noting that the impact on the road infrastructure was high for 79.6% of the respondents in the study area as revealed in Table 4. The result implies that poor road transportation infrastructure had a direct effect on tomato marketing efficiency in the study area as affirmed by Wudad, (2020). In conclusion, Ojo and Adebayo (2020) suggest that enhancing rural accessibility via a good transportation system is key to improving smallholder farmers' productivity and income.

Table 4: Effect of the Road Transportation system on tomato marketing

Effect of the road transportation system on tomato marketing	Large extent	Lesser extent	Least extent	No extent	WMS	Rank
Increased transport cost	35.8	64.2	0.0	0.0	4.36	1st
Inadequate accessibility to other infrastructural amenities	28.3	71.7	0.0	0.0	4.28	2nd
Reduces marketers' income through sales at farm-gate	25.8	57.5	15.0	1.7	4.06	3rd
Cause quick dilapidation of vehicles	0.0	70.8	29.2	0.0	3.71	4th
Poor accessibility of buyers and sellers	0.0	69.2	30.8	0.0	3.69	5th
Poor accessibility to improved farm inputs and other government agro-credit schemes and intervention	0.0	68.3	31.7	0.0	3.68	6th
Discourages expansion of production	0.0	45.0	55.0	0.0	3.45	7th
Wastage of Tomatoes due to unavailability of timely markets	0.0	11.7	86.4	0.0	2.88	8th
Exposure to robbery and theft on roads	0.0	0.0	100.0	0.0	2.77	9th
Reduction in product perishability	0.0	0.0	100.0	0.0	2.77	9th
Discourages transporters from plying routes	0.0	0.0	100.0	0.0	2.77	9th
Longer time spent to transport produce	0.0	0.0	83.8	16.7	2.32	12th
Discourages agro-investors	0.0	0.0	68.4	31.6	2.05	13th
Reduce productivity	0. 0	0.0	35.8	64.2	1.53	14th
Level of Effect of Road Infrastructure					**%**	
High					79.6	
Low					24.1	

Source: Field survey, 2023

Coping strategies employed for marketing Tomatoes

Table 5 indicates that the most common coping strategy among tomato marketers was selling to middlemen (WMS = 2.85), followed by selling to any available buyer at a reduced price (WMS = 2.68). Transporting tomatoes in groups (WMS = 1.73) ranked third. The heavy reliance on

middlemen suggests limited direct market access. While middlemen facilitate connections between rural producers and urban markets, they often diminish farmers' profits, especially during urgent sales of perishable produce like tomatoes (Adebayo *et al*., 2022). Nonetheless, in areas with poor infrastructure, middlemen play a crucial role in maintaining market flow. Selling at lower prices helps minimise post-harvest losses, although it significantly reduces profit margins (Olawale and Fajobi, 2021). Group transportation, while cost-effective, remains underutilised due to coordination and logistical challenges. Yet, the adoption of transport cooperatives could enhance this strategy's effectiveness (Okonkwo and Oyinlola, 2020). Community-led road rehabilitation (WMS = 1.13) ranked lowest, highlighting its rarity despite its value in addressing infrastructure gaps. Although it reflects community resilience, such initiatives are not sustainable without institutional support (Oluwasusi *et al*., 2021; Eze and Nwosu, 2022). Thus, infrastructure investment and institutional backing from government and NGOs are critical for improving market access and livelihoods (Ojo and Adebayo, 2020).

Overall, 65.4% of respondents had low coping capacity, likely due to the severe impact of poor road transport systems (79.6%; Table 4), which threatens the sustainability of tomato production and its contribution to food security (Wudad, 2020).

Table 5: Coping strategies employed for marketing Tomatoe

Coping strategies employed	Always	Often	Seldom	Rarely	WMS	Rank
Sales of tomatoes to middlemen	10.8	63.3	25.8	0.0	2.85	1st
Sales of tomatoes at reduced cost	0.0	67.5	32.5	0.0	2.68	2nd
Transport of tomatoes in groups	0.0	0.0	73.3	26.7	1.73	3rd
Consumption and gifting of unsold tomatoes	0.0	0.0	24.2	75.8	1.24	4th
Downsizing the cultivated area	0.0	0.0	20.8	79.2	1.21	5th
Rehabilitation of access roads by community members	0.0	0.0	13.3	86.7	1.13	6th
Level of coping strategy					**%**	
High					34.6	
Low					65.4	

Source: Field survey, 2023

Relationship between selected variables and utilisation of the road transportation system

Table 6 reveals significant relationships between road transportation utilisation and variables such as annual income (r = 0.532), farm size (r = 0.120), coping strategies (r = 0.485), years of marketing experience (r = 0.450), and membership in marketing associations (χ^2 = 0.501). The strong positive correlation between income and transport use indicates that higher-income marketers can afford more reliable transportation, aligning with Ayuba *et al*. (2021), who noted income as a key determinant of transport affordability in rural settings. Similarly, the positive link between farm size and transport use suggests that larger farms require more efficient logistics for bulk produce movement, echoing Adenubi *et al.* (2021). Coping strategies also showed a significant correlation, highlighting that adaptable marketers are more inclined to overcome transportation constraints (Abdulkadir *et al*., 2024).

Table 6: Test of the relationship between selected Variables and utilisation of Road transportation System (n=120).

Variable	r- value
Age	0.078
Annual income	0.532**
Farm size	0.120**
Coping strategies index	0.485**
Years of Marketing experience	0.450**
Variables	**χ2 –value**
Primary occupation	0.079
Membership of the marketing association	0.501**

Sources: Field Survey, 2023 *P≤0.05

Marketing experience was positively associated with transport usage, implying that experienced marketers better understand market dynamics and prioritise timely delivery to reduce losses (Eze *et al*., 2022; Oluwasusi *et al*., 2021). Furthermore, membership in marketing associations enhances

access to transport solutions, as cooperatives often improve logistics and market access (Kalogiannidis and Syndoukas, 2024). Conversely, age (r = 0.078) and primary occupation (χ^2 = 0.079) showed no significant effect, indicating that transport utilisation is more influenced by economic and logistical factors than by demographic characteristics (Kalogiannidis and Syndoukas, 2024; Ayuba *et al*., 2021).

In summary, the utilisation of road transportation systems in rural communities is significantly shaped by economic capacity, farm scale, experience, adaptability, and social networks, rather than age or occupation.

CONCLUSIONS AND RECOMMENDATIONS

The study concludes that most of the Tomatoes growers were experienced marketers, who access extension services though operate at the subsistence level with moderate annual income. The unfavourable nature of the road system drastically reduced the marketing efficiency of Tomatoe that were transported using different means especially those transported via motor vehicles. The high cost of road transportation system negatively impacted the economic viability of the Tomatoe marketers despite the coping strategies employed. The utilisation of road transportation system hinges on respondents' years of marketing experience, membership of association and the respondents coping strategies. The study recommends that tomatoes marketers should leverage on the extension service and form cooperatives for enhanced bargaining power and enabled group transportation. These will reduce costs and improve market accessibility for sustainable growth, better revenue, and higher efficiency of the Tomatoe marketing system.

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USE OF E-MARKETING PLATFORMS AMONG POULTRY FARMERS IN OYO STATE, NIGERIA

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ABSTRACT
This study was designed to assess the use of E-marketing platforms among poultry farmers in Oyo State. Simple random sampling was used to select 35% of the 695 registered members of Poultry Association of Nigeria (PAN) to give a sample size of 243 respondents. Data were collected on the respondents' personal characteristics, enterprise characteristics, types of E-marketing platforms available, and the use of E-marketing platforms using a structured questionnaire and analysed using descriptive statistics such as frequency counts, percentages, means and inferential Statistics such as Chi-square and Pearson Product Moment Correlation. The result revealed that 52.3% of poultry farmers were male with a mean age of 43. Sixty four percent had tertiary education, while 90.1% were married and the dominant religion was Christianity (78.2%). Majority of the respondents (79.0%) raised broiler birds. More than half of the respondents (51%) had poultry farming experience of 9years and number of labour was 6 persons. WhatsApp emerged as the most available E-marketing platforms (100%) followed by Facebook (91.4%), YouTube (86.8%), Google (70.0%) and TikTok (66.7%). The result revealed that WhatsApp emerged as the most frequently used platform for advertisements of poultry products with the mean value ($\bar{x}$ = 1.7654, sales of poultry products ($\bar{x}$ = 1.7449, customer feedback ($\bar{x}$ = 1.6831), price information$\bar{x}$ = 1.6708), procurement of inputs for poultry production ($\bar{x}$ = 1.0453). There were correlations between educational qualification, age, poultry farming experience, and E-marketing usage. The result of the research showed that there was low utilisation of E-marketing platforms with a frequency count of 147 and 60.5 percent thus the research concluded that the use of E-marketing platforms was low. As a result of the percentage value and frequency counts of the low utilisation of E-marketing platforms among poultry farmers in Oyo State, it is recommended that the Poultry Association of Nigeria (PAN) should encourage diversification beyond WhatsApp and Facebook to include platforms like Instagram, Google, Websites, YouTube etc. to expand market reach and increase profitability.

Keywords: E-marketing, Poultry farmers, Enterprise, Telecommunications

INTRODUCTION

The Nigerian poultry sector occupies a vital position in the nation's economy, serving as a significant source of employment and contributing to the country's food security. The sector has been able to employ 14 million Nigerians in the agricultural sector (Netherlands Enterprise Agency, 2020). According to Food Business Africa (2022), the Nigerian poultry industry includes 180 million birds categorized by production systems. The farmer's weekly (2022) reported that the African poultry industry is expected to grow at a compound annual rate of approximately 4.7% from a current value of $25 billion and Nigeria as one of the largest poultry markets in Africa, experiences a continuous demand for poultry products across various regions. In Nigeria, the importance of the industry cannot be over-emphasised as it provides raw materials to some industries as well as serve as a take up industry for other industries such as the animal health industries (Omiti, J. M., and Okuthe, S. O. (n.d.) The poultry sector not only provides employment opportunities, it also generates significant income that helps to boost the Gross Domestic product of the country (Bawa *et, al.*, 2023).

E-marketing, also known as internet marketing, refers to the use of digital technologies and online platforms to promote and sell products or services (Chaffey and Ellis-Chadwick, 2019). In the context of agriculture, E-marketing encompasses various digital channels and strategies, including websites, social media platforms, online marketplaces, and mobile applications, and information sharing platforms to connect farmers with consumers, intermediaries, and other stakeholders in the value chain (Aji *et al.*, 2020).

The utilisation of E-marketing in agriculture has gained significant momentum in recent years, driven by the increasing penetration of internet and mobile technologies in rural areas, as well as the growing demand for transparency, traceability, and direct marketing channels (Onyedikachi *et al.*, 2021). Many farmers still lack access to digital tools (FAO, 2019). The poultry sector in Oyo State, the largest producer of day-old chicks in Nigeria, faces similar challenges. While the state has a thriving poultry market, many farmers still do not use E-marketing tools to sell their products, limiting their market reach and profitability. It is against this background that this study seeks to assess the utilisation of E-marketing platforms among poultry farmers in Oyo state and achieve the following objectives; describe the personal characteristics of respondents in the study area, examine the enterprise characteristics of the respondents, identify the types of E- marketing

that are available for respondents use, assess the uses of E-marketing platforms.

METHODOLOGY

The study was carried out in Oyo State**,** which is in the South-West geopolitical zone of Nigeria. One of the most prominent actors in the sector is the Poultry Association of Nigeria (PAN), particularly its Oyo State chapter. PAN serves as a central coordinating body that provides critical services such as capacity building, advocacy, and extension services to poultry farmers. The association organises training workshops, farm visits, and information dissemination activities aimed at enhancing best practices in poultry management. A study by Owolade *et al*. (2017) emphasises the role of PAN in bridging knowledge gaps among poultry farmers in the state, with many respondents acknowledging the association as their primary source of technical and operational guidance.

In addition to PAN, the Oyo State Government has played an active role in supporting the poultry industry, particularly in response to rising production costs and feed shortages. In a notable intervention, the government distributed approximately 16,000 bags of maize and 11,000 bags of poultry feed to about 1,691 farmers across the state. This initiative was designed to reduce the burden of feed costs and sustain production levels amidst economic pressures (Voice of Nigeria, 2023; BusinessDay, 2023). These policy responses reflect a growing recognition of the sector's importance in food security and employment generation.

The study population comprised of registered poultry farmers under the poultry Farmers Association of Nigeria (PAN). There were 695 registered members in the association. A simple random sampling technique was used to select 35% out of the 695 registered members to give a sample size of 243 respondents.

The data were collected using a well-structured questionnaire. Data were collected on the respondents' personal characteristics, the enterprise characteristics of respondents', types of E-marketing platforms that are available for respondents' use, and uses of E-marketing platforms. The dependent variable- the use of E-marketing platforms was measured using yes or no and the indication of frequency of use with options of always, occasionally and never with scoring of 0,1 and 3,2,1 respectively. Data was analysed using descriptive statistics such as frequency counts, percentages and means and inferential Statistics such as Chi-square and Pearson Product Moment Correlation.

RESULTS AND DISCUSSION

Personal characteristics

The results in Table 3.1.0 revealed that the mean age of the respondents was 43±9.94 in the study area. The mean age of the respondents was 43± which is quite close to the findings of Bamiro, Torimiro, and Oduntan, (2020) who reported the mean age of commercial poultry farmers in Oyo state as 44.6±. This is an indication that poultry farmers in Oyo State are relatively young and still in their active productive age and they have high tendency of being able to use E-marketing platforms.

The table also shows that more than half of the respondents (52.3%) were male. This implies that the population of poultry farmers of male and female in Oyo state were almost equal that is both genders are involve in poultry production, although the population of male respondents was slightly above that of the female. This is in close alignment with the findings of Akinola, and Essien, (2011) who reported that gender distribution of poultry farmers in Oyo State showed that 51.9% were Males while 48.1% were Females. This is an indication that Poultry production is not dominated heavily with one gender over the other.

Most of the respondents (90.1%) were married, this is in close alignment with the findings of Omonona, Oni, and Ugboh, (2014) that majority of poultry farmers (89%) of the respondents were married while (11%) were single. This is an indication that poultry farming is predominantly an enterprise centered on married family units. Most of the respondents (64.6%) had tertiary education, followed by secondary education (29.6%), primary education (5.8%). This agrees with Adebayo and Adeola (2005) findings on poultry farmers in the state that (62%) had tertiary education, (28%) had secondary education and (10%) had primary education. This implies that the respondents had attained tertiary education.

Majority (78.2%) of the respondents were Christians; this implies that Christianity is the major religion being practiced by respondents in the study area**.** This is in close alignment with the findings of Adejobi, and Kassali, (2013) that majority of Poultry Farmers were (77.5%) were Christians while (22.5%) were Muslims. This implies that Poultry Farmers are predominantly Christians.

Enterprise characteristics

The result in table 3.2.0 reveals that majority (79.0%) of the respondents raised broiler birds, commercial layers (48.6%), Turkey (24.3 %), Breeder Chickens (23.5%), and Cockerel (18.5%).

This finding is in close alignment with Okunola *et.al* (2012) findings that majority of respondents raised broilers and layers while small percentage raised poultry species like guinea fowl, turkeys. The dominance of Broilers and Layers productions suggests that these enterprises are driven by

consumer demand for poultry meat and eggs which are staple sources of animal protein in Nigeria.

Table 3.1.0: Distribution of Respondents by Personal Characteristics n=243

Personal Characteristics	Frequency	Percent	Parameter
Age group			
25-34	52	21.4	Mean:43, SD:9.94
35-44	60	24.7	
45-54	104	42.8	
55-64	21	8.6	
65-75	6	2.5	
Sex			
Male	127	52.3	Mode: Male
Female	116	47.7	
Marital Status			
Single	24	9.9	Mode: Married
Married	219	90.1	
Religion			
Christianity	190	78.2	Mode: Christianity
Islam	53	21.8	
Educational Qualification			
Primary Education	14	5.8	Mode: Tertiary Education
Secondary Education	72	29.6	
Tertiary Education	157	64.6	

Source: Field survey, 2024

Table 3.2.0 reveals that more than half (51.0%) of the respondents were within the years of experience range of 1-9 years in poultry production, (28.0%) were within the range of 11-18, (15.6%) of the respondents were within the range of 19-27, (5.3%) were in the range of 28-36.

This finding is contrary to Adeyemo *et al* (n.d) research findings among poultry in the state that 48.6% of the respondents had been involved in poultry farming for less than 10 years. This is an indication that the increase has been because of more people have ventured into poultry production in the past few years.

Table 3.2.0: Distribution of Respondents by Enterprise Characteristics n=243

Types of Poultry Enterprise	Frequency	Percent	Mean	Std. Deviation
Broiler	192	79.0		
Commercial layers	118	48.6		
Turkey	59	24.3		
Breeder Chickens	57	23.5		
Cockerel	45	18.5		
Guinea fowl	11	4.5		
Geese	5	0.8		
Gosling	2	0.8		
Quail	1	0.4		
Years of Poultry Experience				
1-9	124.0	51.0		
10-18	68.0	28.0	11.19	10.00
19-27	38.0	15.60		
28-36	13.0	5.30		
Number of labour				
1-10	219	90.1		
11-20	4	1.6	6.10	8.90
41-above	5	2.1		
No labour	15	6.2		
Flock size				
50-10,000	230	94.7	3114.61	11495.09
20,001-30,000	13	5.3		

Source: Field Survey, 2024

Table 3.2.0 reveals that majority of the respondents (90.1%) had 1-10 workers in their poultry enterprises (1.2%) of the respondents have the range of (11-20) workers, (2.1%) have of the respondents have the range 41-above, (6.2%) of the respondents have no workers. This finding implies that poultry farming in the study is considerable small compared to medium farming operations.

Table 3.2.0 reveals that the flock size of majority (94.7%) the respondents ranges from 4-10,000, 20,001-30,000(5.3%). This finding is contrary to the findings of Okunlola and Bamiro (2016) that majority of farmers (62.5%) operated a flock size of 500-5,000 birds. This finding implies that small to medium scale poultry farming operations are dominant in Oyo State.

Types of E-marketing platforms available

The result in Table 4.3.0 revealed that WhatsApp ranked highest with a percentage of (100%) followed by Facebook, YouTube, Google, TikTok, Twitter, website, Instagram, Telegram, Shopify, Pinterest, MailChimp with percentages (91.4%), (86.8%), (70.0%), (66.7%), (60.1%), (51.9%), (50.2%), (38.3%), (7.0%), (2.1%), (0.4%). This indicates that WhatsApp is the most available E marketing platform available for respondents' usage followed by Facebook, YouTube, Google, TikTok, Twitter, Website, Instagram, Telegram, Shopify, Pinterest, and the least available platform is Mailchimp. This also implies that WhatsApp is the most popular platform available for usage among poultry farmers. This is in close alignment with Aker (2011) findings who highlighted the popularity of mobile messaging applications like WhatsApp among farmers for sharing information and marketing their products.

Table 3.3.0: Distribution of the types of E-marketing platforms available for usage. n=243

E-marketing Platforms	Yes (%)	No (%)
WhatsApp	100	0.0
Twitter	60.1	39.9
Shopify	7.0	93.0
Pinterest	2.1	97.9
Google	70.0	30.0
Facebook	91.4	8.6
Mailchimp	0.4	99.6
TikTok	66.7	33.3
YouTube	86.8	13.2
Website	51.9	48.1
Instagram	50.2	49.8
Telegram	38.3	61.7

Source: Field survey, 2024

The use of e-marketing platforms

Out of the 12 available e-marketing platforms known by the respondents in the study area, from Table 4.1.0 WhatsApp, Facebook and TikTok were the E-marketing platforms mostly used by respondents for the advertisement of poultry products with the average mean values of ($\bar{x}$= 1.7449), ($\bar{x}$= 1.4115), ($\bar{x}$= 0.3374) respectively. WhatsApp, Facebook and TikTok were the top three E-marketing platforms mostly used for sales of poultry products with the average mean values of ($\bar{x}$=1.7449), ($\bar{x}$ = 1.2346), ($\bar{x}$ = 0.2551).In the use of E-marketing platforms for customer feedbacks, WhatsApp, Facebook and Twitter were commonly used by the respondents with the average mean values of ($\bar{x}$=1.6831), ($\bar{x}$ = 1.0494), ($\bar{x}$ = 0.3292).

Furthermore, WhatsApp, Facebook and Google were the mostly used E-marketing platforms for price information with the average mean values of ($\bar{x}$ = 1.6708), ($\bar{x}$ =1.0823), ($\bar{x}$=0.6091) respectively. The Table also indicated that for procurement of inputs for poultry production, WhatsApp, Facebook and Google were commonly used by the respondents with the average mean values of ($\bar{x}$ = 1.6708), ($\bar{x}$ =1.0823), ($\bar{x}$ =0.6091) This implies that the most used E -marketing platform is WhatsApp (Moreno-Cabanillas, *et. al.*, 2024).

Table 3.4.0: Distribution of Respondents on the utilisation of E-marketing platforms (n=243)

Uses	WhatsApp	Twitter	Google	Facebook	TikTok
Customer feedback					
Always	76.1	12.8	1.6	42.8	7.0
Occasionally	16.0	7.4	10.7	19.3	4.5
Never	7.8	79.8	87.7	37.9	88.5
Mean	1.6831	0.3292	0.1399	1.0494	0.1852
Advertisement of poultry products					

Uses	WhatsApp	Twitter	Google	Facebook	TikTok
Always	83.5	12.3	2.5	66.3	14.8
Occasionally	9.5	4.5	11.9	8.6	4.1
Never	7.0	83.1	85.6	25.1	81.1
Mean	1.7654	0.2922	0.2099	1.4115	0.3374
Procurement of inputs for poultry production					
Always	47.3	4.1	2.5	30.0	2.9
Occasionally	9.9	4.9	11.9	16.5	4.1
Never	42.8	90.9	85.6	53.5	93.0
Mean	1.0453	0.1317	0.1687	0.7654	0.0988
Sales of poultry product					
Always	81.1	8.2	2.1	53.5	10.3
Occasionally	12.3	7.4	11.5	16.5	4.9
Never	6.6	84.4	86.4	30.0	84.8
Mean	1.7449	0.2387	0.1564	1.2346	0.2551
Price information					
Always	79.0	9.5	24.7	48.6	2.9
Occasionally	9.1	6.2	11.5	11.1	4.9
Never	11.9	84.4	63.8	40.3	92.2
Mean	1.6708	0.2510	0.6091	1.0823	0.1070

Source: Field Survey, 2024

The respondents were scored on their use of E-marketing platforms with scores ranging from:

Table 3.4.1: Categorisation of respondents on the use of E-Marketing Platforms (n=243)

Utilisation group	Frequency	Percent
Low (4-19.2)	147	60.5
High (19.3-88.0)	96	39.5
Total	243	100

Source: Field survey, 2024 Minimum= 4.00(low usage) Maximum= 88.00(high usage).

Table 3.5.0 shows that at significant level of p=<0.05, there was a significant relationship between respondents' educational qualification (χ^2 =13.397, p=0.001) and the utilisation of E-marketing platforms. This implies that the educational qualification of poultry farmers influences their use of E-marketing platforms.

Table 3.5.0 Result of Chi square analysis showing the relationship between selected personal characteristics of respondents and the utilisation of E-marketing platforms.

Variables	χ^2	df	p-value
Sex	1.608	1	0.205
Marital status	3.950	1	0.047
Religion	1.666	1	0.197
Educational Qualification	13.39	2	0.001

Source: Field survey, 2024

Table 3.5.1 shows that there was significant relationship between the respondents' age (r= -0.224, p=0.000) and their utilisation of E- marketing platforms. This implies that the age of Poultry farmers influenced their utilisation of E -marketing platforms.

Table 3.5.1 Pearson Product Moment Correlation analysis showing the relationship between age of respondents and the utilisation of E marketing platforms.

Variables	r value	p- value
Age	-0,224	0.000

Source: Field survey, 2024

Relationship between selected enterprise characteristics and utilisation of E – marketing platforms

Table 3.6.1 shows that at a significant of $p<0.05$, there was a significant relationship between respondents' years of poultry farming experience (r=- 0.136, p=0.035) and utilisation of E -marketing platforms. This implies that the poultry farmers' years of poultry farming experience influenced their utilisation of E- marketing platforms.

Table 3.6.1: Pearson Product Moment Correlation analysis showing the relationship between selected enterprise characteristics and the utilisation of E-marketing platforms.

Variables	r value	p-value
Years of poultry farming experience	-0.136	0.035
Number of labour	-0.023	0.727

Source: Field survey, 2024

CONCLUSION AND RECOMMENDATIONS

It can be concluded that there was low level of the utilisation of E marketing platforms. From the results, the E- marketing platforms mostly used by the respondents were WhatsApp, Facebook, TikTok for advertisements of poultry products. WhatsApp, Facebook and TikTok were mostly used for sales of poultry products. WhatsApp, Facebook and Twitter were the platforms mostly used for customer feedback. WhatsApp, Facebook, Google were the platforms mostly used for price information while WhatsApp, Facebook and Google were the platforms mostly used for procurement of inputs for poultry products. Based on the result findings, more than half of the respondents were males within the mean age of 43±, Christians and had tertiary education. The findings also indicated that WhatsApp is the most available E-marketing platform for use.

The study which assessed the uses of E-marketing platforms among poultry farmers in Oyo state is apt and based on the result findings of the low utilisation of E-marketing platforms among poultry farmers in the state and WhatsApp and Facebook being the most used E-marketing platforms among poultry farmers. It is recommended that the Poultry Association of Nigeria (PAN) should encourage diversification beyond WhatsApp and Facebook to include platforms like Instagram, Google, Websites and YouTube etc. to expand market reach and profitability.

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USE OF SMART AGRICULTURAL TECHNOLOGIES AMONG RESEARCHERS IN AGRICULTURAL RESEARCH INSTITUTES IN OYO STATE, NIGERIA

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ABSTRACT
Smart agricultural technologies (SATs) are the emerging technologies used to improve the efficiency, productivity, and sustainability of agriculture. This study investigated the use of smart agricultural technologies among researchers in agricultural research institutes in Oyo state, Nigeria. A multistage sampling procedure was used to select a total of 165 researchers, and information on the knowledge, perception, and level of use of SATs was garnered for the study. The results were analysed using percentages, mean, Chi-square, and Pearson Product Moment Correlation. Results reveal that 66.1% of the researchers had high knowledge of the use of smart agricultural technologies such as Sensors, Drones, Artificial intelligence, Geographical Information Systems, and 58.8% had a favourable perception towards the use of smart agricultural technologies. However, the level of use of smart agricultural technologies was low for 55.2% of the researchers. The researchers' level of education (χ^2 = 8.172, $p<0.05$) and research institution (χ^2 = 8.579, $p<0.05$) had a significant relationship with the use of SATs. However, there was a significant but negative relationship between the respondents' perception and the use of smart agricultural technologies ($r=-0.242$, $p<0.05$). Although the respondents were knowledgeable about the use of SATs and had favourable perceptions towards its use but their level of use of SATs was low, and this could be due to the unavailability of these technologies in the research institutes. To promote the use of SATs by researchers, the government should provide adequate funding for the purchase and implementation of SATs to all government-owned agricultural research institutes.
Keywords: Smart agriculture, Emerging technologies, Agricultural research institute

INTRODUCTION

Smart agricultural technologies are emerging technologies such as sensors, the Internet of Things (IoT), drones, artificial intelligence, Geographical Information Systems (GIS), and digital image mapping systems designed to enhance the efficiency, productivity, and sustainability of agriculture (Gomstyn and Jonker, 2023). These technologies enable farmers and researchers to track, monitor, automate, and analyse data related to the agricultural environment. The integration of these technologies into farm operations is known as smart agriculture (Singh *et al*., 2022). This concept leverages modern technology to optimise agricultural processes, enabling the collection and analysis of data and deploying control mechanisms to improve efficiency and reduce wastage (Radhi and Abu Bakar, 2020). Among this array of technologies, sensors provide essential data for crop monitoring and optimisation, while IoT devices enable automation and remote data collection (Sadiku *et al*., 2020). Robotics plays a vital role in automating various physical tasks in agriculture, including inspection, data collection, and yield prediction (Sadiku *et al.*, 2020). Drones offer fast and efficient methods for crop scouting, treatment planning, and soil quality assessment (Mistry *et al*., 2022), while GIS, complemented by remote sensing and GPS technology, facilitates the analysis and visualisation of agricultural landscapes, land management, and crop yield estimation (Alam and Ahmed, 2008; Adekunjo *et al*., 2013).

While these technologies allow for accurate, site-specific, and real-time data collection and analysis, their adoption and availability within agricultural research institutes in Nigeria remain limited. Studies have shown that most research institutions primarily rely on basic tools such as digital pH meters, digital balances, and data analysis software, while more advanced technologies like field sensors, digital soil maps, and remote sensing software are rarely available (Ojesanmi *et al*., 2014). This limited availability has been attributed to factors such as high procurement costs, lack of technical expertise, and low institutional prioritization of smart technologies in research settings (Ojesanmi *et al.*, 2014). Despite the potential of smart agricultural technologies to revolutionise the agricultural sector, their utilisation and impact on research activities and development remain relatively unexplored, particularly in Nigeria. Against this backdrop, this study addressed the following questions:

1. What are the socioeconomic characteristics of the researchers?
2. What is the researchers' knowledge level on the use of smart agricultural technologies?
3. What is the perception of researchers on the use of smart agricultural technologies?
4. What is the level of use of smart agricultural technologies?

The hypotheses of the study are as stated:

$H_0$1: There is no significant relationship between the selected socioeconomic characteristics of the researchers and their use of smart agricultural technologies

$H_0$2: There is no significant relationship between the knowledge of the researchers on the use of smart agricultural technologies and the use of smart agricultural technologies.

$H_0$3: There is no significant relationship between the respondents' perceptions of the use of smart agricultural technologies and the use of smart agricultural technologies among researchers

METHODOLOGY

The study was conducted in Oyo State, Nigeria, a predominantly agrarian state that hosts several agricultural research institutes. These include the Institute of Agricultural Research and Training (IAR&T), National Cereal Research Institute (NCRI), International Institute of Tropical Agriculture (IITA), Cocoa Research Institute of Nigeria (CRIN), Forestry Research Institute of Nigeria (FRIN), National Center for Genetic Resources and Biotechnology (NACGRAB), and National Institute of Horticultural Research (NIHORT). The target population consisted of agricultural researchers working in these institutes.

A two-stage sampling procedure was used to select 165 respondents. The first stage involved randomly selecting 60% of the seven agricultural research institutes within the state using a simple random sampling technique, resulting in the selection of four research institutes: NIHORT, IITA, CRIN, and FRIN. In the second stage, the estimated number of researchers in each selected institute was obtained from administrative staff based on institutional records. Based on this, 30% of the researchers were randomly selected from each institute, resulting in 41, 45, 41, and 38 researchers from NIHORT, IITA, CRIN, and FRIN, respectively. Structured questionnaires were used for data collection. Content and face validity were used to validate the instrument.

The variables assessed include the socio-economic characteristics, level of knowledge of the use of SATs, Perception of the use of SATs, and level of use of SATs. Knowledge of the use of SATs was measured using 32 true/false statements (true = 1, false = 0), and the mean score was used to categorize knowledge levels into high and low. Perception of the use of SATs was assessed using 26 statements, both positive and negative, rated on a five-point Likert scale. Positive statements were scored from strongly agree = 5 to strongly disagree = 1, while negative statements were reverse scored. The mean score was used to categorize perception as either favourable or unfavourable. Use of SATs was measured using 28 statements and a response scale adapted from Adekunmi and Awoyemi (2017), assessing frequency of use. Responses were scored as never = 0, occasionally = 1, and always = 2. The mean score was used to categorize the level of use into high and low. The data collected was analysed using descriptive statistical tools such as frequencies, percentages, mean, and standard deviation, and inferential statistical tools such as Chi-square and Pearson Product Moment Correlation (PPMC) were used to test the hypothesis.

RESULTS AND DISCUSSION

Socioeconomic characteristics

Table 1 shows that the mean age of researchers was 37.3 years, indicating a predominantly young and agile researchers. This is consistent with the findings of Oyetoro (2022), who reported a mean age of 33.9 years among researchers, and Abiona *et al*. (2021), who found a mean age of 36.9 years among employees in agricultural research institutes. The results also reveal that 54.5% of respondents were female, suggesting a higher female presence in research institutions. This signifies potential benefits from diverse perspectives and expertise, enhancing agricultural research outcomes through gender balance and women's inclusion. These findings contrast with those of Abanikannda *et al.* (2017) and Abiona *et al.* (2021), who reported male dominance among agricultural researchers in Nigeria.

Furthermore, the study found that 50.3% of agricultural researchers held master's degrees, indicating a well-educated cohort capable of leveraging smart agricultural technologies. This corroborates Barakabitze *et al*. (2015) observations of high literacy levels among agricultural researchers, particularly with master's degrees being the most common highest qualification.

Respondents had an average of 7.8 years of research experience, suggesting ample expertise to independently conduct research and utilise smart agricultural technologies. This aligns with the findings of Ojesanmi *et al.* (2014) and Oyetoro (2022), who reported an average of eight years of experience among agricultural researchers.

Respondents' level of knowledge of the use of smart agricultural technologies

Table 2 shows that majority (66.1%) exhibited high knowledge, while 33.9% had low knowledge. This suggests that researchers in the study area possess a strong grasp of these technologies and understand their concepts, functionalities, and potential benefits. This indicates a positive outlook for the adoption and integration of smart agricultural technologies in research practices. However, the sizable proportion with low knowledge (33.9%) highlights the necessity for targeted interventions and capacity-building initiatives. Addressing this knowledge gap will enable researchers to fully leverage these technologies, enhancing agricultural efficiency, productivity, and sustainability in the study area.

Table 1: Frequency distribution of researchers based on their socio-economic characteristics

Variables	Frequency	Percentage	Mean
Age (Years)			37.3
≤ 30	41	24.8	
31-40	75	45.5	
41-50	38	23.0	
≥ 51	11	6.7	
Sex			
Male	75	45.5	
Female	90	54.5	
Level of Education			
HND	12	7.3	
BSc/B.Tech	52	31.5	
MSc	83	50.3	
PhD	18	10.9	
Years of Experience			7.8
1-5	59	35.8	
6-10	67	40.6	
11-15	28	17.0	
16-20	5	3.0	
≥ 21	6	3.6	
Total	**165**	**100**	

Source: Field survey, 2023

Table 2: Respondents' level of knowledge of the use of smart agricultural technologies

Level of Knowledge	Frequency	Percentage	Min	Max	Mean	Std dev
Low (< mean)	56	33.9	10	32	28.26	4.04
High (≥ mean)	109	66.1				
Total	165	100				

Source: Field Survey, 2023

Respondents' perception of the use of smart agricultural technologies

Majority of agricultural researchers (97.5%) agreed that agricultural research activities are made easier with the use of these technologies. Most respondents (95.2%) agreed that smart agricultural technologies would help provide sustainable solutions to agricultural problems. The majority of 95.7% agreed that agricultural issues (such as climate change, irrigation, etc.) can be addressed using these technologies. Most of the respondents (94.3%) agreed that a lot could be achieved using these technologies. Similarly, 93.9% agreed that the data obtained from these technologies are vast and well-detailed. On the other hand, 80% of the respondents disagreed with the statement that researchers cannot achieve much when they use smart agricultural technologies, 72.2% of the respondents disagreed that these technologies could not be used for agricultural research activities, 75.1% of the respondents disagreed with the statement that data captured by these technologies are not useful for research activities. These findings suggest a strong consensus among agricultural researchers on the transformative potential of smart agricultural technologies. It also shows the widespread acceptance and confidence in SATs as essential tools for advancing sustainable agricultural research.

Respondents' level of perception of the use of smart agricultural technologies

Table 4 shows that respondents had favorable (58.8%) perceptions regarding the use of smart agricultural technologies. Recognizing the potential benefits these technologies offer to research activities. The findings suggest that smart agricultural technologies are perceived as valuable tools for enhancing the research process. This positive perception reflects a readiness to adopt and utilise these technologies if accessible.

However, a significant portion (41.2%) of respondents expressed unfavorable perceptions. This suggests that some researchers have reservations, concerns, or doubts about the effectiveness, usability, or practicality of these technologies in their specific research context. Addressing these concerns through enhanced information dissemination, training, and support initiatives could alleviate skepticism and promote greater adoption of smart agricultural technologies among this group.

Table 3: Respondents' Perception of the Use of Smart Agricultural Technologies

Perception Statements	SA (%)	A (%)	U (%)	D (%)	SD (%)
Sensors, robotics, and IoT are not applicable for agricultural research activities.	3.0	13.9	10.9	25.5	46.7
Agricultural research activities are made easier with the use of these technologies	64.8	32.7	1.8	0.6	0.0
These technologies can help address agricultural related issues (such as climate change, irrigation, etc.)	51.5	44.2	3.0	1.2	0.0
These technologies would help achieve sustainable solutions to agricultural problems.	55.8	39.4	4.8	0.0	0.0
Using these technologies can be time-consuming	4.8	15.8	9.7	43.6	26.1
The technologies facilitate the sourcing and management of information.	52.7	38.8	6.1	2.4	0.0
Researchers cannot achieve much using these technologies.	4.8	9.1	6.1	33.3	46.7
Technology guarantee efficiency.	50.3	42.4	6.7	0.6	0.0
These technologies are expensive to acquire	37.0	39.4	8.5	12.1	3.0
Robust data can be collected and analysed using smart agricultural technologies	49.1	44.2	4.8	1.8	0.0
Lack of adequate technical know-how can lead to generation of inaccurate result.	47.3	33.3	10.3	7.3	1.8
Smart agricultural technologies provide easy access to data.	42.4	50.9	4.2	2.4	0.0
Smart agricultural technologies increase the productivity of researchers	47.9	45.5	6.1	0.6	0.0
With the use of these technologies a lot can be achieved within a short time	53.9	41.2	3.0	1.8	0.0
Data captured by these technologies are not useful for research activities	10.3	9.1	5.5	32.1	43.0
Data captured by these technologies are vast and well detailed	53.3	40.6	5.5	0.6	0.0

SA – Strongly agree, A – Agree, U – Undecided, D – Disagree, SD – Strongly disagree
Source: Field Survey, 2023

Table 4: Respondents' level of perception of the use of smart agricultural technologies

Perception towards the use	Frequency	Percentage	Min	Max	Mean	Std dev
Unfavorable	68	41.2	73	124	101.97	11.58
Favorable	97	58.8				
Total	165	100				

Source: Field survey, 2023

Respondents' use of smart agricultural technologies

Table 5 shows that about one-third (33.9%) of the respondents always use Geographical Information Systems (GIS) for geographical data capture, while 30.9% always utilise the Internet of Things (IoT) for data gathering. Similarly, 30.3% always employ GIS for geographic data processing and integration, with 29.1% always using IoT for gathering environmental data. However, 41.2% of respondents occasionally use sensors for monitoring soil and climate conditions, while 38.8% occasionally utilise GIS for solving geographical issues. Additionally, 37.6% occasionally employ GIS for data processing and mapping.

These findings suggest a moderate but inconsistent pattern in the utilisation of smart agricultural technologies among researchers. While some respondents integrate these tools into their workflows regularly, many use them occasionally, suggesting varying degrees of familiarity, access, or relevance to their research focus. These findings align with those of Ojesanmi *et al.* (2014), who reported that while technologies such as GIS and GPS were widely used (60%) for generating research area maps and classifying soils, more advanced technologies like remote sensing were rarely used (1.1%). They attributed this to factors such as lack of specialist skills, software limitations, and technical complexity. Their findings also support the notion that the availability of these technologies does not guarantee their consistent usage; however, factors such as knowledge, relevance to research objectives, and institutional support all influence how frequently these technologies are used.

Table 5: Respondents' use of smart agricultural technologies

Statements	Mean	Std Dev
I use sensors to monitor soil, climate conditions and climate change	0.84	0.75
I use sensor to gather relevant data for my research activities	0.87	0.79
I use sensors with other technologies to carry out research processes	0.73	0.77
I use UAV to monitor the health and growth of vegetation	0.41	0.64
I use UAV together with sensors to assess and analyse the field for research purposes	0.48	0.75
I use robotics to collect spatial data including GPS data to help with mapping.	0.23	0.50
I use digital image mapping system to estimate soil moisture and other soil properties	0.64	0.78
I use GIS to capture geographical data	0.96	0.85
I use GIS to process geographic data and integrate it into a map	0.98	0.79
I use GIS for solving geographical problems	0.93	0.78
I use GIS for soil mapping and soil analysis	0.89	0.83
I use IoT to gather information on temperature, humidity, light and pressure levels for research purposes	0.88	0.83
I use IoT for surveying and mapping of field	0.69	0.78
I use IoT to evaluate field variables such as soil state, atmospheric conditions, and biomass of plants or animals	0.62	0.72
I use IoT to gather relevant data for research purposes	0.92	0.84

Source: Field Survey, 2023

Respondents' level of use of smart agricultural technologies

Table 6 reveals that 55.2% of the respondents had a low level of use, indicating a significant non-use of smart agricultural technologies among agricultural researchers in the study area. Conversely, 44.8% of the respondents had a high level of use, indicating a successful integration of these technologies into their research practices. While many respondents have high knowledge of how to use these technologies, their actual usage is low. This suggests that barriers beyond technical knowledge, such as inadequate institutional support, limited funding for equipment and software, poor internet infrastructure, and the absence of organisational incentives, may significantly hinder utilisation. Additionally, some researchers may not perceive these technologies as immediately relevant to their specific research objectives, especially in specializations or units where traditional methods remain dominant.

Table 6: Respondents' level of use of smart agricultural technologies

Level of use	Frequency	Percentage	Min	Max	Mean	Std Dev
Low (< mean)	91	55.2	0	53.0	18.0	15.15
High (≥ mean)	74	44.8				
Total	165	100				

Source: Field Survey, 2023

Test of hypotheses

Table 7 reveals that the respondents' level of education ($\chi 2 = 8.172$, $p < 0.05$) and research institution ($\chi 2 = 8.579$, $p < 0.05$) had a significant relationship with their use of smart agricultural technologies. The statistically significant relationship suggests that these factors influence agricultural researchers' adoption and utilisation of these technologies. It implies that researchers with higher levels of education are more likely to use smart agricultural technologies. For the research institutions, the implication is that the organisational context and support provided by the research institution influence the use of smart agricultural technologies.

PPMC analysis of respondents' knowledge and use of smart agricultural technologies reveals that there is no significant relationship ($r= 0.083$, $p > 0.05$). This implies that knowledge does not necessarily lead to its practical application. Conversely, the PPMC analysis of respondents' perceptions and use of smart agricultural technologies reveals a significant negative relationship ($r= -0.242$, $p < 0.05$). Despite the favourable perceptions, usage levels remain low, indicating additional factors beyond perception affect adoption and utilisation.

Table 7: Test of hypotheses on the use of smart agricultural technologies

Variable	N	χ^2	Df	p-value
Level of education	165	8.173*	3	0.043
Research institution	165	8.579*	3	0.035
Variable	**N**	**r-value**	**df**	**p-value**
Knowledge	165	0.083	-	0.289
Perception	165	-0.242**	-	0.002

Source: Data Analysis, 2023

CONCLUSION AND RECOMMENDATION

The study revealed that agricultural researchers in Oyo State possess knowledge and hold favourable perceptions regarding smart agricultural technologies. However, their actual utilisation of these technologies remains low. The most frequently used technologies were Geographical Information Systems and the Internet of Things, primarily for data capture, processing, and environmental monitoring. This limited usage could be attributed to inadequate access and availability of these technologies within research institutes. To address this, it is recommended that the government allocate sufficient funding to agricultural research institutes for the acquisition and implementation of smart agricultural technologies. Additionally, institutes should ensure adequate infrastructure support, such as runway facilities for fixed-wing UAVs, to facilitate effective utilisation. Training, workshops, and educational resources should also be provided to enhance researchers' understanding and awareness, build technical capacity, and promote broader adoption of these technologies in agricultural research.

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PERCEIVED IMPACT OF SOME SELECTED INDIGENOUS SPICES ON THE WELL-BEING OF RURAL HOUSEHOLDS IN OYO STATE

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ABSTRACT
The study focused on perceived impact of utilisation of some selected indigenous spices on the well-being of rural households in Oyo State. Two hundred (200) rural households were sampled using a four-stage sampling procedure. Data were collected on respondents' socioeconomic characteristics, awareness, perceived benefits and wellbeing outcomes using structured questionnaire. Results revealed that 63.5% of the respondents were female, 57.5% were married, 40.0% had diplomas, mean household size of 4.67 people, 32.0% were artisans while 28.0% were farmers. Awareness was high about ginger (90.5%) and onions (90.5%), while reduction in the use of artificial flavouring was the leading ($\bar{x}$ = 1.50) perceived benefit. Improved digestion and reduced gastro-intestinal discomfort was the leading ($\bar{x}$ = 4.29) well-being outcome of use of indigenous spices among respondents. There was a significant relationship between physical wellbeing (r = 0.338; p=0.021), mental wellbeing (r = 0.444; p=0.010), social wellbeing (r = 0.518; p=0.000), spiritual wellbeing (r = 0.499; p=0.005) and the extent of use of indigenous spices. The study concluded that the perceived use of selected indigenous spices significantly enhances the overall wellbeing of rural households, thus, affirming their vital role in promoting health and quality of life in traditional food systems. The study recommended that government and development stakeholders should invest in promoting the use of indigenous spices through education and community outreach, leveraging their proven benefits to support rural health and sustainable well-being.
Keywords: Indigenous spices, rural household, utilisation, well-being

INTRODUCTION

Defining well-being is challenging because of the different ways in which the concept is understood in different contexts and by different people. However, rather than being driven by a definition, researchers have focused on dimensions and descriptions (O'Sullivan, 2021). What various authors agreed on is the multidimensional character of well-being and the fact that different dimensions are deeply intertwined. Okereke (2024) defined wellbeing of rural households as a multidimensional concept that encompasses economic, social, and environmental factors. According to Okereke (2024), well-being is not just about income but also includes access to basic amenities such as healthcare and education, social capital, and community participation.

Spices are vegetable substance of indigenous or exotic origin and being aromatic is used to enhance the flavour of food (Ekeanyanwu and Etienajirhevwe, 2012). Spices are in various forms of fruits, roots, dried seeds, barks, leaves or vegetative used nutritionally in significant quantities as a food additive for the purpose of flavour, colour or as a preservative that kills harmful bacteria or prevents their growth and can contribute significant portions of micronutrients (Vitamin A, iron, magnesium, calcium, etc) to the diet (Krishna *et al*., 2019). Spices have a long history of both culinary and medicinal uses, and they are integral parts of daily diets (Tapsell *et al.,* 2016) and regarded as one of the first real functional foods, though largely forgotten in the modern, westernized diet. Spices stimulate appetite, add flavour and texture to food, create visual appeal in meals and they have other uses such as spiritual activities, cosmetic and perfume production (Olife *et al.,* 2013).

The importance of spices in human history cannot be overstated. Spices also play a key role in nutrition as good sources of micro and macro nutrients. Ogunka-Nnoka and Mepba (2018) conducted a proximate analysis of some Nigerian spices and found them to be fairly rich in nutrients. Many of the spices are good sources of calcium, phosphorus, magnesium and zinc. Also, spices provide wellbeing benefits such as speeding up of metabolic rate and mitigating of risks of chronic inflammation. As ingredients in numerous local medicines, they are used in the treatment of ailments such as dysentery, gastrointestinal troubles, fever, postpartum pain, tapeworms and inflammation of the throat and tonsils and as carminatives (Kabiraj and Deshmukh, 2024).

The use of indigenous spices in rural households is an essential aspect of the culture and tradition of the community. These have contributed significantly to the physical, mental, economic, social and spiritual well-being of rural households (Mishra, 2020). However, according to (Kumar *et al*., 2020) the knowledge and use of indigenous spices are gradually decreasing due to the influence of western culture and globalization. As a result, spices usage is limited, and the rural population is losing its connection to their cultural heritage.

Furthermore, the lack of awareness and knowledge of the benefits of these spices is affecting the health and well-being of the rural population. The dependence on processed and packaged food has increased, leading to a rise in lifestyle diseases like obesity, diabetes, and heart diseases (Sinha and Haque, 2022). This has resulted in increased

healthcare costs and decreased productivity, affecting the economic wellbeing of rural households (Mishra, 2020). The reduction in the use of indigenous spices has also led to a decline in the social and cultural fabric of rural communities (Godfrey and Siraje 2019). The loss of traditional knowledge and practices has resulted in the loss of a sense of identity and belonging among rural households (Kumar *et al*., 2020). Additionally, the commercialization of agriculture has affected the spiritual wellbeing of rural households, as traditional farming practices that were intertwined with spirituality have been replaced with modern, commercial practices (Kumar, 2018). In order to promote wellbeing among rural households in Oyo State, it is necessary to explore the potential impacts of utilising the indigenous spices.

The general objective of the study was to examine the impact of some selected indigenous spices on the well-being of rural households in Oyo State. The specific objectives were to:

1. describe the socioeconomic characteristics of the households,
2. ascertain the awareness of indigenous spices among the rural households,
3. determine the perceived benefits of consuming the selected indigenous spices,
4. examine the outcomes of the well-being of rural households in the use of indigenous spices,
5. determine the extent of use of indigenous spices among rural households in the study area.

The hypothesis was stated that there is no significant relationship between the extent of use of indigenous spices among rural households and their well-being.

METHODOLOGY

The study was conducted in Oyo State, Nigeria. The State is geographically located in the Southwest region between latitude $7^{o}02^{1}$N and $9^{o}10^{1}$N and longitude $2^{o}04^{1}$E and $4^{o}30^{1}$E. Oyo State is bordered to the north by Kwara State, to the east by Osun State, and to the south by Ogun State and Republic of Benin, with a projected population of 7,840,864 in 2016 (NBS, 2017). The population of the study constituted all rural households in Oyo State. A four-stage sampling procedure was used to select rural households for the study. The first stage was a random selection of 50% of the ADP Zone in Oyo state which were Ibadan/Ibarapa and Shaki zones. The second stage involved stratification of the zones to urban and rural respectively. The third stage was the selection of 20% of the blocks in the rural stratum of the zones which are Ido, Lagelu, Ibarapa central, from Ibadan/Ibarapa zone, while Itesiwaju and Kajola were selected from Shaki zone, respectively. At the fourth stage, 2% of households were proportionately sampled from the total number of households in the local government area listed by Nigerian Social Safety-Nets Coordinating Office (NASSCO) in 2021, 54 households in Ido, 14 in Lagelu, 55 in Ibarapa central, 60 in Kajola and 17 in Itesiwaju local government, which gave rise to 200 households sampled for the study. Data for the study were gathered through interview schedule using questionnaire. The independent variables were socioeconomic characteristics of the households, awareness of indigenous spices and perceived benefits of consuming indigenous spices. The dependent variable of the study was the outcomes of the well-being of rural households in the use of indigenous spices and was measured using a five-point Likert scale of Strongly agree (5), Agree (4), Undecided (3), Disagree (2) and strongly disagree (1) for positively worded statements and vice versa for negatively worded statements. This covered items on physical, mental, social, economic and spiritual well-being. Data were analysed using descriptive statistics such as frequency counts, percentages, means, while the stated hypothesis of the study was tested using Pearson Product Moment Correlation.

RESULTS AND DISCUSSION

Socioeconomic characteristics

The results in Table 1 shows that 36.5% of the respondents were male while, 63.5% were female. The mean age of respondents was 40.14years. The age distribution shows that the respondents fall within the active age range and are involved in decisions on the use of spices. This finding is in line with the usage of spices in Ugandan cooking explored in a study by Naluyange *et al* (2017), they discovered that younger consumers used spices more frequently than older customers, indicating that age affects a person's decision to utilise spices.

Majority (70%) of the respondents were married including those that are divorced and widowed. The pattern of marital status distribution aligns with the findings of Ewebiyi (2014) who also indicated that the married are in the majority (87.9%) in rural southwestern Nigeria. Meanwhile 17.5% of the respondents had no formal education, 27.0% were primary school leavers, 40% had diploma certificate while 15.5% had higher education. This showed that the people had at least some level of Education and by implication the level of education could have an influence on their knowledge of the use of spices and its functionalities. The result contradicts Ewebiyi (2014) who reported that majority (62.2%) of the respondents in his study on rural southwestern Nigeria had no formal education. Moreso, the mean household size was 4.67 Basically, the household size could influence the amount spent on spices and

the frequency of spice usage in the household's diet. Also, 30% of the respondents were artisans, 27% engaged in farming, 15.5% were civil servants and 22.5% were involved in trading while others (10%) engaged in transportation and charcoal making businesses This finding has important implications for policymakers as it suggests that a significant proportion of the population may be working in low-wage, high-risk jobs such as transportation and charcoal making that lack job security and benefits (Johnson *et al.*, 2021).

Table 1: Distribution of Respondents' Socioeconomic Characteristics

Variables	Response	Frequency	Percentage	Mean
Sex	Male	73	36.5	
	Female	127	63.5	
Age	≤30	63	31.5	
	31-40	57	28.5	40.14
	41-50	35	17.5	
	>50	45	22.5	
Marital status	Single	60	30.0	
	Married	115	57.5	
	Divorced	12	6.0	
	Widowed	13	6.5	
Level of education	No formal education	35	17.5	
	SSCE	54	27.0	
	Diploma	80	40.0	
	Degree	29	14.5	
	M.Sc.	2	1.0	
Household size	≤3	55	27.5	
	4-6	120	60.0	4.67
	>6	25	12.5	
Primary occupation	Artisan	60	30.0	
	Farming	54	27.0	
	Civil Servant	31	15.5	
	Trading	45	22.5	
	Transportation	10	5.0	

Source: Field Survey, 2023

Awareness of the selected indigenous spices among respondents in the study area

Results in Table 2 reveal varied levels of awareness among respondents regarding selected indigenous spices. Spices such as Ginger and Onion had highest awareness at 90.5%, followed closely by Locust beans (90.0%), Bitter leaf (89.0%) and Garlic (88.5%), indicating their prominent role in local diets and traditional culinary practices. In contrast, spices like Negro pepper (41.0%), Uziza (42.0%), and African nutmeg (44.0%) had the lowest awareness levels, suggesting limited exposure or usage within in the study area. Moderately recognized spices such as Turmeric (68.5%), Neem (72.0%), and Bay leaves (68.0%) reflect a growing but low familiarity, possibly influenced by increased health awareness or limited market presence. The high percentage of households who are not aware of certain beneficial spices, such as Rosemary (62.0%), Mint (51.0%), and Cinnamon (46.0%); highlights a significant knowledge gap that may hinder the wider adoption of these spices despite their nutritional and medicinal value. In their investigation of the factors impacting the usage of spices in Osun State, Nigeria, Babarinde and Olanipekun (2018) discovered that poor awareness among rural families was largely caused by a lack of knowledge about the nutritional worth, health advantages and culinary uses of spices.

Perceived benefits of the use of selected indigenous spices by the respondents

Results in Table 3 reveal respondents' perceptions of the benefits of indigenous spices, with a majority attributing significant health-related advantages to their usage. The highest proportions of respondents considered indigenous spices "highly beneficial" for reducing cancer risk (59.0%), regulating blood sugar (56.0%), and detoxifying the body and improving immune function (53.5%). These findings are supported by relatively high mean scores (1.47, 1.46, and 1.41 respectively). This implies that traditional knowledge and usage of indigenous spices still hold considerable weight in preventive health beliefs, particularly within communities where modern healthcare may be less accessible or trusted. Conversely, the findings also show relatively lower perceived benefits in areas related to emotional and spiritual well-being.

Table 2: Distribution of respondents' awareness of the selected indigenous spices

Variables	Aware Percentage	Not Aware Percentage
Ginger	90.5	9.5
Garlic	88.5	11.5
Turmeric	68.5	31.5
Cloves	56.5	43.5
Black pepper	77.0	23.0
Onion	90.5	9.5
Locust beans	90.0	10.0
Moringa	71.5	28.5
Rosemary	38.0	62.0
Uziza	42.0	58.0
Red chili	86.0	14.0
Mint	49.0	51.0
Cinnamon	53.0	46.0
Scent leaf	86.0	14.0
Neem	72.0	28.0
African nutmeg	44.0	55.0
Cayenne pepper	58.5	42.0
Basil	58.0	42.0
Curry leaves	76.5	23.5
Bay leaves	68.0	32.0
Thyme	82.5	17.5
Mustard seed	58.5	41.5
Nutmeg	63.0	37.0
Bitter leaf	89.0	11.0
Negro pepper	41.0	59.0

Source: Field Survey, 2023

In Table 3, only 19.0% and 29.0% of respondents considered spices to be "highly beneficial" for promoting spiritual growth and enhancing spiritual wellbeing respectively, while 44.0% and 39.0% rated them as "non-beneficial". This implies that while indigenous spices are largely trusted for physical health benefits, their roles in psycho-social and spiritual domains remain less acknowledged. This finding agrees with Adewale (2019) who reported that health outcomes enhanced the consumption of spices in rural homes. This highlights the potential of promoting indigenous spices as functional food ingredients in nutrition and public health campaigns aimed at disease prevention and cost-effective wellness strategies.

Table 3: Distribution of respondents perceived benefits of indigenous spices

Benefits	Highly beneficial (%)	Moderately beneficial (%)	Non beneficial (%)	Mean	SD
Reduce risk of cancer	59.0	28.5	12.5	1.47	0.708
Maintain healthy weight	49.0	40.0	11.0	1.38	0.67
Regulates blood sugar level	56.0	33.5	10.5	1.46	0.678
Improves digestion	53.0	31.5	15.5	1.38	0.740
Detoxifies and improves immune system	53.5	33.5	13.0	1.41	0.710
Reduce stress level	41.0	44.0	15.0	1.26	0.703
Improves mood and lifts spirit	30.0	35.0	35.0	0.95	0.807
Improve brain function	39.0	39.5	21.5	1.18	0.760
Reduce feeling of loneliness	32.0	31.5	36.5	0.96	0.828
Reduce the use of artificial flavourings	59.0	31.5	9.5	1.50	0.665
Reduced economic burdens of healthcare	47.0	37.0	16.0	1.31	0.733
Enhance spiritual wellbeing	29.0	32.0	39.0	0.90	0.821
Promote spiritual growth	19.0	37.0	44.0	0.75	0.755
Reduce reliance on chemical fertiliser	46.5	36.0	17.5	1.29	0.747
Creates sense of pride	35.5	41.0	23.5	1.12	0.761

Source: Field Survey, 2023

Respondents' well-being outcome of the use of some selected indigenous spices

Results in Table 4 affirmed the physical well-being benefits of indigenous spices. A combined 88% agreed that spice use improved digestion and reduced gastrointestinal discomfort, while 81% reported enhanced immune function and 73.5% noted better blood sugar regulation. These findings emphasise the bioactive and antioxidant capacities of spices like cumin, turmeric, ginger, and black pepper to support digestive health, immune response, and glycemic control. This finding conforms with Alkhatib *et al* (2021), who reported that spices boost immune responses. Economically, 70% agreed that spices made affordable nutritious food and reduced cooking expenses suggesting tangible cost-saving benefits. These findings reflect broader trends in sub-Saharan Africa, where indigenous crops and spices contribute to household income and reduced healthcare-related expenditures (Kakudidi *et al*, 2016). In contrast, mental, social, and especially spiritual well-being were rated more conservatively. Although a substantial share acknowledged improvements in sleep quality (74%) and stress reduction (65%). In spiritual domains, agreement among households was below 40%. This suggests that while physical and economic benefits are clearly internalized by users, intangible outcomes are less widely appreciated.

Table 4: Distribution of the respondents' wellbeing outcome of the use of some selected indigenous spices

Outcomes	SA	A	U	D	SD
Physical well-being	(%)	(%)	(%)	(%)	(%)
Improved digestion and reduced gastro discomfort	48.5	39.5	6.5	3.0	2.5
Boost my immune system and prevent illness	27.5	53.5	14.0	2.5	2.5
Regulates blood sugar levels and manage diabetics	37.0	36.5	16.5	7.5	2.5
Improved overall health and ability to do activity	46.5	37.5	10.0	3.0	3.0
Helped to improve my bone health	26.5	41.5	23.5	3.5	50.5
Helped me manage my weight effectively	31.0	39.0	21.5	5.0	3.5
Mental well-being					
Improved quality of sleep	33.0	41.0	11.0	11.0	4.0
Confident and empowered	18.0	34.5	27.5	16.0	4.0
More relaxed and less stressed	25.0	40.0	19.0	13.0	3.0
Energized and alert	20.5	36.0	26.0	11.5	6.0
Ability to concentrate and focus	20.0	30.0	27.0	15.5	7.0
Improved mental clarity	20.5	33.0	24.5	15.5	6.5
Social well-being					
Cultural heritage	28.5	35.0	16.5	15.0	5.0
Cooking skills and culinary tradition	32.0	29.0	18.5	15.5	5.0
Diversity of food	25.0	38.0	19.5	12.5	5.0
Social interaction	25.0	26.5	28.5	14.0	6.0
Appreciation for tradition cooking method	27.5	36.0	20.5	12.5	3.5
Sense of pride	24.5	32.0	23.5	13.0	7.0
Economic well-being					
Afford nutritious food	32.0	38.0	13.0	12.0	5.0
Reduced cost of food preparation	32.5	35.0	13.5	11.5	7.5
Reduced burden of healthcare expenses	25.0	38.5	22.0	9.0	5.5
New income generating opportunities	19.5	28.5	24.5	20.5	7.0
Increase In income	16.5	19.0	22.0	34.0	8.5
Employment opportunity	12.5	29.0	20.5	27.5	9.5
Spiritual well-being					
Spiritual quality of life	20.5	13.0	26.5	22.5	17.5
Connect to beliefs and practices	17.0	20.0	21.5	23.0	18.5
Add depth and richness to my spiritual practices	1.5	6.5	22.5	27.5	22.0
Creates deeper sense of reverence	12.0	19.5	28.0	25.5	15.0
Maintain connection with ancestors and wisdom	14.0	22.5	22.5	22.5	18.5
Sense of belonging to my community and religion	11.5	24.5	26.0	23.0	15.0

Source: Field Survey 2023

Extent of use of indigenous spices by the respondents

The analysis of the extent of use of indigenous spices by rural households (Table 5) revealed that the most frequently used spices include ginger ($\bar{x}$ = 1.39), garlic ($\bar{x}$ = 1.30), black pepper ($\bar{x}$ = 1.11), onions ($\bar{x}$ = 1.52), locust beans ($\bar{x}$ = 1.52), red chili pepper ($\bar{x}$ = 1.28), scent leaf ($\bar{x}$ = 1.35), curry leaves

($\bar{x}$ = 1.21), thyme ($\bar{x}$ = 1.61), and bitter leaf ($\bar{x}$ = 1.48). These spices are commonly used due to their availability, affordability, strong flavouring properties, and well-known roles in enhancing both the taste and medicinal value of food. On the other hand, spices such as turmeric, cloves, moringa, rosemary, uziza, mint, cinnamon, neem, African nutmeg, cayenne pepper, basil, bay leaves, mustard, nutmeg, and negro pepper were found to be occasionally used or rarely used by respondents ($\bar{x} \leq$ 0.99). Several factors may explain the low usage of these spices, including limited local cultivation, lack of awareness about their culinary and health benefits, high cost, or unfamiliarity with their preparation and application in traditional recipes. Cultural food preferences and regional differences in spice use may also contribute to their less frequent use. These findings align with Babarinde and Olanipekun (2018), who identified ginger, garlic, onions, and black pepper as among the most widely used spices in Nigerian households, due to their strong aromatic properties and therapeutic potential. Similarly, Adepoju *et al.* (2019) reported that rural dwellers primarily rely on easily accessible and culturally accepted spices, while more exotic or lesser-known varieties tend to be underutilised. While the use of indigenous spices remains vibrant in rural communities, there is a need to raise awareness about the nutritional and medicinal value of underused spices. Promoting their sustainable use can enhance dietary diversity, improve health outcomes, and preserve cultural culinary heritage, especially when aligned with environmental and socio-economic considerations.

Table 5: Distribution of the Respondents' Extent of Use of the Selected Indigenous Spices

Extent of use	Often used (%)	Occasional use (%)	Not used (%)	Mean
Ginger	54.0	31.0	15.0	1.39
Garlic	46.5	36.5	17.0	1.30
Turmeric	30.0	37.0	33.0	0.97
Clove	26.0	25.5	48.5	0.78
Black pepper	36.0	38.5	25.5	1.11
Onions	66.5	18.5	15.0	1.52
Locust beans	65.0	21.5	13.5	1.52
Moringa	30.0	33.0	37.0	0.93
Rosemary	10.0	25.0	65.0	0.45
Uziza	13.0	28.5	58.5	0.55
Red chili pepper	44.5	38.5	17.0	1,28
Mint	16.0	32.0	52.0	0.64
Cinnamon	16.5	29.0	54.5	0.62
Scent leaf	52.5	29.5	18.0	1.35
Neem	26.0	37.5	36.5	0.90
African nutmeg	18.5	26.0	55.5	0.63
Cayenne pepper	30.5	27.0	42.5	0.88
Basil	29.0	28.5	42.5	0.87
Curry leaves	44.5	31.5	24.0	1.21
Bay leaves	31.0	34.0	35.0	0.96
Thyme	42.0	34.0	24.0	1.20
Mustard seed	19.5	27.0	53.5	0.66
Nutmeg	28.0	29.0	43.0	0.85
Bitter leaves	59.0	30.0	11.0	1.48
Negro pepper	20.0	28.5	51.5	0.69

Source: Field Survey 2023

Test of relationship between the extent of using indigenous spices among rural households and the outcomes of the wellbeing of rural households

The results presented in Table 6 show the correlation between the extent of use of indigenous spices and various dimensions of wellbeing. A statistically significant positive relationship was found between the use of indigenous spices and physical wellbeing (r = 0.338, p = 0.021), suggesting that regular consumption of these spices may contribute to improved physical health outcomes, possibly due to their known anti-inflammatory, antioxidant, and antimicrobial properties (Adepoju *et al*., 2019). Similarly, the relationship with mental wellbeing was also significant (r = 0.444, p = 0.010), indicating that spices such as scent leaf, garlic, and ginger known for their calming and mood-enhancing effects may play a role in mental health regulation.

Interestingly, the relationship between spice use and economic wellbeing was positive but not statistically significant (r = 0.552, *p* = 0.125), implying that while the cultivation and sale of spices may have economic value, it may not yet be a major income stream for rural households. Conversely, significant relationships were observed between spice use and social wellbeing (r = 0.518, *p* = 0.000) and spiritual wellbeing (r = 0.499, *p* = 0.005). This reinforces the cultural importance of spices in traditional ceremonies, communal eating, and spiritual rituals such as using spices in healing, prayer, or sacrificial contexts (Babarinde and Olanipekun, 2018).The findings underscore the multidimensional benefits of indigenous spices beyond nutrition, highlighting their relevance in promoting holistic well-being particularly in physical, mental, social, and spiritual domains. Efforts to encourage their sustained use in rural communities may therefore serve not only health-related goals but also broader social and cultural development objectives.

Table 6: Relationship between extent of use of indigenous spices and the outcomes of wellbeing

Variables	r	p-value
Physical wellbeing	0.338	0.021
Mental wellbeing	0.444	0.010
Economic wellbeing	0.552	0.125
Social wellbeing	0.518	0.000
Spiritual wellbeing	0.499	0.005

Source: Field Survey, 2023 Level of Significance (p<0.05)

CONCLUSION AND RECOMMENDATIONS

The study concluded that the perceived use of selected indigenous spices significantly enhances the overall well-being of rural households, thus, affirming their vital role in promoting health and quality of life in traditional food systems. The findings show a high level of awareness and frequent use of common spices like ginger, garlic and onions. However, the study also highlights a low awareness of less common spices, which may limit their inclusion in local diets despite their potential benefits. The study therefore recommended that government and development stakeholders should invest in promoting the use of indigenous spices through education and community outreach, leveraging their proven benefits to support rural health and sustainable well-being.

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VARIETAL PREFERENCE FOR BANANA AND PLANTAIN IN ILESHA METROPOLIS, OSUN STATE, NIGERIA

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ABSTRACT
Adoption rates of introduced banana/plantain cultivars are often low compared to their economic importance. This study investigated banana/plantain varietal preference among farmers in Ilesha, Osun State, Nigeria. A total of 150 banana/plantain farmers were sampled using snowballing technique to select 150 respondents. Data collected were analysed with both descriptive and inferential statistics. The mean age of the farmers was 41.8. Findings showed that majority of the respondents cultivated Alabameji (82.7%), Agbagba ohun (82.7%) and PITA 17 (63.3%). PITA 17 ($\bar{x}$=2.09) ranked first as improved variety cultivated while Ijeshaloba and Asogba ($\bar{x}$=2.39) ranked first as local varieties cultivated. The aggregated score showed that local varieties ($\bar{x}$=2.22) were most preferred by farmers. Findings on farmers' preference criteria showed that high market value ($\bar{x}$=3.75) ranked first, bunch length ($\bar{x}$=3.74) ranked second and results on constraints facing the banana/plantain plantation of preferred varieties indicated that incidence of pest and diseases ($\bar{x}$=3.74) ranked first. Hypothesis testing showed that education (β=-0.199, $p<0.05$); age (β=-2.436, $p<0.05$), education (β= 0.143, $p<0.05$), and farm-size (β= 0.236, $p<0.01$) influenced their preferences for local and improved banana/plantain varieties respectively. The study concluded the farmers in the study area had higher preference for local varieties of banana/plantain due to high market value and bunch length. Varieties mainly preferred were Ijeshaloba, Asogba, Agbagba ohun and PITA 17. Thus, agricultural research institutions concerned with genetic breeding should focus on developing varieties with higher attributes for bunch length, and number of fingers per bunch to boost farmers' prospect for high market value for banana/plantain produce.
Keywords: Bunch, Cultivation, Improved varieties, Local varieties, Preferred

INTRODUCTION

The family Musaceae includes plantains and bananas. Plantains are often taller and produce fewer, larger, and looser fruits than bananas. Plantains are available in a variety of sizes, shapes, and numbers of fruits per bunch. Plantains and bananas are essential food crops in Sub-Saharan Africa's humid forest and mid-latitude zone, accounting for more than 25% of carbohydrate and 10% of calorie consumption for around 70 million people (Olumba and Onunka, 2020; Mignouna *et al.*, 2020).

The economic value of plantains and bananas makes the crops highly valuable tree crops in a country like Nigeria, where health, nutrition, and dietary implications of foods are top priorities in most debates. In addition to being a staple food for rural and urban residents, it is a source of revenue for smallholder farmers who grow it in compounds or income gardens (Mogaji and Mogaji, 2020). Plantains, like most horticulture crops, are relatively valuable products. Their yearly output value in Sub-Saharan Africa exceeds that of several other food crops, including maize, rice, cassava, and sweet potatoes (Kindt *et al*., 2023).

Like other bananas, plantain production is still dominated by farmers preferred local varieties, principally owing to their consumer-preferred attributes (taste, texture, colour and aroma) (Marimo *et al.*, 2020). Food uses of plantain in Nigeria include dodo (fried ripe pulp), boli (roasted unripe–ripe pulp), fufu (boiled and pounded unripe pulp), amala (unripe pulp milled into flour and reconstituted into a thick dough), moin-moin (unripe–ripe pulp milled and steamed), porridge/pottage (unripe pulp boiled with additional ingredients), chips (fried unripe pulp) and dodo Ikire (fried overripe pulp with additional ingredients) (Owolade *et al.*, 2022).

Understanding farmers' preferences for banana and plantain cultivars and their features is crucial for developing cultivars that suit consumer needs in the numerous ways for which they are used in Nigeria, as well as for effective farmer adoption (Madalla, 2021). Even though most of the hybrid banana/plantain cultivars have good yields and are resistant to numerous major pests and pathogens harming the area's banana/plantain industry, farmers' adoption is still determined by a combination of several key characteristics (Sanya *et al.*, 2020).

Adoption rates of introduced banana and plantain cultivars are frequently low compared to their economic importance and are lower than for other staple crops (Marimo *et al.*, 2020; Walker and Alwang, 2015). Furthermore, research is scarce on the adoption rates of new banana/plantain cultivars in SSA. The adoption of local cultivars has failed to match the increasing demand for the commodity, resulting in a decline in banana/plantain production in Nigeria in the last two decades (Ebewore, 2016).

The general objective of the study was to examine the farmers' varietal preference for plantain and banana in Ilesha, Osun State, Nigeria and the specific objectives were to;

i. describe the socio-economic characteristics of banana and plantain farmers;

ii. identify the banana and plantain varieties grown by the farmers;
iii. assess the preferred banana and plantain varieties by the farmers;
iv. assess the preference criteria for banana/plantain varieties by the farmers; and
v. determine the constraints facing the plantation of preferred banana/plantain varieties

METHODOLOGY

The study was conducted in Ilesha, Osun State. Osun State is in South-Western Nigeria and lies within latitudes 6° and 9° N of the equator and approximately between longitudes 2° and 7° E of the Greenwich meridian (Fadipe and Oladepo, 2020). It is one of the landlocked states of the Federal Republic of Nigeria. It covers an estimated 8,062 square kilometres. Ilesha has an agrarian economy, with a vast majority of the populace involved in farming and it is a typical rainforest with mean annual rainfall varying between 880 mm and 2600 mm and is characterised by forest vegetation.

There was no existing registered list of banana and plantain farmers in Ilesha metropolis. Therefore, this study used snowball sampling to generate and compile the list of banana and plantain farmers in Ilesha metropolis, where about 192 farmers were generated. From this list, Taro Yamane sample determination formula was used as expressed mathematically thus:

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

Where:
n= sample size
N = target population = 520
e = 0.05

$$n = \frac{240}{1 + 240(0.05)^2}$$

n = 150 respondents
Therefore, a simple random selection of 150 farmers was generated from the list generated.

RESULTS AND DISCUSSION

Socioeconomic characteristics

The results in Table 1 indicated that the majority (67.3%) of the respondents were male, with a small percentage (32.7%) being female. This suggests that males dominated banana and plantain-related activities in the study area. This finding supports the results of Joel *et al.* (2022), who claimed that banana/plantain farming in Nigeria is dominated by males, which could be related to the difficult activities involved in banana/plantain production. Furthermore, Table 1 showed that the respondents' average age was 41.8 years, indicating that the banana and plantain farmers were still relatively young and that they were expected to work on plantations with agility and activity in order to increase production.

Further results showed that some (47.3%) were married while only 13.3% were divorced. This implies that a larger percentage of the respondents were married, and this conforms to the findings of Morgan and Kainga (2024), in which 60.0% of the plantain farmers in their study area were married. Men and women need family income to support their families. Thus, an increase in family income will lead to an increase in output and, in turn, improve their standard of living.

Findings in Table 1 showed that some respondents (39.3%) had primary education and a small percentage (14.0%) had no formal education. Based on the findings, it is possible to conclude that banana/plantain farmers in the study area had a moderate level of education. This suggests that some banana/plantain farmers will value the use of improved technologies for banana/plantain production. Furthermore, nearly half (48.0%) of respondents had 6–10 people living in their households, while 13.3% had 11 or more, with an average household size of 6 people. The result shows the availability of family labor for banana/plantain agricultural activities in the study area.

The majority (79.2%) of farmers worked full-time, while others (23.3%) worked part-time in banana/plantain production. This implies that just a few banana/plantain farmers in the study area had alternative livelihoods. This occupation could contribute to these farmers' commitment to banana/plantain production (Olumba and Onunka, 2020). Furthermore, the majority (76.0%) of respondents inherited land for banana/plantain farming, with only a small percentage (5.3%) renting. According to Nkwain *et al.* (2022), farmers who purchased and rented land increased production costs, resulting in higher prices and lower profits from banana/plantain production.

Table 1 showed that 40.0% of respondents cultivated 1-10 acres of banana/plantains, with only 2.7% cultivating 31 acres or more. This implies that the banana and plantain farmers in the study area were smallholders. The results are consistent with the findings of Kainga *et al.* (2019), who discovered that 80.0% of plantain farmers in Bayelsa State had farms of less than 2.5-5 acres. Results in Table 1 also showed that the average years of banana/plantain farming experience were 12.7 years, with half (50.0%) of respondents having 1-10 years of experience and only a few (1.3%) having 31 or more years of experience. This suggests that the farmers in the study area had many years of expertise producing bananas and plantains. This experience may enhance their understanding of improved banana/plantain varieties available in the study area. This also shows that banana/plantain farmers with

many years of farming experience are familiar with the limitations, which increases their adoption of innovations as a means of alleviating productivity constraints (Kainga *et al.,* 2019).

Table 1: Distribution of respondents by their socio-economic characteristics

Variables	Frequency	Percentage	Mean (SD)
Sex			
Male	101	67.3	
Female	49	32.7	
Age (years)			41.8(16.19)
≤ 30	40	26.7	
31 – 40	46	30.7	
41 – 50	34	22.7	
51 and above	30	20.0	
Marital status			
Single	38	25.3	
Married	71	47.3	
Divorced	20	13.3	
Widowed	21	14.0	
Level of education			
None	21	14.0	
Primary	59	39.3	
Secondary	20	13.3	
Tertiary	50	33.3	
Household size (persons)			6.0(2.77)
1 – 5	58	38.7	
6 – 10	72	48.0	
11 and above	20	13.3	
Farming status			
full time farming	115	76.7	
part-time farming	35	23.3	
Mode of farm land ownership			
Inheritance	114	76.0	
Purchase	27	18.0	
Rent	8	5.3	
Gift	1	0.7	
Banana/plantain farm size (Acres)			15.1(8.15)
1 – 10	60	40.0	
11 – 20	53	35.3	
21 – 30	33	22.0	
31 and above	4	2.7	
Years of Banana/plantain farming experience			12.7(8.00)
1 – 10	75	50.0	
11 – 20	46	30.7	
21 – 30	27	18.0	
31 and above	2	1.3	

Source: Field Survey, 2024

4.2 Banana and plantain varieties grown by farmers

Table 2 showed that most respondents cultivated Agbagba ohun (82.7%), Alabameji (82.7%), Ifenla (79.3%), and Agbagba erin. Only a few farmers cultivated BITA 3 (32.0%) and Cardaba (24.0%). The limited plantation of improved varieties, frequently associated with inferior fruit quality attributes, shows the importance of incorporating consumption qualities early in the breeding process (Marimo *et al.*, 2020; Tenkouano *et al.,* 2019).

Table 2: Distribution of respondents by types of banana/plantain varieties cultivated

Banana/plantain varieties	Frequency	Percentage
Improved varieties		
BITA 3	48	32.0
PITA 17	95	63.3
FHIA 21	84	56.0
Cardaba	36	24.0
Local varieties		
Ijeshaloba	110	73.3
Ifenla	119	79.3
Agbagba ohun (False horn type)	124	82.7
Agbagba erin (Elephant type)	119	79.3
Koloko (alabameta)	111	74.0
Asogba (olomoyoyo)	96	64.0
Alabameji (twin)	124	82.7

Source: Field Survey, 2024

Farmers preference on banana and plantain varieties

Table 3 showed that respondents ranked Cardaba (mean=2.10) first, PITA 17 (mean=2.09) second, FHIA 21 (mean=1.95) third, and BITA 3 ($\bar{x}$=1.64) fourth. This indicates that respondents preferred to plant Cardaba and PITA 17 in the improved banana/plantain variety category, which is consistent with the findings of Weltzien *et al.* (2019).

The results of local varieties in Table 2 also revealed that both Ijeshaloba and Asogba ($\bar{x}$= 2.39) were ranked first by respondents, Agbagba ohun ($\bar{x}$= 2.30) was ranked third, and Alabameji ($\bar{x}$= 2.05) was placed seventh as the least cultivated local variety indicated by respondents.

The aggregated score of improved and local varieties revealed that farmers in the study area preferred local varieties ($\bar{x}$= 2.22) over improved varieties ($\bar{x}$= 1.95). The most popular locally grown varieties were Ijeshaloba, Asogba (olomoyoyo), and Agbagba ohun (false horn type). This implies that the banana/plantain farmers in the study area preferred the local varieties to the improved varieties, and this may result from the unavailability of the improved varieties (Lamessa, 2021).

Table 3: Farmers' Preferred banana/plantain varieties by respondents

Banana/plantain Varieties	**Highly Preferred**	**Preferred**	**Not Proffered**	**Mean**	**Rank**
Improved varieties					
Cardaba	36.0	38.0	26.0	2.10	1st
PITA 17	35.3	38.7	26.0	2.09	2nd
FHIA 21	22.0	50.7	27.3	1.95	3rd
BITA 3	12.0	40.0	48.0	1.64	4th
Average score				**1.95**	
Local varieties					
Ijeshaloba	46.7	46.0	7.3	2.39	1st
Asogba (olomoyoyo)	46.7	46.0	7.3	2.39	1st
Agbagba ohun (False horn type)	47.3	35.3	17.3	2.30	3rd
Ifenla	45.3	35.3	19.3	2.26	4th
Agbagba erin (Elephant type)	36.0	38.0	26.0	2.10	5th
Koloko (alabameta)	34.7	38.7	26.7	2.08	6th
Alabameji (twin)	31.3	40.0	28.7	2.05	7th
Average score				**2.22**	

Source: Field Survey, 2024

Farmers' preference criteria for banana and plantain varieties

Table 4 showed the results of farmers' preferences criteria for bananas and plantains in Ilesha. According to the findings, respondents ranked high market value ($\bar{x}$=3.75) first, bunch length ($\bar{x}$=3.74) second, number of fingers per bunch ($\bar{x}$=3.52), and good post-harvest storage ($\bar{x}$=2.94) as the least preferred criteria for banana and plantain plantations. This result suggests that high market value, bunch length, and number of fingers per bunch were the primary selection criteria for banana and plantain plantation varieties in the study area, which is consistent with the findings of Robertson *et al.* (2024).

Table 4: Farmers' preference criteria of banana and plantain varieties

Reasons	SA	A	D	SD	Mean	Rank
High market value	76.7	21.3	2.0	0	3.75	1st
Bunch length	75.4	23.3	1.3	0	3.74	2nd
Number of fingers per bunch	61.4	29.3	9.3	0	3.52	3rd
Finger length	47.3	50.7	2.0	0	3.45	4th
High productivity	52.0	40.0	6.7	1.3	3.43	5th
Taste and Sweetness	44.0	42.0	12.7	1.3	3.29	6th
Resistance to pests and diseases	44.7	35.3	18.7	1.3	3.23	7th
Tolerance to drought	44.0	27.4	25.3	3.3	3.12	8th
High nutritive value	37.3	37.4	24.0	1.3	3.11	9th
Good post-harvest storage	21.3	55.4	19.3	4.0	2.94	10th

Source: Field Survey, 2024; SA=Strongly Agree, A= Agree, SD=Strongly Disagree and D=Disagree

Constraints to plantation of preferred banana/plantain varieties

Table 5 showed that the most common constraints in banana/plantain production were pests and diseases ($\bar{x}$=3.74), low soil fertility ($\bar{x}$=3.34), insufficient extension delivery to farmers ($\bar{x}$=3.28), and farmers' access to markets ($\bar{x}$=2.63). This finding shows that the occurrence of pests and diseases, low soil fertility, and insufficient extension delivery systems to farmers were the primary obstacles faced by banana/plantains farmers in cultivating preferred varieties of banana/plantains in the study area. The result aligns with the assertions of Acheampong *et al*. (2018) and Olumba and Onunka (2020) that stated that banana and plantain production were mostly limited by pests and diseases.

Table 4.5: Constraints facing the cultivation of preferred banana and plantain varieties

Constraints	Highly severe	Severe	Less severe	Not a constraint	Mean	Rank
Incidence of pests and diseases	75.4	23.3	1.3	0	3.74	1st
Low soil fertility	57.3	26.0	10.0	6.7	3.34	2nd
Inadequate extension service delivery system to farmers	54.7	24.0	16.0	5.3	3.28	3rd
Post-harvest deterioration of roots	45.3	30.0	22.0	2.7	3.18	4th
Illiteracy of farmer	44.7	30.7	16.0	8.6	3.11	5th
Shortage of good/quality planting material	21.3	55.4	19.3	4.0	2.94	6th
Low awareness of available varieties	33.4	31.3	24.0	11.3	2.87	7th
Lack of agricultural inputs	33.4	30.0	25.3	11.3	2.85	8th
Unavailability of planting materials during planting season	24.7	35.3	32.0	8.0	2.77	9th
Access to market	21.3	35.4	28.0	15.3	2.63	10th

Source: Field Survey, 2024; SA=Strongly Agree, A= Agree, SD=Strongly Disagree and D=Disagree

Hypothesis 1: On relationship between the socio-economic characteristics of the respondents and their preferences for banana/plantain varieties

Table 6 showed that socio-economic factors had significant influences on respondents' preferences for banana/plantain varieties at LR χ^2=41.22. The study found a negative significant correlation (β=-0.199, $p<0.05$) between education and preference for local banana/plantain varieties among the respondents. This implies that the higher the education of the farmers, the more preferences for local varieties of banana/plantain which could be due to the suitability of local varieties to their farming conditions. This result corroborates the findings of Udomkum *et al.* (2021) who found education to be one of the socio-economic determinants of plantain and plantain-based products in the Central Region of Cameroon and Oyo State, Nigeria.

Also, age had a negative significant relationship (β=-2.436, $p<0.05$) with the farmers' preference for improved varieties of banana/plantain. This indicates that as their age increases, they are less likely to prefer improved varieties of banana/plantain. The younger farmers are always open to taking risks for potential benefits which could result to higher yields (Figurek *et al.*, 2023).

Education also had a significant positive relationship (β= 0.143, $p<0.05$) with the farmers' preference for improved varieties of banana/plantain. This implies that respondents are more likely to prefer improved banana and plantain varieties as their level of education rises. Farmers' preferences for improved banana/plantain varieties

are greatly influenced by their level of education, and policies aimed at educated farmers may be influenced by this (Jamaldin *et al*., 2024).

Additionally, banana/plantain farm size positively influenced (β= 0.236, p<0.01) the farmers' preference for improved varieties. This suggests that farmers are more likely to prefer the improved banana/plantain varieties as their farm sizes increase because larger farms can afford the possible risks and rewards of implementing improved varieties (Abiola *et al.*, 2023).

Table 6: Multinomial regression result of socio-economic factors that influenced varietals of banana/plantain preferred by farmers

Preference for banana/plantain varieties	Parameters	Local varieties	Improved varieties
Age (years)	β_1	-0.002(-0.405)	-0.013(-2.436)*
Household size (persons)	β_2	-0.024(-1.613)	-0.004(-0.234)
Education	β_3	-0.199(-2.871)*	0.143(2.585)*
Banana/plantain farm size (acres)	β_4	0.006(1.336)	0.236(2.845)**
Banana/plantain farming experience (years)	β_5	-0.015(-0.844)	0.009(1.260)
LR Chi2	41.22		
Prob > Chi2	0.0015		
Log likelihood	-32.3713		

Source: Field Survey, 2024
Values in parenthesis are t–values
* P≤0.05 and ** P≤0.01

CONCLUSION AND RECOMMENDATIONS

The study therefore concluded that the banana/plantain farmers still prefer to grow local varieties of banana/plantain due to high market value, farmers' bunch length, and number of fingers per bunch. Although the incidences of pests and diseases, low soil fertility and inadequate extension delivery system to farmers posed severe challenges to the farmers for commercial cultivation of preferred varieties. In order to increase the preference for banana/plantain varieties in the study area at high level, agricultural research institutions concerned with genetic breeding of improve banana and plantain varieties should focus on developing varieties with higher attributes for attribute for bunch length, and number of fingers per bunch to boost farmers' prospect for high market value for banana/plantain produce. Extension agents in the study area should train banana/plantain farmers on best agronomic practices that help to tackle the problems of incidence of pest and diseases as well as low soil fertility. The extension agents can create a link platform through which farmers can reach for timely access to improved banana/plantain varieties for plantation in the study area.

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FACTORS INFLUENCING THE ROLE PERFORMANCE OF COMMODITY LEADERS IN PERIODIC MARKETS IN ONDO STATE, NIGERIA

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ABSTRACT
The study investigated critical factors that influenced role performance of commodity leaders in periodic markets in Ondo State by employing multistage sampling procedure to select 390 respondents. Primary data collected with the aid of a structured interview schedule and key informant interview were analysed using descriptive analysis and Factor analysis. Results reveal that a large proportion of the leaders were female (61.0%), 23% were married with a mean age of 44±8.39 years and a mean household size of 6 persons. Election (47.5%) and nomination (38.5%) were the predominant criteria used for leadership emergence. Leading discussion in market meetings ($\bar{x}$ = 2.37), representing the association in general market body ($\bar{x}$ = 2.36), dissemination of market information ($\bar{x}$ = 2.19), resolving conflicts among members and customers ($\bar{x}$ = 2.13) were major roles performed. Critical factors found that influenced role performance of commodity leaders in periodic market were personal status, socioeconomic status, leadership base and institutional support. It was therefore recommended that the criteria for emergence of commodity leaders should take into consideration the identified factors to enhance market growth and the overall economic landscape of the State.
Keywords: Commodity leaders, Periodic markets, Factors, Role performance

INTRODUCTION

One of the defining features of humanity is the act of interchanging goods and services (Desai, 2013), a fundamental characteristic that has led to the establishment of markets with specific locations and designated times. However, markets are more than just physical spaces for buying and selling of goods and services, they transcend these transactions to become social institutions, constructed in culturally specific ways. Kio-Lawson *et al*. (2015) outlined two fundamental classes of markets, namely: daily and periodic. Olayiwola (2020) added another class of market which he called special markets. This distinction laid the foundation for understanding the intricate dynamics that shape market structures and their profound impact on the socioeconomic fabric of communities. According to Omole (2012), the daily markets are characterised by a large number of full-time vendors who provide a handy means of regularly meeting the demands of the public. In order to keep up a regular supply of goods and services, commercial operations must continue continuously. Special markets are hosted on holidays such as Christmas, Ramadan, and Easter. Furthermore, these occur at significant events such as state trade fairs (Olayiwola, 2020).

On the other hand, periodic markets are temporary marketplaces that occur regularly, typically on a weekly or monthly basis, at specific locations. These markets often cater to rural or remote areas where access to traditional brick-and-mortar stores may be limited. They serve as platforms for local farmers, craftsmen, and vendors to sell their products, while offering consumers the opportunity to purchase fresh produce, handmade goods, and various other items. The frequency of occurrence distinguishes periodic markets from other markets. The frequency of periodic markets varies from location to location, often structured as 4-day markets, 5-day markets, or 7-day markets. In Nigeria, periodic markets are vital to rural development, influencing agriculture, transportation, and social structures. They act as economic hubs, enabling trade, job creation, and income generation. These markets help integrate rural economies into the national framework and are essential for balanced regional development (Babajo *et al*., 2018; Adanu *et al*., 2016).

However, their potential is limited by fragmentation and inadequate government support, particularly in infrastructure and access to finance (Elenwo and Weje, 2019). Strengthening periodic markets through improved facilities and leadership is crucial to unlocking sustainable growth in rural communities.

To effectively fulfil their pivotal roles in rural development, periodic markets must operate optimally and substantively contribute to the economic base of the locality that they are present in. However, the realisation of these objectives' hinges on the presence of competent leadership within the market. The importance of periodic markets necessitates the presence of strong and visionary leaders, capable of navigating complex market dynamics and steering strategic initiatives towards sustainable socio-economic advancement. Effective leadership is crucial for addressing the issues facing these markets and mobilizing collective efforts towards their development. Market leaders play a pivotal role in advocating for government support, fostering collaboration among market stakeholders, and implementing initiatives to enhance market efficiency and resilience. Mgbada

and Agumagu (2007) revealed that the roles of leaders in agricultural production chain include settlement of disputes among farmers, organising youths into groups, bringing information to the farmers and encouraging farmers to form cooperative societies. Furthermore, Ozor and Nwankwo (2008) reported that leaders play important roles in legitimisation, decision making, liaison between governmental and non-governmental organisations, monitoring and evaluation of projects, and sourcing for financial and technical assistance.

Leaders within periodic markets play crucial roles in organising and managing market activities, mediating conflicts, facilitating transactions, and representing the interests of market participants. Their leadership significantly influences the overall functioning and sustainability of these markets, making them central figures in the local economy and community life. Despite the critical contributions of periodic markets to rural development, especially in Ondo State, Nigeria, limited scholarly attention has been given to evaluating the actual performance of periodic market leaders. In Ondo State, periodic markets serve as key platforms for the exchange of agricultural produce, manufactured goods, and services, thereby enhancing local livelihoods and fostering rural-urban economic integration. The foregoing reviews underscore the pivotal importance of these markets and the influential roles played by their leaders. However, it is apparent that the performance of these leaders in driving market development may be influenced by various local socio-economic, cultural, and institutional factors that remain underexplored. Therefore, this study aimed to describe how leaders emerge in periodic markets, ascertain the extent of which periodic market leaders in Ondo State fulfil their roles, evaluate their expected and performed roles and investigate the factors influencing their performance.

METHODOLOGY

The study was conducted in Ondo State, Nigeria, which comprises three senatorial districts: Ondo North, Ondo Central, and Ondo South. The study population consisted of commodity leaders in periodic markets. A multistage sampling procedure was employed, the first stage involved purposive selection of three Local Government Areas (LGAs) from each senatorial district, chosen based on the concentration and distribution of periodic markets. This resulted in a total of nine LGAs being selected: Akoko North-West, Ose, and Owo from Ondo North Senatorial district; Ifedore, Akure North, and Ondo East from Ondo Central Senatorial district; and Ileoluji/Okeigbo, Okitipupa, and Ilaje from Ondo South Senatorial district. In the second stage, a proportionate sampling technique was utilised to select fifty percent of the total periodic markets within each selected LGA, totalling 26 periodic markets sourced from the records of the Ondo State Bureau of Statistics. At the final stage, a random sampling technique was employed to select three executives from each of the five commodity associations (yam, tomatoes/pepper, plantain/fruit, palm oil, and fish sellers' association) across all periodic markets, resulting in 15 periodic market leaders per market and a final sample size of 390 respondents. Additionally, two key informants were chosen from each market to partake in in-depth interviews, resulting in 52 key informants.

Data for the study were collected through the use of structured interview schedule and analysed using simple descriptive statistical techniques such frequency counts and percentages, means and standard deviation. Factor analysis was used to isolate crucial factors influencing role performance of commodity leaders in periodic markets. Variables were grouped using principal component analysis with varimax rotation. The cut-off point for constant loading was 0.30 and the constant loading less than 0.30 was discarded. Also, Kaiser's criterion was used to determine the factor to retain in the result of the analysis, thus factors with Eigen value greater than one were retained. The factors were thereafter named based on the following criteria as employed by (Ogunjimi *et al*. 2012). First, synonyms of the most heavily loaded variables on each factor were selected. Next, names were retained based on the similarity of the features exhibited by the variables contributing to the factors. Subsequently, a joint explanation or interpretation of the positive and highly loaded variables was conducted. Finally, the researcher's subjective interpretation of experiences gleaned from relevant literature was incorporated into the naming process. Role performance was measured by asking the commodity leaders to indicate the extent to which they perform their expected roles in periodic market activities. Their responses were rated on a 4-point scale ranging from never performed rarely performed, occasionally performed and always performed and were scored as 0, 1, 2, 3, respectively. The total scores of each respondent were calculated as role performance score.

RESULTS AND DISCUSSION

Socioeconomic characteristics

Results in Table 1 showed that a great percentage (75.9 %) of the respondents were within the age range of 30 to 50 years with the mean age of 44 ± 8.39 years. Age is a pivotal factor used in measuring level of biological, intellectual maturity and experience of any individual (Famakinwa *et al*., 2019). Age is significant in leadership selection due to accumulated experience and physical ability; this

combination has the potential to augment a leader's performance. The finding indicates that the respondents were youthful and middle-aged individuals possessing the energy to endure the challenges of commerce and leadership.

Table 1: Distribution of respondents by selected socio-economic characteristics (n = 390)

Variables	Frequency	Percentage	Mean	SD
Age				
< 30	29	7.4	44	8.39
30 – 50	296	75.9		
> 50	65	16.7		
Sex				
Female	238	61.0		
Male	152	39.0		
Marital status				
Divorced	17	4.4		
Married	302	77.4		
Single	9	2.3		
Widowed	62	15.9		
Household size				
0 – 5	174	44.6	6	1.84
6 – 10	216	55.4		
Indigenes of the community				
Yes	304	77.9		
Years of residence				
< 30	65	16.7		
30 - 50	263	67.4	41	11.59
>50	62	15.9		
Formal education				
0 – 6 years	176	45.1	7.14	4.68
7 – 12 years	179	45.9		
>12 years	35	9.0		
Periodic marketing experience				
< 30	330	84.6	20	8.81
30 – 50	60	15.4		
Years in leadership position				
0 - 5	228	58.5		
6 – 10	161	41.3	5.50	2.24
>10	1	0.3		
Estimated annual income				
50,000 – 350,000	166	42.6	423,025.64	199,312.64
350,001 – 700, 000	188	48.2		
>700,000	36	9.2		

Source: Field Survey, 2024

A good number (61.0%) of the respondents were female while 39.0 percent were male. The result indicates that majority of the commodity leaders in the periodic market in the study area were female. This might be because culturally in the study area, the market is seen as a woman's sphere. The result is in tandem with the findings of Ehinmowo and Ibitoye (2010) and Yusuf (2009) that majority of marketers in periodic markets were females especially in Yoruba and Nupe societies. Majority (77.4%) of the respondents were married implying a sense of responsibility because marriage holds significant value in Yoruba communities. Table 1 also revealed that majority (92.8%) of the respondents were Yoruba with 77.9 percent being indigenous to the community where the periodic markets are situated.

Moreso, it was found that 67.4 percent of the respondents had lived in the community for a duration spanning between 30 and 50 years, with mean years of residence of 41±11.56 years. This finding corroborates the finding of Famakinwa *et al* (2019) who reported that community leaders were predominately indigenous. This underscores the significance of indigenous status as a determinant of leadership within periodic markets in Ondo State. Furthermore, Table 1 indicates that 45.9% of respondents had received between 7 and 12 years of formal education, with a mean of 7 years and a standard deviation of 4.68. This educational

attainment suggests that many respondents possessed adequate basic literacy skills necessary for conducting business, marketing activities and leadership roles effectively. Moreso, the findings revealed a mean of 20±8.81 years of marketing experience among respondents, indicating extensive involvement in the periodic market system and a thorough understanding of their roles. Additionally, the mean tenure of respondents in leadership positions was 6±2.24 years, suggesting that leadership within these markets is dynamic rather than static.

Leadership emergence

The results in Table 2 revealed that 47.7 percent of the respondents attained leadership roles via elections, 39.5 percent were nominated, and 12.8 percent were appointed. This implies a diverse array of pathways to leadership, reflecting a blend of cultural norms, formal processes, and selection methods within the market environment; the most prominent way leaders are chosen is through election. This finding was supported by excerpt from the KII session conducted across the study area: *As one of the commodity leaders in this market, I came into leadership position as a result of election carried out among yam traders in the market.* (KII excerpt from a periodic market leader from Oja Ogbese in Akure North LGA)

The use of diverse criteria suggests a comprehensive approach that takes into account various aspects when making decisions, both individually and collectively. This finding was supported by excerpt from the KII session conducted across the study area: *In this market, the selection criteria are based on the individual's character and experience within the market system.* (KII excerpt from a periodic leader from Oja Owena in Ondo East LGA)

Table 2: Distribution of respondents by their emergence in periodic markets. n = 390

Variables	Frequency	Percentage
Ways leaders are chosen		
Appointment	50	12.8
Election	186	47.7
Nomination	154	38.5
Criteria for selection of leaders*		
Age	95	24.4
Charisma	131	33.6
Experience	170	43.6
Financial status	95	24.4
Indigenous status	61	15.6
Integrity	142	36.4
Sex	158	40.5

Field Survey, 2024 *= Multiple responses

Role Performance of Commodity Leaders in Periodic Markets

Table 3 presents the mean ratings of roles performed by commodity leaders in the periodic markets. Roles such as leading discussions in market meetings ($\bar{x}$ = 2.37), representing the association in broader market bodies ($\bar{x}$ = 2.36), and disseminating market information ($\bar{x}$ = 2.19) recorded the highest mean scores. These indicate that such responsibilities are regularly performed and thus represent the core functions of market leaders.

Conversely, roles like organising collective purchases ($\bar{x}$ = 1.29) and price regulation ($\bar{x}$ = 1.24) were performed less frequently. However, this does not diminish their importance. Rather than being categorized as "minor," these roles can be seen as less regularly performed, possibly due to external constraints such as limited resources or weak institutional support. This distinction aligns better with the dynamic nature of market leadership, where all functions are critical, but not all are consistently executed.

Qualitative insights from Key Informant Interviews (KIIs) further underscore the range of responsibilities undertaken by market leaders. For instance, a leader from Oja Ala in Akure North LGA shared: *"On different occasions, I have raised funds through the association and sometimes I use my own money for the welfare of my members. I also organise collective purchase of goods for my members and transportation to reduce the cost and maximize their profit."*

Another leader from Oja Ipare in Ilaje LGA shared: *"Whenever I am privy to any new market information, I inform my members readily so they can benefit from it and give support where I can."*

These narratives reinforce the quantitative findings and reveal a deep sense of commitment among leaders to their roles, even when certain activities are performed irregularly. The integration of these qualitative perspectives provides a more nuanced understanding of leadership performance in periodic markets.

Table 3: Distribution of respondents by role performance in periodic market activities

Roles of Periodic leader	NP %	RP %	SP %	AP %	Ranked Mean
Lead discussion in market meetings.	0.5	9.5	42.6	47.4	2.37
Represent the association in the general market body.	0.5	13.1	36.4	50.0	2.36
Dissemination of market information.	0.5	15.4	48.2	35.9	2.19
Settle/resolve conflicts among members and customers.	0.5	20.8	43.6	35.1	2.13
Contribution of resources (such as levies and donations).	0.5	28.5	34.6	36.4	2.07
Maintain peace.	0.5	22.6	49.5	27.4	2.04
Ensuring rules and regulation of market associations is maintained.	4.1	16.9	51.0	27.9	2.03
Ensuring security of members and their goods.	9.0	15.9	48.7	26.4	1.93
Establish good communication among members.	8.2	42.1	30.3	19.5	1.61
Ensuring sanitation of the market.	15.6	24.6	44.4	15.4	1.59
Organising collective purchase by members.	33.6	26.7	16.7	23.1	1.29
Price regulation of goods and services.	31.3	31.3	20.0	17.4	1.24

Source: Field Survey, 2024 Grand Mean = 1.90

Factors influencing role performance of commodity leaders in periodic markets

The factor analysis results in Table 4 illustrate the contribution of each variable with high loadings to role performance: socioeconomic factors (Factor 1) accounted for the largest portion at 30.27%, followed by institutional factors (Factor 2) at 12.94%, literacy factors (Factor 3) at 11.54%, and constraints (Factor 4) at 10.36%, culminating in a cumulative variance of 65.11%. The remaining 34.89% is attributed to unidentified factors. This cumulative variance of 65.11% across the four factors suggests that these variables are robust determinants of the factors influencing commodity leaders' role performance in the study area.

Table 4: Results of Principal Component Analysis showing the initial Eigen value for factors influencing the performance of periodic market leaders

Factors	Eigen value	% of variance	Cumulative %
Socio-economic factor	3.330	30.272	30.272
Institutional factor	1.423	12.936	43.208
Literacy factor	1.269	11.539	54.747
Constraint factor	1.140	10.360	65.107
Unknown factor	< 1.00	34.893	100.00

Source: Field Survey, 2024

Socioeconomic factor

Results in Table 5 show that six variables significantly contributed to the socio-economic factor. These were age (L= 0.890), years of marketing experience (L= 0.871), years of residence (L=0.855), years in leadership position (L=0.774), household size (L= 0.390) and leadership characteristics (L=0.461). The factor named was based on criterion one – picking synonyms of the highest loaded variables. The influence of age, years of marketing experience, years of residence, years in leadership position, leadership characteristics and household size on the role performance of commodity leaders in periodic market activities was notable. Longer years in the market, and in leadership position coupled with increase in household size (in terms of number of children) could affect role performance positively as a result of increased exposure and responsibilities. Similarly, age, years of residence and leadership characteristics could potentially enhance their role performance in market activities. This is because a leaders' age and experience would assist him in making quality decisions that would affect his performance positively or negatively.

Institutional factor

Results in Table 5 show that four variables significantly contributed to the institutional factor. These were estimated annual income (L= 0.645), institutional factors (L= -0.623), household size (L= -0.491) and leaders' role perception overall score (L= 0.491). The institutional factor includes summation of variables such as governmental institutions roles, non-governmental institutions roles, religious institutions roles, family institution roles and availability of infrastructure. The factor was named based on criterion two – retaining the name based on the similarity of the features reposed in the variables contributing to the factors. This implies that if all institutions perform their respective roles, it would enhance role performance of periodic market leaders. This corroborates the

findings of Famakinwa, Adisa and Alabi (2019) that when institutions such as government and family perform their roles of provision of social infrastructure and supporting leaders respectively, role performance of leaders in rural development would increase significantly. An increase in household size (in terms of number of children) could affect role performance positively as a result of increased exposure and responsibilities. Similarly, an elevation in the income level of a periodic market leaders could potentially enhance their role performance in market activities. This was due to the facilitation of financial contributions or resource allocations toward market-related initiatives or programmes. As income levels rise, individuals may find it easier to invest in market activities, thereby, potentially amplifying their role performance within this domain.

Literacy factor

The results in Table 5 show that leaders' role perception (L = 0.167281), years of formal education (L = 0.585225) and leadership characteristics (L= 0.350464) contributed to the literacy factor. Criterion two was used to name the factor – retaining the name based on the similarity of the features reposed in the variables contributing to the factors. This implies that having years of education, the perception of the respondents about their role responsibilities, and their leadership characteristics would affect their performance positively or negatively. The interplay of these factors underscores their importance in shaping leadership effectiveness within the market.

Constraints factor

The result in Table 5 the significant contributions of two variables to the constraints factor. Specifically, the leaders' role perception (L = -0.475) and identified constraints affecting performance (L = 0.830) emerged as noteworthy contributors. Criterion two was used to name the factor – retaining the name based on the similarity of the features reposed in the variables contributing to the factors. This implies that the perception of the respondents in regards their role responsibilities and the identified constraints (such as political instability, role conflict, literacy of traders, among others) would inhibit effective role performance of the respondents. This suggests that constraints such as corrupt practices, role conflict, illiteracy of traders, among others, acted as impediments to effective role performance of respondents in their roles.

Table 5: Results of Principal Component Analysis showing the variables contributing to factors influencing the performance of periodic market leaders

Factors and Contributing variables	L	L^2	ג
Socioeconomic factor			
Age	0.890	0.7921	
Years of marketing experience	0.871	0.758641	
Years of residence	0.855	0.731025	
Years in leadership position	0.774	0.599076	3.245463
Household size	0.390	0.1521	
Leadership characteristics	0.461	0.212521	
Institutional factor			
Annual income	0.645	0.416025	
Institutional	-0.623	0.388129	
Household size	-0.491	0.241081	1.286316
Leaders' role perception	0.491	0.241081	
Literacy factor			
Leaders' role perception	-0.409	0.167281	
Years of formal education	0.765	0.585225	1.10297
Leadership characteristics	0.592	0.350464	
Constraint factor			
Leaders' role perception	-0.475	0.211375	0.900275
Constraints	0.830	0.6889	

Source: Field Survey, 2024.

L= Loading factors, L2 = Square of loading factor, ג = Latent root for the factor (summation of the square loading)

CONCLUSION

The study concluded that leadership emergence in periodic markets in the study area was through election and nomination by members of their association while experience and sex determined the criteria for selection. Furthermore, major roles performed by commodity leaders were leading discussion in market meetings, representing the association in general market body and dissemination of market information among others. It was also established that the factors that influenced role performance of commodity leaders in periodic markets were socioeconomic factor, institutional factor, literacy factor and constraints

factor. It is therefore recommended that these identified factors should be critically considered in leadership selection to enhance periodic markets leadership structure which would in turn promote development.

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AGGREGATORS' INFORMATION NEEDS ON POST-HARVEST MANAGEMENT PRACTICES OF CASHEW NUTS IN KWARA STATE, NIGERIA

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ABSTRACT

Post-harvest management practices have significant roles in the quality and marketability of cashew nuts. This study assessed cashew nut aggregators' information needs on cashew nuts' post-harvest management practices in Kwara State, Nigeria. A three-stage sampling procedure was used in selecting 130 respondents for the study. Data were obtained using structured questionnaire. Frequencies, percentages, means and regression analysis were used to analyse the data. The mean age of the respondents was 46.8 years, and they were predominantly male (85.4%) with an average of 13.7 years' experience in cashew nut aggregation. The major post-harvest management activities of the nut aggregators were buying and selling of nuts ($\bar{x}$ =1.80). The respondents had highest information needs in 'determination and maintenance of kernel out-turn ratio of the nuts ($\bar{x}$=1.84). 'Unfavourable climate and weather conditions' was identified as a major challenge impeding post-harvest management practices ($\bar{x}$ = 2.02). Aggregators' years of formal education (β = 0.071) and years of experience (β = -0.108) had significant contribution to their information needs at 0.05 level of significance. The study concluded that cashew nut aggregators require more information on nut testing and quality assessment. It recommended that agricultural extension services be strengthened and specifically designed to deliver practical, up-to-date guidance on best practices in nut testing and quality assessment.

Keywords: Cashew Nut Aggregators, Economic Trees, Kernel Out-turn Ratio, Information Needs, Post-Harvest Management Practices

INTRODUCTION

Cashew (*Anacardium occidentale L.*) is cultivated in agro-ecological zones of Nigeria including the semi-arid areas, with a high concentration in the north central areas of the country. Cashew is an important cash crop contributing significantly to foreign exchange earnings of many developing countries, including Nigeria. Nigeria is ranked among the leading exporters of raw cashew nuts, with an average kernel Output Ratio KOR of 48 (Nmeregini *et al.*, 2023; Azeez and Olabanji, 2024). Improving the quality of Nigerian cashew is dependent on the application of Good Agricultural Practices (GAP) at the farm level and postharvest handling from the farm to the market (Agbongiarhuoyi *et. al.*, 2020; Olabanji *et al*., 2021a).

Cashew production in Nigeria is predominantly carried out by small-scale farmers, who typically rely on middlemen to connect their harvests with the market. After harvest, the nut handling has significant impact on the overall quality of the nut (Azeez and Olabanji, 2024). High quality nut is of primary concern to buyers in local and international markets and a principal criterion for success. Poor postharvest handling leading to shrivelled, discoloured, infected and pitted nuts is a major setback to the quality, market value, and overall profitability of Nigerian cashew nuts in international market space (Nmeregini *et al*., 2023; Valenzuela, 2023). Clean nuts with higher percentage of kernel out-turn and lower moisture content usually attract higher price.

Cashew nut aggregators play a central role in the collection, and distribution of cashew nuts. These aggregators serve as intermediaries between farmers and the market, making their involvement in postharvest management essential. This position puts them at the forefront of determining the quality of the nuts that get to the market. They are most times responsible for storage and packaging of the cashew nuts. This pivotal role demands adequate knowledge and skills regarding effective postharvest practices.

To take the leading position, supply of quality nuts is crucial. This is achievable with adequate technical support and capacity upgrade for the nut handlers. Therefore, assessing the information needs of cashew nut aggregators regarding post-harvest management practices is critical for enhancing the overall quality and marketability of cashew nuts. Understanding these needs will help in designing targeted training programs, extension services, and information dissemination strategies to support the aggregators. By improving post-harvest management, the cashew industry in Nigeria can achieve higher standards in nut quality, reduce postharvest losses, and enhance income for all stakeholders involved in the cashew value chain. It is against this backdrop that the study assessed the cashew nut aggregator's information needs on nuts' postharvest management practices in Kwara State, Nigeria. Specifically, the objectives of the study were to;

1. describe the socioeconomic characteristics of the respondents in the study area

2. identify post-harvest management activities of the cashew nut aggregators in the study area
3. assess the information needs of cashew nut aggregators on post-harvest management practices
4. identify the major challenge impeding cashew nut's post-harvest management practices

The hypothesis of the study was stated that selected socioeconomic characteristics of the respondents has no significant contribution to their information needs.

METHODOLOGY

The study was carried out in Kwara State, Nigeria. The State is located in the North Central geo- political zone of Nigeria with its capital in Ilorin. Kwara State is one of the leading states in Cashew nut production in Nigeria and hosts the presence of aggregators due to the volume of nuts in the State. The State extends from latitude 7° 45`N in its southern end, latitude 2° 45`E to the west and longitude 6° 40`E to south east. It has an estimated total population of 3,390,330 (Nigeria Bureau of Statistics, 2022) with a population density of 66 people/km^2. The population in the state makes up 1.7% of Nigeria's total population. The State is typically agrarian. It lies exclusively within a tropical hinterland. The State experiences both the wet and dry seasons each lasting for about 6 months. Cashew mut aggregation and marketing of raw nuts is usually carried out from February to April in Kwara State. The State has sixteen (16) Local Government Areas. Agricultural Development project (ADP) classified the 16 LGAs into four (4) Agricultural zones, 23 blocks and 184 cells in consonance with ecological characteristics and cultural practices. The zones comprise Zone A (with headquarters at Kaiama), Zone B (with headquarters at Lafiaji), Zone C (with headquarters at Ilorin East) and Zone D (with headquarters at Igbaja). The population of this study comprised all cashew nut aggregators in Kwara State. A three -stage sampling procedure was used to select respondents for the study. In the first stage, four Local Government Areas (LGAs) Isin, Asa, Edu and Barutene LGAs were purposively selected from each of the Agricultural Development Zones of the State due to the number of cashew plantations in those areas. In the second stage, four communities were purposively selected from each of the LGAs based on the volume of aggregation activities and the influx of aggregators in those communities. Lastly, 70% of the total numbers of aggregators (186) in the communities were proportionately selected to make a total of 130 respondents for the study. The selection was from a list of aggregators generated through the assistance of lead farmers in each community. A structured interview schedule was used to collect data from the respondents. The level of involvement in post-harvest management activities was measured as highly involved, slightly involved, and not involved. These operational terms were assigned 2, 1 and 0 scores respectively. The weighted mean score for each item was computed and its average was used as decision to categorize the level of involvement in post-harvest management activities as either high or low. The information needs were measured as highly needed, moderately needed, needed and not needed, these operational measures were assigned scores of 3, 2, 1 and 0 respectively. Furthermore, the weighted mean for each item was computed and its average was used as decision to categorize the information needs as high, moderate or low. The challenges impeding cashew nut's post-harvest management practices was measures with response options of very severe, mildly severe, severe, and not a challenge with scores of 3, 2, 1 and 0 assigned respectively. The weighted mean average was used to rank the severity of the challenges. Descriptive statistical tools of frequency distribution, percentages, mean counts and standard deviations were used in achieving the objectives. While multiple regression analysis was used to test the hypothesis at 0.05% level of significance.

RESULTS AND DISCUSSION

Socioeconomic characteristics

The result in Table 1 shows that more male (85.4%) were involved in cashew nuts' aggregation than their female counterparts (14.6 %). This aligns with broader trends observed in agricultural sectors across Nigeria and other developing countries in which gender disparities in agricultural value chains is often observed, with men frequently occupying major roles (Folarin *et. al*., 2021; Bello *et. al.*, 2021). The average age of the respondents was 46.8 years, with a notable proportion (39.2%) in the age bracket of 41-50 years. This is an indication that the respondents are in their middle age and are able to carry out post-harvest management practices. This finding is in consonance with the findings from Agbongiarhuoyi *et al.,* (2020), that suggests that cashew aggregation and similar agricultural enterprises attract middle-aged individuals who have developed networks and resources that are critical to successful aggregation. Majority (83.9%) of the respondents were married, while few were single (14.6%) and divorced/separated (1.5%). This data highlights the economic stability often associated with marital status in rural settings. A study by Louzek (2022) shows that married individuals tend to engage more in economically secure and income-generating activities to support family livelihoods. In terms of educational attainment, majority of the respondents (78.5%) had

from primary to post-secondary education and only a few (21.5%) had no education. Education increases an individual's ability to comprehend and utilise information capable of improving their practices. Close to half (46.9%) of the respondents identified farming as their primary occupation, followed by artisanship (30.0%). This is consistent with the finding of Iraoya and Isinika (2020) who asserted that rural economies in Nigeria typically exhibit a strong linkage between farming and other supplementary income generating activities. Annually, the respondents earn an average income of about ₦687, 549 from aggregation. This income level highlights the economic potential of cashew aggregation. According to Olukunle (2020), aggregation in high-demand export crops like cashew offers substantial income potential. The mean years of experience of the respondents in nuts' aggregation was 13.7 years. Experience is known to significantly impact efficiency in value chain activities as it tends to improve the proficiency of the individuals concerned (Olabanji *et. al*., 2021b).

Table 1: Distribution of respondents based on the socioeconomic characteristics

Socioeconomic variables	Percentages (%)	Mean
Sex		
Male	85.4	
Female	14.6	
Age (in years)		**46.8 years**
Below 20	3.1	
20-30	14.6	
31-40	25.4	
41-50	39.2	
51 and above	17.7	
Marital Status		
Married	83.9	
Single	14.6	
Divorce/separated	1.5	
Years of Formal Education		**10.9 years**
No Formal Education (0)	21.5	
Primary School Certificate (1-6)	27.7	
Secondary School Certificate (7-12)	45.4	
Post-Secondary Education (12-18)	5.4	
Primary Occupation		
Trading	20.8	
Civil Servant	2.3	
Artisanship	30.0	
Farming	46.9	
Annual income from aggregation (₦)		**₦687, 549**
≤ 100,000	16.2	
100,001 – 500,000	35.4	
500,001 – 1,000,000	45.3	
>1,000,000	3.1	
Years of Experience in nut's aggregation		**13.7 years**
Less than 5	8.5	
5-10	36.9	
11-15	30.8	
Above 16	23.8	

Source: Field Survey, 2024

Level of involvement in post-harvest management activities

The data in Table 2 show that the major post-harvest management activities of the cashew nut aggregators was buying and selling of nuts which ranked 1st ($\bar{x}$ =1.80). This was followed by nut testing ($\bar{x}$ =1.72) which ranked 2nd and quality assessment ($\bar{x}$ =1.50) ranking 3rd. Transporting of the nuts ($\bar{x}$ =0.57) ranking 8th, processing of nuts ($\bar{x}$ =0.28) ranking 9th and the separation of apples from nuts after harvest ($\bar{x}$ =0.23) ranking 10th were the least post-harvest management practices aggregators were involved in. This finding aligns with the studies of Abraham (2022) and Agbongiarhuoyi *et al*. (2020) on the structure of post-harvest management in cashew value chains in Nigeria and other West African countries, where small-scale aggregators are generally more focused on immediate sales and quality checks than on

value-added activities such as processing and transportation.

Table 2: Distribution of the respondents based on level of involvement in post-harvest management activities

Post-harvest management activities	Highly Involved	Slightly Involved	Not Involved	WMS	Std. Dev	Rank
Buying and selling of nuts	85.4	9.2	0.0	1.80	1.089	1st
Nut testing	73.8	24.6	1.5	1.72	0.786	2nd
Quality assessment	59.2	31.5	9.2	1.50	0.862	3rd
Grading and sorting	35.4	45.4	19.2	1.16	0.991	4th
Drying	33.1	43.1	23.8	1.09	0.899	5th
Loading/off loading	26.2	31.5	42.3	0.84	1.009	6th
Bagging	23.8	32.3	43.9	0.80	1.102	7th
Transportation	16.2	24.6	59.2	0.57	0.920	8th
Processing	6.2	16.2	77.7	0.28	1.026	9th
Separation of apples from nuts	6.2	10.7	83.1	0.23	0.867	10th

Source: Field Survey, 2024

The result in Table 3 shows that the highest information needs were in the areas of quality assessment of cashew nuts. These include determination and maintenance of kernel output ratio (KOR) ≥ 44 with a weighted mean score ($\bar{x}$) of 1.84 ranking as 1st and determination of total defects (≤ 10%) having a weighted mean score ($\bar{x}$) of 1.76 and ranked 2nd. This was followed by determination of the percentage of good kernel ($\bar{x}$ =1.75; ranking 3rd), determination of nut count ($\bar{x}$ =1.53; ranking 4th) and sorting and grading ($\bar{x}$ =1.24; ranking 5th). The least information needs were on insect and disease prevention ($\bar{x}$ =0.50; ranking 9th) and assessing raw nut quality through floatation test ($\bar{x}$ =0.48; ranking 10th). A study by Agbongiarhuoyi *et al.*, (2020) and Castka *et al*., (2023) underscores the importance of accurate KOR and defect measurements in meeting international buyer standards, which in turn allows aggregators to secure higher prices and better contracts. A lack of information in these areas can affect aggregators' ability to ensure consistency in quality, which could limit market access and pricing.

Table 3: Distribution of the Respondents based on information needs on post-harvest management practices

Post-harvest Management Practices	HN	MN	N	NN	WMS	Std. D
Nut Harvesting						
Determining nuts ready for harvest.	7.6	10.8	16.2	65.4	0.61	1.011
Nut test						
Assessing raw nut quality through floatation test	6.2	8.4	12.3	73.1	0.48	0.768
Determination of nut count (nuts per kilogram).	26.1	28.5	17.7	27.7	1.53	0.896
Determining the percentage of good kernel by opening the nut	28.5	32.3	24.6	14.6	1.75	1.009
Sorting and grading	18.4	22.3	23.8	35.3	1.24	0.998
Quality assessment						
Determination of total defects (≤ 10%).	33.1	23.8	29.2	3.8	1.76	0.909
Determination and maintenance of kernel output ratio (KOR) ≥ 44.	37.7	24.6	21.5	16.2	1.84	0.896
Proper storage method						
Determination of proper drying method for moisture level (8-10%)	14.6	16.2	19.2	0.50	0.95	1.087
Insect and disease prevention	6.9	9.2	10.8	73.1	0.50	0.916

Source: Field Survey, 2024

Keys: HN = Highly Needed; N= Needed; NN =Not Needed

Table 4 reveals that unfavourable climatic and weather conditions was noted as the major challenge impeding cashew nuts' post-harvest management practices having a weighted mean score of 2.02. This was followed by shady practices of mixing of immature nuts with matured nuts on the part of the sellers ($\bar{x}$ =2.00; ranking 2nd) and poor infrastructure and technological deficit ($\bar{x}$ =1.67; ranking 3rd). Other challenges with minimal severity were limited knowledge and training ($\bar{x}$ =1.52; ranking 8th),

limited access to processing technology ($\bar{x}$ =1.27; ranking 9th) and lack of market ($\bar{x}$ = 0.42; ranking 10th). Quange (2024) noted that adverse weather patterns can increase post-harvest losses due to rapid deterioration of harvested produce, affecting quality and reducing shelf life. Climate variability has led to increased unpredictability in cashew production, intensifying the challenges of maintaining quality in post-harvest stages. The low ranking for market access suggests that market demand for cashew nuts is relatively strong, meaning that aggregators have fewer challenges finding buyers compared to overcoming quality and infrastructural hurdles.

Table 4: Distribution of the respondents based on the major challenge impeding cashew nut's post-harvest management practices

Challenges	VS	MS	S	NS	WMS	Std. D	Rank
Unfavourable climate and weather conditions	36.9	39.2	13.1	10.8	2.02	0.991	1st
Shady practices of mixing of immature nuts with matured nuts on the part of the sellers.	33.1	43.1	14.6	9.2	2.00	1.090	2nd
Poor infrastructure and technological deficit	26.9	35.4	15.4	22.3	1.67	1.012	3rd
Inadequate skilled labour	25.4	31.5	23.7	20.0	1.62	0.901	4th
Bad quality of nuts	22.3	33.1	26.1	18.5	1.59	1.006	5th
Inadequate storage facilities	26.2	31.5	15.4	26.9	1.57	0.863	6th
Combination of old and new season nuts	29.2	22.3	20.8	27.7	1.53	0.910	7th
Limited knowledge and training	23.8	22.3	36.2	17.7	1.52	1.102	8th
Limited access to processing technology	15.4	23.8	33.1	27.7	1.27	1.011	9th
Lack of market	6.1	8.5	6.9	78.5	0.42	0.876	10th

Source: Field Survey, 2024

Data in Table 5 shows that among the seven characteristics entered the model, two were found to be statistically significant predictors at 5% level of significance. These include years of formal education (B = 0.071) and years of experience (B = -0.108). The coefficient for age is positive and statistically significant ($p < 0.05$) indicating that the older the aggregators the more their information needs. On the other hand, years of experience is negative and statistically significant ($p < 0.05$) indicating that the more the years of the respondents' experience in aggregation of nuts the lesser information needs. This could be because the number of years spent on the field of aggregation can make an individual garner requisite knowledge on handling various issues. This finding aligns with the work of Adefalu *et al*. (2021) who observed that less experienced farmers had greater needs for extension services due to limited exposure and practical understanding of modern agricultural practices. Similarly, Olabanji *et al*., (2021b) emphasised that experience in agricultural activities reduces information gaps as individuals tend to learn from hands-on practices and repeated exposure to similar challenges.

Table 5: Contribution of Socioeconomic characteristics to Information Needs

Variables	Coefficient (B)	SE	t-value
Age	0.087	0.317	0.380*
Sex	0.164	0.245	1.327
Marital Status	0.547	0.087	5.259
Years of formal education	0.071	0.213	0.640
Annual Income	-0.060	0.182	-0.168
Years of experience	-0.108	0.170	-0.567*

R^2= 0.698, Adjusted R^2 = 0.571, F = 19.237, $p<0.05$

Source: Data Computation, 2024

CONCLUSION AND RECOMMENDATIONS

The study concluded that the respondents have information needs on the determination of quality nuts and the major constraint impeding cashew nut's post-harvest management practices was unfavourable climate and weather conditions. Given the adverse impact of climatic conditions on post-harvest quality, introducing climate-resilient storage and handling methods would be beneficial. This includes training on proper drying techniques and low-cost storage innovations to preserve nut quality during adverse weather.

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PATTERNS AND TRENDS OF COMMUNAL CONFLICTS IN BENUE AND NASARAWA STATES, NIGERIA

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ABSTRACT
The study examined the patterns and recent trends of communal conflicts in North-central, Nigeria. The specific objectives were to identify the types of communal conflicts; determine the frequency of occurrence of communal conflicts in the study area; determine the seasonality of occurrence of communal conflicts; identify the category of people mostly affected by communal conflicts and examine the period of displacement from communities during communal conflicts. A four staged sampling procedure was used to obtain a sample size of 391 farmers. Data were elicited using questionnaires as interview schedule and were analysed using descriptive statistics such as frequencies, percentages and mean. The major findings showed that farmers/herder's conflict (75.70%) was a common occurrence with 47.05% of the conflicts occurred both in the dry and rainy seasons. The result revealed that both the young (58.82%) and adult (59.59%) population were affected by the occurrence of communal conflicts. The mean period of displacement from communities during communal conflicts in the study area was 11.74 months. In conclusion, the study identified communal conflicts involving herdsmen/farmers primarily affecting mostly youths, with a mean displacement period of 11.74 months. The study recommended that extension service providers, government and non-governmental organisations should facilitate farmers' access to productive resources to improve their well-being and productivity and aid in mitigating the effects of communal conflicts.

Keywords: Types of Communal Conflicts, Farmers/herders, Conflict occurrence

INTRODUCTION

Communal conflicts have become a recurring problem in Nigeria and have plagued the nation for decades (Daudu *et al.*, 2024). These conflicts, often rooted in ethnic or socioeconomic differences, have led to violence, displacement, and loss of lives. The patterns and trends of communal conflicts in Nigeria is a complex phenomenon with deep-seated historical, political, and economic causes (Anierobi, *et al.*, 2024). One of the key factors contributing to communal conflicts in Nigeria is the country's diverse population. With over 250 ethnic groups and a multitude of languages and cultures, the potential for misunderstandings and tensions is high. Competition for scarce resources such as land, water, and political power has exacerbated these tensions, leading to clashes between different groups (Olumba, 2022).

The impact of communal conflicts in Nigeria has been devastating, with thousands of lives lost and communities torn apart. The cycle of violence and retaliation has created a climate of fear and mistrust, hindering efforts at reconciliation and peacebuilding. The humanitarian consequences of these conflicts are also profound, with many people displaced from their homes and in need of urgent assistance (Ochogwu, 2024). Ultimately, the incidence of communal conflicts in Nigeria is a complex challenge that requires sustained commitment and cooperation from all stakeholders. By addressing the root causes of these conflicts and promoting dialogue and reconciliation, Nigeria can move towards a more peaceful and inclusive society where all its citizens can coexist harmoniously (Orhero, 2020).

North Central Nigeria is situated within the critical hotbed of Nigeria's communal conflicts' axis. The region has, over the years, witnessed varying degrees and dimensions of ethno-communal incidents, often resulting in widespread violence and instability (Okoli and Ukwandu, 2021). Expectedly, there exists a gamut of literature on communal conflict in North Central Nigeria. Whilst the existing studies have variously emphasised some crucial aspects of communal conflict in Nasarawa State, especially its general causes and impacts, there has not been much attempt to systematically account for the socio-contextual dynamics of such conflicts, particularly their opportunistic dialectics in the contemporary period.

North-central Nigeria has experienced an array of ethno-communal incidents over the years, with many ending in widespread bloodshed and instability. Additionally, the prevalence of communal conflicts is a complicated issue that needs sustained dedication and collaboration from all parties. There is an urgent need to investigate the current patterns and trends of such conflicts in order to propose relevant solutions for curbing them. As a result, this study examines the prevalent narratives of communal conflicts in Benue and Nasarawa States to obtain insight into the current state of socio-contextual complications. Specifically, the study aims to:

i. identify the types of communal conflicts in the study area;
ii. determine the frequency of occurrence of communal conflicts in the study area;
iii. determine the seasonality of occurrence of communal conflicts in the study area;
iv. determine the category of people mostly affected by communal conflicts in the study area, and;
v. determine the period of displacement from communities during communal conflicts in the study area.

METHODOLOGY

Benue and Nasarawa states, in North-Central Nigeria, were the study's locations. The total land mass of North Central Zone covers an area of 296,898 km^2 which represents approximately 32% of the land mass of the country. Its coordinates are 6° 30' to 11° 20' North by latitude and 2° 30' to 10° 30' East by longitude. More than 77% of the population in the region are largely involved in one type of agricultural activity or another (Adzenga, Umar and Onyenkazi, 2024).

The study's population consisted of all farm families in Nigeria's Benue and Nasarawa states, selected through a multistage sampling procedure. Initially, all Local Government Areas (LGAs) where communal conflicts occur often in the two states were selected using the purposive sampling procedure due to the severity of occurrence of the conflicts in the selected Local Government Areas. Overall, seven (7) LGAs with a high incidence of communal conflict over the years were selected: four (4) out of 23 LGAs in Benue state and three (3) out of 13 in Nasarawa state. In the second stage, eleven (11) extension blocks were chosen from the specified LGAs using a purposive sampling technique based on the high prevalence of communal conflicts in the area. That is, eight (8) extension blocks from LGAs in Benue state and three (3) extension blocks from LGAs in Nasarawa state (the significant number of extension blocks affected in Benue state reflects the severity of conflicts in the State. In the third stage, twenty-four (24) extension cells that have suffered repeated communal conflicts were randomly selected (15 extension cells from Benue state and nine (9) extension cells from Nasarawa state) using a simple random sampling method. Finally, 391 farmers (277 from Benue and 114 from Nasarawa) were selected from a list of registered farm families in each cell using the Taro Yamane formula for sample size determination. Primary data were obtained using a structured questionnaire and interview schedule to elicit information from farmers and analysed using descriptive statistics such as percentages, mean scores, and ranking.

RESULTS AND DISCUSSION

Types of communal conflicts in the study area

The results in Table 1 indicated that the prominent type of conflicts in the study area was farmers/herders' conflict with 85.1% and 71.8% for Nasarawa and Benue states respectively. Land use conflicts (49.8%) and conflicts over demarcation of administrative boundaries (28.5%) were the other prominent types of conflicts in Benue state while for Nasarawa state, ethnic conflicts (76.3%), conflicts over chieftaincy stools and community leadership tussle (62.3%) and land use conflicts (54.4%) were the other prominent types of conflicts that were prevalent in the area.

The pooled results showed that farmers/herder's conflict (75.7%) was of common occurrence in the study area. The result suggests that resource-based conflicts involving farmers and herders over struggle to control land resources was the commonest type of communal conflicts in the study area. Other conflicts prevalent included land use conflicts (51.2%), conflicts over demarcation of administrative boundaries (30.2%) and ethnic conflicts (27.9%). This result agrees with the findings of Soomiyol and Fadairo (2020), that violent conflicts between nomadic herders from northern Nigeria and settled farming communities in North-Central Nigeria have become common. These clashes have increased over the years and are now spreading southward. The violence threatens Nigeria's security and stability.

Table 1. Types of communal conflicts in Benue and Nasarawa States

	Benue		Nasarawa		Pooled	
Types of Conflict	**f**	**%**	**f**	**%**	**f**	**%**
Ethnicity	22	7.9	87	76.3	109	27.9
Farmer/herders	199	71.8	97	85.1	296	75.7
Boundary demarcation	79	28.5	39	34.2	118	30.2
Land use	138	49.8	62	54.4	200	51.2
Communal fishing Streams	16	5.8	20	17.5	36	9.2
Chieftaincy tussle	26	9.4	71	62.3	102	26.1

Source: Field survey, 2019 *Multiple response

Frequency of occurrence of communal conflicts in the study area

As shown in Table 2, the mean frequency of occurrence of conflicts between farmers/herdsmen in the last two years in Benue state was 17.8 times as against 16.8 times in Nasarawa state. This is an indication that the occurrence of land and boundary conflicts is slightly higher in Benue state than in Nasarawa state. The pooled result revealed that the mean frequency of occurrence of farmers/herdsmen conflicts in the study area in the last two years was 17.5 times. This suggest that extension services which provide complimentary services to farming which is the predominant occupation of communities in areas prone to communal conflicts is being disrupted by these conflicts. This makes livelihood difficult at both the immediate locality as well as the larger societies that are dependent on the produce from these communities. This result conforms to findings of Animasawun (2023) who observed that out of a total of 677 hundred incidents of communal conflicts in 2020 across several States in Nigeria, about 207 came from clashes between farmers and herders (resource use conflicts).

Table 2. Frequency of occurrence of communal conflicts

	Benue		Nasarawa		Pooled	
Types of Conflict	**f**	**%**	**f**	**%**	**f**	**%**
Ethnicity	97	35.0	35	30.7	132	33.8
Farmer/herders	159	57.4	75	65.8	234	59.8
Land use/Boundary	15	5.4	03	2.6	18	4.6
Fishing/ Chieftaincy Tussle	06	2.2	01	0.9	07	1.8
Total	277	100	114	100	391	100
Mean	17.8			16.8	17.5	

Source: Field survey, 2019

Seasonality of occurrence of communal conflicts

The result in Table 3 revealed that 41.9% of the respondents in conflict prone areas of Benue State indicated that farmers/herders' conflicts mostly occur during the rainy season. This result suggests that farmers in areas prone to communal conflicts in Benue State experience communal conflicts mostly during the farming season probably due to interference in their major source of livelihoods. This result is congruent with that of Olaiya, Ogungbaro and Olujide (2022), who observed that the majority of resource-based conflicts between farming communities in Nigeria occur during the farming season. Table 3 shows that majority (86.0%) of the respondents from Nasarawa State indicated farmer/herdsmen conflicts occur both in rainy and dry seasons. This result implies that resource use conflicts in conflict prone areas of Nasarawa State do not follow a particular pattern of the season as there was no specific season of occurrence of the conflicts.

However, the pooled result in Table 3 showed that 47.0% of the respondents in areas prone to communal conflicts in the study area reported that farmers/herders' conflicts occur both in the dry and rainy seasons. The inference to be drawn from this is that communal conflicts do not follow any cycle as recent occurrences indicated that resource-based conflicts do not necessarily involve seasonal movements but some of them may result from reprisal attacks. This result is consistent with the findings of Onuoha *et al.* (2023), who reported that resource-based conflicts do not end with the rainy season, and the violent nature of the conflicts was not limited to specific times of year, but occurred throughout the year.

Table 3. Seasonality of Occurrence of Communal Conflicts

Type	**Season**	**f**	**%**
Ethnicity/Chieftaincy	Rainy	127	32.5
Land/Boundary/Fishing	Dry	80	20.5
Farmers herders	Rainy and Dry	184	47.0
Total		391	100.0

Source: Field survey, 2019

Category of people mostly affected by communal conflicts

As shown in Table 4, the category of people mostly affected by farmers/herders' conflicts in Nasarawa State were the adults (73.7%) while for Benue State, category of people mostly affected were youths (65.3 %). The pooled result revealed that both the young category of persons (58.8%) and adults (59.6%) almost in equal proportion were mostly affected by occurrence of communal conflicts. This result suggests that all classes of community members are affected by crises especially the youths who serve as the active labour force in the communities as well as major beneficiaries of extension services. Occurrence of communal conflicts may result in their displacement

and subsequent migration to urban centres in search of less risky jobs, thereby affecting the labour supply within the communities. In a related study, Okpa *et al*. (2023) stressed that armed conflict can have a serious and protracted effect on children, young people, and their families and it can result in increased violent behaviour, poverty, high school dropout rates, and long-lasting psychological trauma.

Table 4. Category of people mostly affected by communal conflicts

Category	Benue		Nasarawa		Pooled	
	f	%	f	%	f	%
Young	146	52.7	84	73.7	230	58.8
Adults	181	65.3	52	36.1	233	59.6
Elderly	118	42.6	37	32.5	155	39.6

Source: Field survey, 2019 *Multiple responses

Period of displacement from communities during communal conflicts

Table 5 showed that the mean period that the respondents were displaced in Benue State was 13 months, while the mean period of displacement in Nasarawa State was 11 months. This suggests that farmers in Benue State had a longer period of displacement from their communities than their counterparts in Nasarawa State probably due to the intensity of the conflicts in Benue State. The pooled result revealed that the mean period of displacement from communities in the study area was 11.7 months. The desertion of several communities and consequent interruption of farming and extension activities in communities affected by communal conflicts will likely affect the income generating activities of the people. This result corroborates the findings of Anierobi *et al.* (2024) who reported in their study that many of the displaced persons were yet to spend up to 1 year in the IDP camps because they were new arrivals at the camps due to recent incidents in their communities while others have spent between one to three years in the camps.

Table 5. Period of displacement from communities during communal conflicts

Duration	Benue n=277		Nasarawa n=114		Pooled n=391	
(Months)	f	%	f	%	f	%
1-11	162	58.4	63	55.3	225	57.5
12-23	78	28.2	19	16.7	97	24.8
24-35	28	10.1	26	22.8	54	13.8
36-47	03	1.1	03	2.6	06	1.5
48-59	03	1.1	03	2.6	06	1.5
≥ 60	03	1.1	00	0.0	03	0.9
Total	277	100	114	100	391	100
Mean	13.3		11.1		11.7	

Source: Field survey, 2019

CONCLUSION AND RECOMMENDATIONS

The findings revealed that the prevalent seasonal communal conflict was herdsmen/farmers conflicts, occurring in about 18 times within two years; affecting mostly the youths in the study area. The conflicts have displaced them for almost a year. Therefore, it is recommended that extension service providers, other government organisations and non-governmental organisations (NGOs) such as the National Emergency Management Authority (NEMA), Red Cross, and others should help displaced community members lessen the impact of communal conflicts with productive resources.

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ATTITUDE OF RICE FARMERS TOWARDS ANCHOR BORROWERS' PROGRAMME IN NORTH-CENTRAL NIGERIA

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ABSTRACT

The Anchor Borrowers' Programme (ABP) was launched to boost rice production in North-Central Nigeria. Despite its potential, the effectiveness of the initiative is uncertain as farmers' attitudes towards the programme may affect its success, yet there is limited empirical research in this direction. Hence, attitude of rice farmers towards ABP in North-Central, Nigeria was investigated. A multistage sampling procedure was used to select 157 respondents for the study. Interview schedules were used to elicit responses on respondents' socioeconomic characteristics, attitude towards ABP, and constraints to sustainability of ABP. Data were analysed using mean, and percentages. Findings showed that respondents were averagely 42 years old; majority (73.2%) were male; married (64.3%); with average farm sizes of 3.3±1.0ha, while they earned an average of ₦696,817.8 annually. About 55.41% of the respondents had favourable attitude towards ABP. The ABP implementation was constrained by poor farmers involvement in decision-making **(**1.6±0.6); communal crises/farmers-herder conflicts **(**1.6±0.6); delay in loan disbursement **(**1.6±0.6); poor extension service component **(**1.54±0.60); side selling of farm produce by farmers after harvest **(**1.54±0.62). The study recommends favourable attitudes of farmers towards the programme should be complimented with timely disbursement of input/credits and substantial participation of farmers in decision-making.

Keywords: Anchor Borrowers' Programme, North-Central, Public policy, Rice farmers

INTRODUCTION

Nigeria has the potential to be among the most agriculturally productive nations in Africa due to its abundance of fertile land, favourable environmental conditions, and considerable labour force (Mahmud, 2023 and Nwankwo *et al.,* 2024). Despite this, the nation still finds it difficult to feed its rapidly growing population as domestic food production has remained below demand due to several factors, including inadequate access to modern farming technologies, poor funding, and infrastructural deficits (Abdulwaliyu *et al.,* 2023 and Akinwale and Grobler, 2023). The mismatch between domestic production and demand has led to a heavy reliance on food imports, particularly rice, one of the primary staples in the country (Onoja *et al.,* 2024). This situation not only threatens food security but also puts pressure on foreign reserves, as the country continues to spend hugely on food imports (Okpala *et al.,* 2023 and Obiora *et al.,* 2023).

In a bid to achieve self-sufficiency in rice production, the Federal Government through the Central Bank of Nigeria (CBN), implemented various programmes aimed at supporting farmers in the country. One such initiatives is the Anchor Borrowers' Programme (ABP) introduced in 2015. According to Abdulmumini (2021) and Emeh, and Ani, 2021), the ABP was launched in 2015 as an intervention to agricultural production by providing the smallholder farmers with much-needed financial support in the form of loans. In addition to providing necessary agricultural inputs including machinery, fertilizer, and seeds, the initiative links rice farmers with financial institutions and agro-processors primarily to lessen reliance on imports, boost domestic output, and improve farmers' access to funding for farming operations (CBN, 2015 and Akinbile *et al.,* 2023).

Despite the programme's potential to transform rice cultivation in Nigeria, there has been rising concern over its effectiveness particularly in the North-Central region of Nigeria. This concern arises from the differing responses of rice farmers, whose perspectives can greatly influence the initiative's effectiveness. More so, the effectiveness of the programme is contingent upon the farmers' attitude and engagement (Hasan *et al.,* 2024). Empirical studies on Anchor Borrowers' and rice farmers in Nigeria abound in literature (Ejiogu, 2021; Ojo *et al.,* 2023; Akinbile *et al.,* 2023). However, the attitude of rice farmers towards the programme coupled with potential threats to the sustainability of the initiative, has not been ascertained; particularly in North-Central Nigeria which is one of the major regions in the country where the ABP has been widely implemented. Hence, it is essential to understand their perspectives about the ABP to assess its long-term viability and impacts.

The study was anchored on the theory of planned behaviour by Icek Ajzen. According to the idea of planned behaviour, three main factors influence an individual's conduct: their attitude toward the given task, their perception of behavioural control, and subjective norms (Jaganathan *et al.,* 2023). All these factors work together to affect an individual's intention to engage in a specific task, which in this context is participation in ABP. Within the framework of this

research, rice farmers' attitudes regarding the ABP might be interpreted as their general assessment of the advantages and disadvantages of the programme. According to the theory, having a good attitude toward a particular task increases the probability that one will intend to engage in that action (Cuong, 2024). These enthusiastic sentiments in the case of ABP may be influenced by things like improved farming methods, resource accessibility, and projected economic rewards.

Subjective norms are another critical component of the theory which according to Al Halbusi *et al.* (2023) and Wu *et al.* (2023) deals with the expectations or perceived social pressures from notable individuals about whether to participate in a given task. Subjective norms in this research may include the opinion of family members, community leaders, and other farmers regarding participation in the ABP. Farmers are more likely to be engaged in ABP if they think that their peers endorse taking part in the programme. Another crucial component of the theory of planned behaviour is perceived behavioural control, which represents an individual's confidence in their capacity to carry out a particular task (La Barbera and Ajzen, 2024). This encompasses both external (like available resources and support system) and internal (like self-efficacy). Based on this background, the study analysed the attitude of rice farmers towards the Anchor Borrowers' Programme in North-Central, Nigeria. Specifically, the research objectives were to:

i. describe socioeconomic characteristics of rice farmers;
ii. determine the attitude of rice farmers' towards the ABP in the study area;
iii. identify the constraints to the sustainability of ABP in the study area.

METHODOLOGY

The study was carried out in North-central, Nigeria, situated within the southern guinea savannah agro-ecological zone. The National Bureau of Statistics (NBS, 2020) estimates that 29,252,408 people are living in the North Central, which has a landmass of 226,668 km^2. The population of the study include all rice farmers in North-Central, Nigeria. A multi-stage sampling procedure was employed to select respondents for the study.

At first, three of the seven states in the North-Central region (Benue, Kogi, and Niger) were purposively selected using a purposive sampling technique. This selection was based on their active participation in rice production under the ABP. Secondly, two major rice-producing Local Government Areas (LGAs) were purposefully selected from each of the three states. This was equally based on their active involvement in the ABP, totalling 6 LGAs. Thirdly, 157 registered ABP participants from the 6 LGAs were randomly selected using a simple random sampling technique. These participants were from Benue state: Gwer East (27) and Gwer West (23); Kogi state: Idah (25) and Kogi (28); as well as from Niger state: Katcha (24) and Bida (30). Data were collected using an interview schedule.

Farmers' attitude towards ABP was measured on a five-point Likert-type scale of strongly disagree (1), disagree (2), undecided (3), agree (4), and strongly agree (5) for a positively worded statement and revise order for the negatively worded statement; with the index's categorisation of 42-67 (unfavourable attitude) and 68-106 (favourable attitude). Also, the constraints to the sustainability of Anchor Borrowers' Programme in the study area was measured on a three-point Likert-type scale of not a constraint (0), mild constraint (1), and serious constraint (2) with a mean of 1.0 as standards for classifying the constraints, with a mean score of 1.0 and above being considered as major constraint and otherwise classified as minor constraint. The data generated were analysed using percentages and mean scores.

RESULTS AND DISCUSSION

Socioeconomic characteristics

According to the findings in Table 1, the mean age of the was 42.1±9.6 years, respectively. Male farmers dominate the farming population (73.2%). This indicates a gender disparity in the ABP, aligning with observations that male farmers are more involved in agricultural production in North-Central Nigeria (Abdulmumini, 2021). The results further reveal that 64.3% of participants were married. This confirmed the submission that married individuals are more likely to engage in farming activities (Balogun *et al.*, 2021). Educationally, a significant proportion of respondents had at least a secondary educational qualification (52.8%).

This could facilitate their ability to understand and implement new agricultural practices introduced by the ABP (Abdu-Raheem *et al.*, 2023). Also, the respondents had a significant years of farming experience, averagely 14.31±5.71. This indicates a reasonable level of rice farming expertise among farmers. The mean farm size was 3.3±1.0ha for participants. This implies that the farmers were mainly smallholders. Furthermore, income levels were modest among respondents, with a mean of ₦696,817.8 per annum for participants. The result reflects their small scale of operations. The low-income level suggests financial limitations that could prevent investment in innovative technology to enhance the living standard of farmers.

Participants' attitude towards the anchor borrowers' programme

The reports in Table 2 show that about 55.41% of the respondents had favourable attitude towards the programme in the study area. For example, Table 2 shows that most (96.8%) of the respondents had no regret over their involvement in ABP activities; expressing their love for the programme and promised to continue to renew their engagement in ABP so long as the programme continues (75.2%). More so, the majority (72.6%) them praised the Government for this life changing opportunity for farmers; believing that the ABP has instilled their interest in further agricultural interventions in Nigeria (71.2%); and most (70.7%) of them further confirmed that the benefits they derived from the ABP is worth the time spent on it.

Table 1: Respondents' socioeconomic characteristics

Variable	Frequency	Percentage (%)	Mean/Mode
Age			
25-34	38	24.2	
35 - 44	68	43.3	42.1±9.60
≥ 45	51	32.5	
Sex			
Male	115	73.2	Male
Female	42	26.8	
Marital status			
Single	38	24.2	
Married	101	64.3	Married
Divorced	13	8.3	
Widow/widower	2	1.3	
Separated	3	1.9	
Education			
No formal education	22	14.0	
Primary education	52	33.1	
Secondary education	63	40.1	Secondary
Tertiary education	20	12.7	
Experience			
5 - 10	47	29.9	
11 - 15	78	49.7	14.31±5.71
≥ 16	32	20.4	
Farm size			
2 - 3.0	87	55.4	
3.1 - 4.0	54	34.3	3.32±0.97
≥ 4.1	16	10.3	
Estimated monthly income (₦)			
25,700 - 49,127	76	48.4	
49,128 - 72,555	48	30.6	58,068.15
≥72,556	33	21.0	

Source: Field Survey (2022)

Farmers who have a positive attitude about government-assisted agricultural interventions could be able to take advantage of the programme to increase production which could translate to national economies growth and development (Alfred and Adekayode, 2014; Fadairo *et al.*, 2015; Oyibo, 2020). No wonder, Ayuba *et al.* (2020) and Balogun *et al.* (2021) emphasised that the ABP intervention boosts rural income and acts as a stimulant for the contemporary economy. Okoroh *et al*. (2021), Mahmud *et al*. (2022) added that it has also lowered Nigeria's food import bill and increased agricultural exports. ABP has encouraged agricultural industry and, consequently, the economy (Sambe *et al.*, 2020). The finding upholds the reports of a similar study by Fadairo *et al.* (2015), who asserted that the majority of crop farmers had positive attitudes toward the e-wallet platform of the Growth Enhancement Scheme (GESS).

However, Table 2 further indicates that close to half (44.59%) of the respondents were reported to have had an unfavourable attitude towards the programme in the study area. This serves as a pointer to the programme organisers and necessary stakeholders, suggesting the need for a more public enlightenment campaign for clearer understanding of the programme among farmers in the area. For example, the respondents believed that the government introduced ABP for political reasons (78.3%) and alleging that ABP is a means to exploit smallholder farmers in the country (75.1%). They

further added that if farmers had been adequately consulted, the ABP would have been much better (66.9%).

Table 2: Distribution of respondents based on their attitude towards ABP

Attitudinal statement	SD	D	U	A	SA
Just like every other programme in Nigeria, the ABP will fail	4.5	13.4	44.6	29.2	8.3
For me, the ABP approach is ideal for obtaining agricultural inputs	37.6	20.4	14	15.9	12.1
I believe that the ABP platform has greatly reduced corruption in agriculture sector	42.7	19.1	14	14.6	9.6
I believe that the modus operandi of ABP is suitable for our agricultural system	36.9	18.5	17.8	15.3	11.5
I love the programme and I shall continue to renew my partnership	5.1	10.2	9.5	32.5	42.7
The government introduced the ABP for political reasons	5.7	7.6	7.6	46.5	31.8
The ABP has properly addressed our input demands	34.4	19.1	18.5	15.3	12.7
With ABP, the time of agro-input delivery is ideal	36.9	18.5	17.8	13.4	13.4
If farmers had been adequately consulted, ABP would have been much better	5.1	17.2	10.8	38.2	28.7
Poor feedback opportunity makes the ABP uninteresting to me	36.3	17.8	19.7	16.6	9.6
ABP has instilled my interest in the future agricultural programmes in Nigeria	11.5	10.8	6.4	24.2	47.1
I believe that more farmers will emerge if ABP is sustained	35	19.1	19.7	15.9	10.2
I am not in support of ABP, it is fake and unreliable	36.3	17.8	18.5	16.6	10.8
I have no regret over my involvement in ABP	1.3	1.9	0	26.1	70.7
Anchor Borrowers' Programme is for poor people in the society	36.3	19.1	17.8	15.9	10.8
ABP is a means to exploit smallholder farmers in the country	4.5	14.6	5.1	40.1	35.7
Benefits I derived from the ABP are worth the time I spent on it	19.7	5.1	4.5	28	42.7
I believe that ABP has come to stay for the good of all	36.9	19.1	17.3	14.6	12.1
The Government got it right for this life-changing opportunity for farmers	5.1	15.9	6.4	35	37.6
I believe that ABP has assisted the SHF to go into large production	7.6	14.6	23.6	35.7	18.5
I am no longer willing to continue with ABP henceforth	35.7	19.1	18.4	15.3	11.5
I believe that if ABP is sustained, success in growing agriculture will be achieved	34.4	17.8	22.3	15.9	9.6

Overall categorisation of respondents based on their attitude towards ABP

Attitude	Percentage	Mean ($\bar{x}$)
Unfavourable attitude (42 - 67)	44.59	68.00±16.17
Favourable attitude (68 - 106)	55.41	

Note: SA = Strongly Agree, A = Agree, U = Undecided, D = Disagree and SD = Strongly Disagree.
Source: Field Survey (2022)

Constraints to the sustainability of anchor borrowers' programme

Table 3 observes that poor involvement of farmers in the decision-making process **(**1.60±0.58) was a major constraint to participating in ABP. This was followed by communal crises and farmers-herder conflicts **(**1.58±0.57). Conflict is a battle or competition between parties having divergent requirements, opinions, beliefs, or objectives. In some regions, insecurity and conflicts pose significant challenges to farming activities. Farmers face risks such as theft, land disputes, communal crises, and displacement. Onoja, *et al.* (2022) assert that increased competition for grazing areas and water has resulted in frequent disputes between farmers and herders. Nigeria has a history of farmer-herder conflict, but more recently, population growth and climate change have encouraged farmers to cultivate additional land intended for grazing and cattle routes. It is crucial to remember that these conflicts directly affect both the productivity of those affected and the nation as a whole.

Furthermore, the delay in inputs delivery and disbursement of funds by officials **(**1.56±0.60) ranked 3rd. This was followed by poor extension service component **(**1.54±0.60), which is very necessary as frequent interactions with extension personnel could boost farmers' knowledge on rice cultivation and yields (Ayinde *et al.*, 2018). Other major constraints include: side selling of farm produce by farmers after harvest **(**1.54±0.62), incidence of pests and diseases **(**1.54±0.65), poor adherence to recommended agronomic practices **(**1.53±0.65), incidence of flood **(**1.52±0.62), high level of corruption and sharp practices **(**1.50±0.65), incidence of renege **(**1.47±0.68), and lastly, high

level of bureaucracy **(**1.46±0.67). According to Umoren *et al.* (2021) and Akinbile *et al*. (2023) persistent insect and disease attacks pose significant barriers to farmers' ability to boost their output on a commercial scale. Farmers may incur additional expenses for using insecticides and herbicides. This finding upholds the work of Okoroh *et al.* (2021); Salisu *et al.* (2022) who reported that the bureaucratic bottleneck in loan processing constitutes a serious challenge to the ABP implementation process in Southeastern Nigeria and Kebbi state, respectively.

Table 3: Distribution of respondents based on constraints to the sustainability of ABP

Constraints faced	Not a constraint	Mild constraint	Serious constraint	Mean±S.D
Side selling of farm produce by participants after harvest	6.4	33.1	60.5	1.54±0.62
Diversion of inputs/fund by farmers for different purposes	42.0	28.0	29.9	0.88±0.84
Poor adherence to recommended agronomic practices	8.3	30.6	61.1	1.53±0.65
High interest rate/transaction charges	42.7	28.0	29.3	0.87±0.84
Incidence of pests and diseases	8.3	29.9	61.8	1.54±0.65
Incidence of flood	7.0	34.4	58.6	1.52±0.62
Delay in inputs delivery and disbursement of funds by officials	5.7	32.5	61.8	1.56±0.60
Poor extension service component	5.7	34.4	59.9	1.54±0.60
Land tenure system	37.6	42.7	19.7	0.82±0.74
Diversion of inputs/Fund by officials	32.5	45.9	21.7	0.89±0.73
Incidence of renege	10.2	33.1	56.7	1.47±0.68
Price instability	10.2	33.1	56.7	0.90±0.85
High level of bureaucracy	10.2	33.8	56.1	1.46±0.67
Poor involvement of farmers in the decision-making process	4.5	31.2	64.3	1.60±0.58
High level of corruption and sharp practices	8.3	33.1	58.6	1.50±0.65
Communal crises and farmer-herder conflicts	3.8	34.4	61.8	1.58±0.57
Poor accountability and feedback mechanism	31.8	46.5	21.7	0.88±0.73
Grand mean				**1.30**

Mean ≥ 1 = Major constraints; Mean < 1 = Minor constraint.
Source: Field Survey (2022)

CONCLUSION AND RECOMMENDATION

The study reveals that rice farmers hold a favourable attitude towards the Anchor Borrowers' Programme, indicating potential for success in supporting agricultural development in the country (North central in particular). However, the effectiveness of the ABP has been limited by poor involvement of farmers in decision-making; recurring communal crises and farmer-herder crises, as well as delays in loan disbursement. To enhance ABP's success and sustainability, it is recommended that targeted awareness campaigns be intensified to promote understanding of the programme's benefits and dispel misconceptions that may deter farmer participation. Additionally, greater inclusion of farmers in the planning and implementation phases is essential to foster trust and ownership. Finally, improving and expediting the loan disbursement process is critical to ensuring timely access to inputs, particularly ahead of key planting periods.

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ASSESSMENT OF THE COPING STRATEGIES ADOPTED BY POULTRY FARMERS ON HIGH COST OF FEED IN EKITI, STATE, NIGERIA

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ABSTRACT

This study assessed the coping strategies of poultry farmers with high cost of feed ingredients in Ekiti State. The multistage sampling procedure was used to select 120 respondents. Primary data were collected on socio economic characteristics, causes of price increase, perceived effect of high cost of poultry feed, coping strategies adopted by poultry farmers on high cost of feed and perceived Effect of coping strategies adopted on poultry production in Ekiti State. Also, tests of significant relationship were tested between the causes of price increase of poultry feed and the coping strategies adopted by farmers. Data were collected with the aid of structured questionnaires and analysed using frequency, percentage, mean and Pearson product moment correlation. The result showed that the mean age of the respondents was 48 years, 58.3% were married with a mean monthly income of N61, 400. The causes of price increase of poultry feed ingredients were high demand for feed ingredients by humans and animals (89.4%), low production of feed ingredients (85.4%), and high cost of transporting feed (85.0%). The perceived effects of the high cost of poultry feed on poultry farms revealed that the most significant impact was the constant increase in the price of poultry products, driven by high feed costs (73.3%) while the least reported effect was the outright Discontinuation of poultry farming activities (37.5%). Coping strategies adopted by poultry farmers were feed formulation (86.7%), change in feed routine of broilers (78.3%) while the least coping strategies used was growing feed ingredients on-farm (8.3%). A significant relationship existed between the causes of price increase of poultry feed (r= 0.522) and the coping strategies adopted by farmers. The study concludes that Rising feed prices and driven by demand threaten profitability and farm sustainability. The study recommends policies to stabilize feed prices to help farmers sustain operations and enhance food security.

Keywords: Feed formulation, Coping Strategies, Poultry Feed Ingredients.

INTRODUCTION

Livestock production is a vital component of the agricultural sector, providing essential animal products such as meat, milk, eggs, and by-products, contributing to food security, nutrition, and economic development, particularly for smallholder farmers. According to Afodu *et al.* (2024), Livestock production is a key contributor to global food security and supports the livelihoods of about 1.3 billion people around the world. It contributes 34% of the global protein supply and significantly influences agricultural output accounting for 40% in industrialized countries and 20% in developing nations (FAO, 2022). Beyond food, livestock offers income, employment, and draught power for millions of rural households. Busch (2023), opined that livestock serves numerous functions globally, ranging from the provision of food, protein, and income for farmers to less visible roles such as cultural or religious significance, ecosystem services, and fulfilling the emotional needs of animal caretakers. Among livestock sectors, poultry production encompassing chickens, ducks, and turkeys has experienced the most rapid growth worldwide. It offers affordable, high-quality animal protein, investment opportunities, job creation, and a dependable income source for smallholder farmers (Attia *et al*., 2022). In Nigeria, which holds Africa's second-largest chicken population, approximately 180 million birds produce over 14 billion eggs and 454,000 tons of poultry meat annually, thereby strengthening food security, employment generation, and rural livelihoods (Bello *et al.*, 2022). Despite its economic importance, the Nigerian poultry industry faces sustainability challenges, particularly due to the rising cost of feed—which accounts for over 70% of production expenses. Feed prices are influenced by fluctuations in the costs of key ingredients like maize and soybeans (Berger, 2024). These raw materials are also in high demand for human consumption and export, further compounding their scarcity and cost.

In Ekiti State, where small- and medium-scale poultry farming plays a vital role in the agricultural economy, high feed costs have become a pressing issue. Traditionally, some farmers relied on scavenging or household waste to feed birds. However, modern poultry systems require nutritionally balanced feeds, which are becoming increasingly expensive due to factors such as climate change, hoarding, and global disruptions—including those triggered by the COVID-19 pandemic (Attia *et al*., 2020; Abdulrahaman *et al*., 2022).

The surge feed prices have created an arduous predicament for small-scale poultry farmers, requiring them to devise cost-saving strategies, reduce the scale of their operations, or even close their businesses. In a bid to stay afloat, farmers are resorting to coping strategies, including producing their own feed, diversifying their farming systems, and utilising alternative feed sources such as crop

residues and agro-industrial waste (Ekot, 2022). However, maintaining production remains a challenge, emphasising the urgency for measures to stabilize feed prices, support local feed production, and encourage innovation in poultry farming practices. In Ekiti State, persistent high feed prices have driven some poultry farms out of business. Therefore, farmers must adopt sustainable and effective coping mechanisms to navigate these challenges without compromising productivity. This study, therefore, seeks to assess the coping strategies adopted by small-scale poultry farmers in Ekiti State. Specifically, the study aims to: Describe the socio-economic characteristics of poultry farmers in Ekiti State, identify the causes of price increase, identify the effect of high cost of poultry feed on poultry farmers, assess the coping strategies adopted by poultry farmers with high cost of feed and perceived effects of coping strategies adopted on poultry farms.

The hypothesis of the study stated that there is a significant relationship between the causes of price increase of poultry feed and the coping strategies adopted by farmers

METHODOLOGY

The Study Area is Ekiti state. The state is in the southwestern part of Nigeria between latitude 7.667^0N and longitude 5.20^oE. It has a total land area of 6,353km^2. The major economic activity of the study area is predominantly farming. They grow food (yam, rice, cassava, plantain, and cocoyam) and cash crops (cocoa, kolanut and palm oil) Alabi *et al.*, (2023). In addition, farmers in the state rear animals such as sheep, goat, poultry birds (Turkey, broilers, laying birds, duck, geese).

The population of the study consists of all the registered poultry farmers in Ekiti State. A multistage sampling procedure was employed in the selection of 120 small scale poultry farmers in the study area. The first stage involved selection of 25% of local government area in Ekiti State which are Ado, Ikole, Oye and Ido-Osi Local Government Areas, the second stage involved a random selection of six communities from each LGA that has high population of poultry farmers, at the third stage involve a random selection of fifteen (5) poultry farmers from each community to arrive at a sample size of 120 respondents for the study. Primary data were collected with the aid of questionnaires**.** Coping strategies adopted by poultry farmers on the high cost of feed ingredients was measured on a four point rating scale using frequently used, occasionally used, rarely used and not used. Perceived Effects of coping strategies adopted on poultry production was measured on a 5 points likert scale of strongly agree, agree, undecided, disagree and strongly disagree**.** Data collected was analysed descriptively using frequency count, percentage, and Pearson product moment correlation.

RESULTS AND DISCUSSION

The socio-economic characteristics of respondents, as shown in Table 1, provide insight into the dynamics of poultry farming in Ekiti State. Majority (57.5%) of the respondents were male, indicating male dominance in the sector. This could be linked to the physically intensive nature of poultry farming, which may deter female participation. Hence, male dominance underscores the need for gender-inclusive interventions aimed at enhancing women's participation and access to poultry farming opportunities. Oyedokun, *et.al*. (2023), opined that high level of men involvement in poultry production may also be due to high demand for labour in terms of feeding and medication which women may not be able to combine with household activities. The age distribution reveals that 51.7% of respondents were between 41 and 50 years old, with a mean age of 48 years. This age bracket represents economically active individuals who are more likely to adopt innovations and modern practices, contributing to enhanced productivity (John *et al*., 2022). Furthermore, 58.3% of the respondents were married, suggesting that family labor is a common support mechanism in poultry operations. In terms of religious affiliation, the majority of respondents identified as Christians (61.7%) or Muslims (32.5%), with a small proportion (6.8%) practicing other religions. While not directly affecting production, religious background may influence attitudes toward certain farming practices and technologies.

Educational attainment among respondents was relatively high, with 40.8% having tertiary education and an average of 11 years spent in school. This level of education is advantageous for understanding technical concepts and implementing best practices in poultry farming. As Alabi *et al.* (2024) pointed out, education significantly enhances income-generating potential, thereby reinforcing the value of investing in farmer education to improve productivity. The income profile shows that 61.8% of the respondents earned between ₦10,000 and ₦50,000 monthly, with a mean income of ₦61,400. This modest income level could limit investment in improved inputs and expansion, although it also reflects the economic potential of poultry farming as a source of livelihood. Farm size data indicate that 65% of respondents kept between 1–200 broilers, with only 3.3% managing over 1,000 birds. The mean farm size was 435 broilers, suggesting that poultry farming in the study area is largely small-scale. This presents challenges such as limited access to economies of scale, commercial markets, and external financing. Household sizes were

generally small, with 74% of respondents having 1–5 members and a mean household size of 4. While this may reduce dependency pressure and improve manageability, larger households can also provide valuable labor support when needed. However, increased household size may strain limited resources (Adeoti, 2019). Experience in poultry farming was generally limited, with 86.7% having only 1–5 years of experience and an average of 3 years. Limited experience can be a significant hindrance for poultry farmers, as they may lack the skills and knowledge to effectively manage production challenges. This underscores the importance of training and mentorship programs to enhance capacity and address this gap in experience. Oyedokun *et al*. (2023) noted that poultry farmers in Ekiti State have limited experience in the field. In terms of funding, more than half of the respondents (56.7%) relied on personal savings, while 34.2% accessed loans. A small proportion received support from family or other sources. This pattern suggests a lack of access to institutional credit, which may hinder business expansion and the adoption of innovative practices. Only 48.3% of respondents belonged to cooperative societies. The low cooperative membership rate limits poultry farmers' access to collective benefits such as reduced input costs and pooled resources. This weakens their competitiveness and hinders efficiency and sustainability in the sector.

Non-membership may deprive farmers of collective benefits such as bulk input purchases, credit facilities, and shared knowledge. Encouraging cooperative participation could enhance resilience and resource sharing. Most respondents (71.1%) owned their farms solely, assuming full responsibility for profits and liabilities. While sole ownership grants autonomy, it can also limit access to external support, partnerships, or joint ventures that could improve productivity. Finally, a significant portion (64.2%) of poultry farmers had not received any extension services. The lack of technical support impedes access to critical information and technologies, which are essential for improving farm outcomes. Without adequate support, poultry farmers may struggle to adopt new and innovative techniques, leading to suboptimal performance and reduced profitability.

Table 3: Socioeconomic characteristics of Poultry Farmers in Ekiti State (n=120)

Variables	Responses	Percentage (%)	Mean
Gender	Male	57.5	
	Female	42.5	
Age	20-30 years	9.2	
	31-40 years	31.6	48
	41-50 years	51.7	
	>51	7.5	
Marital Status	Single	41.7	
	Married	58.3	
Education background	No Formal Education	18.3	
	Primary	12.5	
	Secondary	28.3	
	Tertiary	40.8	
Monthly Income	10,000-50,000	61.7	
	50,001-100,000	34.2	N61,400
	>100,000	4.2	
Number of Broilers	1-200	65.0	
	201-400	5.0	435
	401-600	10.0	
	>601	20.0	
Household Size	1-5	74.2	4
	6-10	25.8	
Poultry Experience	1-5 years	86.7	3 years
	6-10 years	13.3	
Membership of Cooperative Society	Yes	48.3	
	No	51.7	
Extension Services	Yes	35.8	
	No	64.2	

Causes of price increase of poultry feed ingredients

Table 2 highlights the primary causes of the rising costs of poultry feeding ingredients in the study area. The findings reveal that the leading cause is high demand for feed ingredients by both humans and animals (89.4%). This aligns with Dalha (2021), who identified the potential consequences of

exporting large quantities of poultry feed ingredients, resulting in competition between human and animal consumption, scarcity of ingredients, and subsequent price increases. This, in turn, can lead to significant pressure on poultry farmers, potentially resulting in farm closures. This emphasises the necessity of maintaining a balance between the demand for poultry feed and human nutrition and serves as a reminder of the interconnectedness of different sectors in the food industry. The second major cause is low production of feed ingredients (85.4%), which significantly drives up costs. High transportation costs and Climate change (85.0%) were ranked third respectively, as highlighted by Abdulrahman (2022), who noted that the movement of feed from purchase points to farms substantially raises overall expenses. However, Climate change affects all the dimensions of food security which are: availability, accessibility, utilisation and sustainability Falade *et al*. (2024). The fifth cause is the buying and hoarding of feed ingredients by traders (84.6%). Lastly, farmers' loyalty to specific feed brands (81.8%) contributes to increased demand for those brands, thereby raising their costs.

Table 2: Causes of price increase of poultry feeds (n=120)

Cause	Percentage (%)
High demand for feed ingredients by humans and animals	89.4
Low production of feed ingredients	85.4
High transportation costs	85.0
Climate change	85.0
Buying and hoarding of feed ingredients by traders	84.6
Farmers' loyalty to specific feed brands	81.8

Perceived effect of high cost of poultry feed on poultry farm

Table 3 highlights the perceived effects of the high cost of poultry feed on poultry farms. The findings reveal that most (73.3%) of the respondents strongly agreed that the increase in the price of poultry products, driven by high feed costs was the most effect of the high cost of poultry feed on poultry farm. This shows how increased input costs are transferred to consumers. This was closely followed by the reduction in feed quality and efficiency (62.5%). Above average (55.0%) of the respondents strongly agreed to decrease in the number of broilers as effect of high cost of poultry feed on poultry farm, indicating that farmers scale down operations to manage costs. However, a few of the respondents agreed that Loss of weight in broilers (42.5%), reflects the direct result of feeding challenges. Lastly, the outright Discontinuation of poultry farming activities ranked seventh (37.5%), showing the severe impact of prolonged high feed costs, a finding also supported by Ekot (2022), who observed that persistent feed price hikes lead to reduced consumer demand and force some farms to shut down completely. This also corroborates with Afodu (2024), that high cost of feed had a negative impact on the poultry farmers.

Table 3: Perceived effect of high cost of poultry feed on poultry farmers (n=120)

Effect	SA (%)	A (%)	U (%)	D (%)	SD (%)
Increase in poultry product price	73.3	26.7	10.0	0.0	0.0
Reduction in feed quality and efficiency	62.5	27.5	10.0	0.0	0.0
Decrease in number of broilers	55.0	45.0	0.0	0.0	0.0
Low-quality poultry products	38.3	35.0	22.5	5.0	0.0
Low profit margins for broiler farmers	35.8	36.7	5.0	22.5	0.0
Loss of weight in broilers	42.5	40.0	17.5	0.0	0.0
Discontinuation of poultry farming activities	37.5	40.0	5.0	16.7	0.0

Coping strategies adopted by poultry farmers on the high cost of feed

The result in Table 4 indicates that feed formulation was the most widely adopted coping strategy, with 86.7% of the respondents using it frequently, reflecting a strong preference for adjusting feed composition to reduce costs while still meeting the nutritional needs of broilers. The second most adopted strategy was changing the feeding routine of broilers, which was used frequently by 78.3% of respondents. This shows that a significant number of farmers adjusted feeding patterns to cut down on unnecessary feed use and minimise wastage. Sourcing funds through cooperative societies was also a common strategy, adopted frequently by 75.0% of farmers, reflecting the role of cooperatives in providing financial support to manage the rising cost of poultry feed. The use of crop waste as a feed alternative with 66.7% of respondents using it frequently, demonstrating farmers' creativity in utilising locally available by-products to reduce dependence on

commercial feeds. However, the use of alternative feed sources based on availability and cost was adopted frequently by 45.8% of respondents. As Elahi *et al*. (2022) noted, such alternatives can be effective substitutes for conventional feed, helping to mitigate the impact of rising feed prices. The least adopted strategy was growing feed ingredients on-farm, with only 8.3% using it frequently and a large majority 61.7% not using it at all. Despite its low adoption, it represents a potentially sustainable and cost-effective long-term approach for reducing feed dependency if adequately supported with resources and training. According to Afodu (2024), Experienced farmers may have a greater understanding of the challenges associated with high feed costs and may be better equipped to identify and adopt innovative strategies to cope with these challenges.

Table 4 Coping strategies adopted by poultry farmers on the high cost of feed ingredients (n=120)

Coping strategies	Frequently (%)	Occasionally (%)	Rarely (%)	Not used (%)
Feed formulation	86.7	1.7	0.0	11.7
Purchasing poultry feed in large quantities	18.3	15.0	30.8	35.8
Growing of feed ingredients	8.3	21.7	8.3	61.7
Use of alternative feed sources based on its availability and cost	45.8	39.2	4.2	10.8
Change in feeding routine of broilers so as to cut cost	78.3	0.0	0.0	21.7
Downsizing of poultry farm because of the soaring expense of feed	58.3	14.2	0.0	27.5
Use of crop waste as feed source due to the cost of feed	66.7	13.3	2.5	17.5
Source for fund through cooperative societies	75.0	5.8	1.7	17.5
Government intervention to cushion the high cost of feed	24.2	41.7	4.2	30.0

Perceived effect of coping strategies adopted on poultry production

Table 6 highlights the perceived effects of the coping strategies adopted by poultry farmers in response to the rising cost of feed. A significant (57.7%) of respondents strongly agreed that coping strategies help poultry farmers stay in business. This finding supports the assertion of John *et al*. (2022), who emphasised that without appropriate coping strategies, farmers face an increased risk of bird mortality and may ultimately be forced out of business. In addition, (45.8%) of respondents strongly agreed that coping strategies help reduce the cost of poultry feed. This aligns with the observation of Ekot (2022), who reported that most poultry farmers respond to high feed costs by lowering the quality or quantity of feed used, a strategy that can ultimately affect both productivity and profitability. Coping strategies also promote collaborative efforts through cooperative societies, as noted by (10.8%) of farmers who strongly agreed with this statement. Although this is a relatively small proportion, it still indicates that some farmers see collective action as a viable means to cushion the impact of economic pressures, particularly those related to feed inputs. In terms of financial outcomes, (20.8%) of respondents strongly agreed that coping strategies help maintain profit margins despite economic challenges.

Table 5: Perceived effects of coping strategies adopted on poultry farms

Coping strategies	SA (%)	A (%)	U (%)	D (%)
Coping strategies reduce the cost of poultry feed	45.8	43.3	0.0	0.0
Coping strategies help poultry farmers maintain profit margin	73.3	20.8	0.0	5.8
Coping strategies help produce high quality poultry product	72.5	15.8	5.8	5.8
Coping strategies reduce bird mortality	15.8	37.5	10.8	35.8
Coping strategies help poultry farmers to stay in business	57.7	37.7	5.8	0.0
Coping strategies encourage the recycling and reuse of organic waste	26.7	50.0	00	23.3
Coping strategies lead to pooling collaborative efforts by forming cooperative societies	10.8	73.3	15.8	0.0
Coping strategies helps increase the food security status	67.5	6.7	00	5.8

Regarding sustainability, (26.7%) of farmers strongly agreed that coping strategies encourage the recycling and reuse of organic waste. This reflects a positive attitude toward integrating environmentally friendly practices into poultry farming, though it may also point to the need for increased support or education in sustainable farming techniques. Finally, the least strongly supported claim was that coping strategies reduce bird mortality, with only (15.8%) of farmers strongly agreeing, and a notable proportion expressing disagreement. This suggests that while coping strategies are broadly viewed as beneficial for business continuity and profitability, their direct impact on poultry health outcomes remains less convincing to many farmers. These findings underscore the significance of adaptive coping strategies in enhancing the resilience and sustainability of poultry farming under economically challenging conditions.

Relationship between the causes of price increase of poultry feed and the coping strategies adopted by farmers

The result in Table 6 shows a significant relationship between the causes of poultry feed price increases (r=0.522), This suggests positive correlation, meaning that as feed prices rise due to factors like supply chain disruptions or inflation, farmers are more likely to adopt strategies like feed formulation, bulk buying, and sourcing funds through cooperatives. Wanglin (2023), noted that Farmers' organisations such as cooperatives, associations, and producer organisations play a vital role in promoting sustainable agricultural development and improving rural livelihoods. The statistically significant p-value confirms that this relationship is not due to chance, highlighting that farmers actively respond to economic challenges by adjusting their strategies to manage feed costs.

Table 6: Relationship between the causes of price increase of poultry feed and the coping strategies adopted by farmers

Variables	N	Mean	Standard Deviation	r-value	p-value
Causes of increase	120	4.26	0.51	0.522*	0.000
Coping Strategies adopted	120	1.75	0.11		

p<0.05

CONCLUSION AND RECOMMENDATION

The study shows that poultry farming is male dominated, with most farmers in their productive years and were literate. Many rely on personal savings for funding, while limited access to extension services restricts their exposure to new techniques. Rising feed prices, driven by demand, low production, transport costs, and climate change, threaten profitability and farm sustainability. To enhance productivity and sustainability, the study recommends better extension services, policies to stabilize feed prices, and support for cooperatives to help farmers sustain operations and enhance food security.

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SOCIO-CULTURAL FACTORS INFLUENCING THE PRODUCTION OF KOLANUT IN EKITI STATE, NIGERIA

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ABSTRACT
The study assessed the socio-cultural factors influencing kola nut production in Ekiti State, Nigeria. Specifically, it described the socio-economic characteristics of kola nut farmers, examined the level of kola nut production, determined the extent to which socio-cultural factors influence production, and identified the constraints to production. A three-stage sampling technique was used to select 120 respondents. Data were collected through a structured interview schedule and analysed using descriptive statistics and Ordinary Least Squares (OLS) regression. The results showed that most respondents were male (81.7%), above 60 years (50.8%), and married (80.3%), with secondary education (28.3%) as the highest level attained by most. Respondents had an average farm size of 1.8 hectares and produced 0.4 metric tons of kola nut annually. Findings further revealed that socio-cultural factors strongly influenced kola nut production. Items with high perceived influence included kola nut's role in traditional ceremonies ($\bar{x}$ = 4.18, SD = 0.66), hospitality and friendship ($\bar{x}$ = 4.22, SD = 0.58), medicinal benefits ($\bar{x}$ = 4.10, SD = 0.60), prayer for longevity ($\bar{x}$ = 3.95, SD = 0.71), and its cultural symbolism in marriage and unity. In terms of production constraints, the most severe were lack of access to credit ($\bar{x}$ = 3.41, SD = 0.63), unfavourable weather ($\bar{x}$ = 3.37, SD = 0.62), inadequate knowledge of improved practices ($\bar{x}$ = 3.34, SD = 0.74), poor information on preservation strategies ($\bar{x}$ = 3.23, SD = 0.69), and high cost of pesticides ($\bar{x}$ = 3.13, SD = 0.78). The OLS regression analysis showed that income generation (β = 0.916, p = 0.011), medicinal value (β = 0.055, p = 0.008), cultural relevance (β = 0.085, p = 0.000), and spiritual significance (β = 0.081, p = 0.011) were significant predictors of kola nut production. The study concludes that kola nut production is deeply socio-culturally rooted but constrained by systemic, financial, and environmental challenges. It recommends improved access to extension services, farm inputs, and the integration of cultural heritage into development strategies to enhance sustainable kola nut production.
Keywords: Culture, extinction, kola nut, relevance, values

INTRODUCTION

Foods are important to humans' mental and social health. Food contains nutrients such as carbohydrates, protein, vitamins, fats, and minerals, which are very necessary for our physical and mental growth (National Institute of Ageing, 2019). Some foods are derived directly from plants. Kola nut is a tropical crop with over 20 species, and the trees are native to the tropical rainforests of Africa **(**Unya, 2021). Yalwa and Bello (2017) affirmed that kola-nuts comprise about 2% caffeine, and other stimulants (kolanin and theobromine). Kola is grown commercially and globally, particularly in Nigeria, Sri Lanka, Indonesia, Brazil, and other parts of South America (Yalwa and Bello, 2017). Nigeria produces about 120,000 tons of kola-nut annually (Ndagi, *et al*, 2012) mostly, from the Southwest States of Ogun, Ekiti, Ondo, Oyo, Osun, and Lagos (Agbebaku *et al*, 2020). It is popular because of its caffeine content (Ojo and Ehinmowo, 2010). Kola-nuts are exported to Europe and North America for flavouring kola drinks and for use in the manufacture of pharmaceuticals as well as dyes (Jayeola and Olayiwola, 2018).

Beyond the economic values of kola-nuts, it also has some cultural and social values. According to Wood (2017), kola nut has a ubiquitous presence in Yoruba culture. It connotes different meanings to different situations in Ekiti state. It is highly valued in traditional ceremonies. It forges and strengthens bonds among the people. It is regarded as one of the original immaterial and immortal divinities in the universe, known in Yoruba as *Irun mole.* It is presented by the groom's family to the bride's family for the traditional Yoruba wedding ceremony where it signifies fertility and protection from evil (Wood, 2017; Bawa, and Suuk 2019).

Despite the significance of Kola-nuts to the culture of Ekiti state, research efforts are concentrated on the economic values. While existing studies, such as Akinnagbe and Ikusika (2016), examined household roles in kola nut production and marketing in Ekiti State, there is a dearth of information on the sociocultural influences on kola nut production in the region. This gap underscores the necessity for further studies to explore these sociocultural dimensions. The primary objective of the study is to determine the sociocultural factors influencing kola-nut production in Ekiti State. The specific objectives include describing the socio-economic characteristics of kola-nut farmers in the study area; ascertaining the level of kola-nut production; determining the extent to which social and cultural values influenced kola-nut production and identify the constraints to kola-nut production in Ekiti State.

METHODOLOGY

The study was carried out in Ekiti state, Nigeria. Ekiti State, located in the southwestern region of Nigeria, covers a land area of approximately 6,353 square kilometres. It lies between latitude 7°15′N

and 8°5′N and longitude 4°45′E and 5°45′E. The state is predominantly inhabited by the Yoruba ethnic group, and Yoruba language is widely spoken, with various Ekiti dialects. As of the 2006 national census, Ekiti State had a population of about 2.4 million, with current estimates placing it at 3.5 million due to natural growth (Ekiti State Government, 2023). The population is largely rural and agrarian. Ekiti State is known for its fertile soil and favorable climate, which support the cultivation of both food and cash crops. Major food crops include yam, cassava, maize, and rice, while cash crops such as cocoa, oil palm, and kola nut are also widely cultivated. The state's economy is heavily dependent on agriculture, with a significant proportion of the population engaged in farming. Other notable features include a high literacy rate compared to national averages and a reputation for producing scholars, which has earned it the nickname "Fountain of Knowledge.

A multi-stage sampling technique was used in the selection of the respondents for the study. In the first stage, three out of 16 Local Government Areas were purposively selected due to the predominance of kola-nut producers in the areas. The second stage involves a random selection of 5 villages from each LGA to give a total of 15 villages. The third stage entails a snowball selection of eight kola-nut producers from each village/community, which gave a total sample size of 120 respondents for the study. A structured interview schedule was used for data collection. Data collected were analysed using descriptive statistics such as frequency counts and percentages and mean. The extent to which social and cultural values influence kola nut production was determined using a 5-point Likert-type rating scale of Large Extent (LE), Somewhat Extent (SE), Undecided (UD), low extent (LE) and No Extent (NE), on a scale of 5 to 1 point. The results were analysed using frequencies and percentages. The constraints to social and cultural values on kola nut production were determined using the same procedure.

RESULTS AND DISCUSSIONS

Socioeconomic characteristics

The result in Table 1 shows that 81.7% of the respondents were male. The mean age of the respondents was 60.5 years, an indication of the ageing population of kola-nut farmers in the study area, which can negatively influence the sustainability of the plantations, especially if there are no succession plans by the farmers for the takeover of their farms after their demise. Most (79.0 %) of the respondents were married, and 70.0% had no occupation other than farming.

Table 1: Socioeconomic Characteristics of the Respondents

Variables	Frequency	Percentage
Gender		
Male	98	81.7
Female	22	18.3
Age		
31-60 years	58	48.2
>61 years	62	50.8
Marital status		
Single	05	4.2
Divorced	08	9.6
Married	97	80.3
Widow	12	10.0
Secondary occupations		
Farming	84	70.0
Artisan	14	11.7
Civil servants	07	5.8
Trading	15	12.5
Highest Qualification		
No formal education	26	21.7
Adult education	16	13.3
Primary education	28	23.3
Secondary education	34	28.3
Tertiary education	16	13.3
Religion		
Islam	32	26.7
Christianity	68	56.7
African Traditional Religion	20	16.6

A majority (78.3%) of the respondents were literate and they cut across all the main religious practices in the area, with %56.7%, 26.7% and 16.6% practising Christianity, Islamic and African Traditional religions, respectively. It shows that Kola-nut production in Ekiti state is dominated by male literate farmers, mostly married, who are relatively old and cut across all the religious practices in the study area. The socioeconomic characteristics of kola-nut farmers in Ekiti state are similar to farmers in Niger state and Southeastern Nigeria as reported by Unya (2021).

Level of kola-nut production

In determining the level of kola nut production, the farm size as well as the quantity produced annually were considered. The result in Figure 1 indicates that 39.0% of the respondents cultivated between 1 and 2.5 hectares of kola nut farm with a mean farm size of 1.8 hectares, an indication of small-scale production. It is important to note that kola-nuts were cultivated along with cocoa plantations. It suggests that kola nut production in Ekiti State is largely small-scale. This small farm size limits economies of scale and implies relatively low output levels per farmer, which could affect market surplus, income generation, and the potential for commercialisation. Oluwalana *et al.* (2016), in their study of kola nut production in Ogun State, indicated that the average farm size for kola nut cultivation was 2.71 hectares, suggesting small-scale operations. Additionally, it was observed that kola nut is often intercropped with other crops, which may imply its secondary status in some farming systems. They emphasised the need for improved support and market linkage to boost production. Ashaye *et al.* (2021) also reported that low investment and poor access to credit among kola nut farmers contribute to stagnated production levels, despite the crop's cultural and economic value in southern Nigeria.

Additionally, the fact that kola nut is often intercropped with cocoa suggests that it is not the primary crop for many farmers but is grown as part of a mixed farming system, possibly for risk management or household use. This intercropping practice might also lead to sub-optimal yield due to competition for resources such as nutrients, water, and sunlight. Alawode, and Oladeji (2020) found that smallholder farmers in southwestern Nigeria operate on small land sizes, which constrain productivity and income levels. They also noted that intercropping systems are prevalent among tree crop farmers as a strategy for maximizing land use and income.

Small plot sizes may limit the adoption of mechanization and improved agronomic practices, which are critical for higher productivity. These findings highlight the need for agricultural extension support, input subsidies, and land consolidation policies that can encourage increased investment and specialization in kola nut production.

Given the predominance of smallholder, intercropped systems and the average farm size of 1.8 hectares, it can be concluded that the overall level of kola nut production in Ekiti State is moderate but largely underdeveloped. Despite favourable agroecological conditions, limited specialization, low input use, and small farm sizes constrain expansion and productivity. The state holds potential for increased production if efforts are made to provide credit, improved planting materials, extension services, and access to markets.

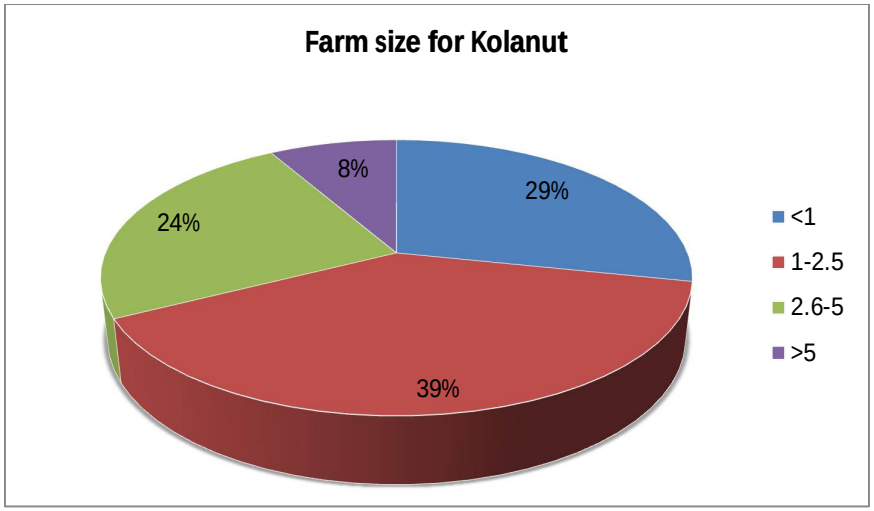

Figure 1: Size of kola nut farms

The Quantity of kola-nuts harvested annually

The data presented in Figure 2 indicates that a significant majority (76.7%) of respondents harvest between 1 to 50 bags of kola nuts annually, while 10.8% harvest between 51 to 100 bags. Considering each bag is approximately 25 kg, the average annual

production per farmer stands at 16 bags, totalling 400 kg. This production level is considerably below the national average yield of 500 kg per hectare reported by the Cocoa Research Institute of Nigeria (CRIN, 2021). The low production levels can be attributed to several factors. Oluwalana *et al*. (2016) highlighted that most kola nut farmers operate on small-scale farms, with 43% cultivating between 2 to 2.9 hectares and only 1% managing farms above 5 hectares. Additionally, the age of kola trees plays a crucial role; older trees tend to have reduced productivity, and many existing plantations consist of ageing trees that have surpassed their peak production years (CRIN, 2021).

Furthermore, the lack of adoption of improved cultivation practices and limited access to high-yielding kola nut varieties contribute to the suboptimal yields. CRIN has developed improved propagation techniques and high-yielding hybrids that can produce up to 2,000 nuts per tree annually, compared to the 250 nuts from unselected materials. However, the dissemination and adoption of these innovations remain limited among farmers (CRIN, 2021). The current average annual production of 400 kg per farmer underscores the need for interventions aimed at rejuvenating kola nut plantations, adopting improved agronomic practices, and facilitating access to high-yielding varieties to enhance productivity and ensure the sustainability of kola nut farming in Ekiti State, Nigeria.

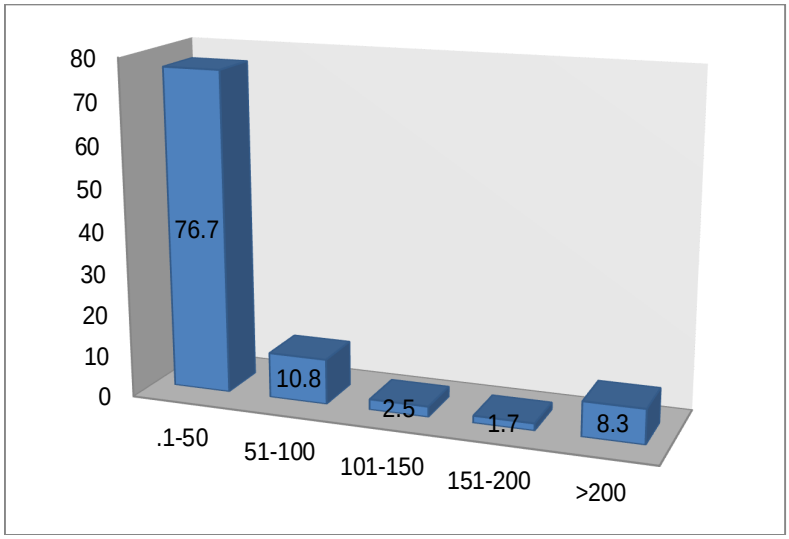

Figure 2: Quantity of kola nut harvested annually

Influence of socio-cultural factors on kola-nut production

The findings presented in Table 2 revealed that socio-cultural factors significantly influence kola-nut production among respondents. Notably, the highest mean score was recorded for the economic motivation for kola cultivation ($\bar{x}$ = 4.60, SD = 0.54), highlighting that beyond its cultural significance, kola nut remains a critical income-generating crop for rural farmers. This aligns with the report by Adebayo *et al*. (2021), which emphasised the dual economic and socio-cultural functions of traditional crops like kola nut in sustaining rural livelihoods. Cultural and symbolic functions such as usage during traditional ceremonies ($\bar{x}$ = 4.18), hospitality and respect ($\bar{x}$ = 4.07), and as a requisite item in traditional marriage rites ($\bar{x}$ = 4.22) also recorded high scores, supporting earlier findings by Akinyemi (2010) and Okafor (2015) that kola nut plays a central role in rituals, social cohesion, and symbolic communication within Nigerian communities. It also supported the assertion by Unya (2021), who described kola-nut as *"the king of fruits"*, integral to rites of passage, traditional marriage ceremonies, and kinship reinforcement, particularly among the Igbo ethnic group. Furthermore, the spiritual uses of kola nut—including for prayer ($\bar{x}$ = 3.85), sacrifice ($\bar{x}$ = 3.97), and appeasement of deities ($\bar{x}$ = 3.55)—underscore its religious relevance, consistent with Falade and Okunade (2020), who noted that indigenous belief systems often dictate agricultural choices in many African settings. It echoes Lovejoy (2007) and Sprague (2018), who found that kola-nut holds symbolic and religious importance in Nigeria, Ghana, Sierra Leone, and Gambia—used in prayers, rituals, and oath-taking to signify sincerity and spiritual alignment.

The recognition of kola nut as a symbol of unity ($\bar{x}$ = 3.84) and acceptance ($\bar{x}$ = 3.73) further demonstrates its embeddedness in communal values and identity. Obineche (2017) explains that the presentation and sharing of kola-nut at events symbolize unity, peace, and gratitude, reinforcing communal ties. Additionally, its medicinal attributes

($\bar{x}$ = 4.10) reinforce its multifunctionality, aligning with the findings of Asogwa *et al*. (2012), who documented that kola-nut contains caffeine and theobromine, compounds known for their stimulant and therapeutic effects in traditional medicine. Adegoke and Odesanmi (2019), also identified the nut's pharmacological properties. Collectively, these findings reinforce the notion that kola-nut is not merely an agricultural commodity, but a cultural institution whose production is influenced by a complex mix of economic, spiritual, and social values**.** Policy makers and agricultural extension agents must therefore recognize and integrate these socio-cultural dimensions into development programs aimed at revitalising kola-nut production in Ekiti State (Ogunniyi *et al*., 2012; Adetunji and Rauf, 2015).

Table 2: Influence of socio-cultural values on kola-nut production

Item	LE (%)	SE (%)	UD (%)	LOE (%)	NE (%)	Mean
I produce Kola nut for economic purposes.	62.5	35.0	2.5	0.0	0.0	4.60
Kola nut production is a symbol of hospitality, respect and friendship.	41.6	43.3	2.5	5.8	6.7	4.07
Kola nut production is influenced by usage during traditional ceremonies.	46.7	41.7	2.5	1.7	7.5	4.18
I produce kola nut because of its prayer value for longevity.	24.2	52.5	10.0	10.8	2.5	3.85
Kola nut is an object of worship and sacrifice.	36.7	40.0	9.2	11.7	2.5	3.97
The use of kola nut to appease to gods for guidance influences my production.	19.2	44.2	19.2	7.5	10.0	3.55
Kola is a symbol of acceptance.	20.0	42.5	28.3	9.2	0.0	3.73
I produce Kola nut because I know it enhances unity.	29. 2	35.0	26.7	9.2	0.0	3.84
I produce kola because it symbolizes good fortune.	19. 2	60.0	15.0	5.8	0.0	3.93
I produce Kola nut because of its medicinal properties.	31.7	53.3	8.3	6.7	0.0	4.10
Kola nut is a must item in the traditional marriage engagement list.	39. 2	55.0	0.0	0.0	5.8	4.22

Constraints to kola nut production

Table 3 presents the constraints encountered by kola-nut producers, measured through the respondents' level of agreement using a 4-point Likert scale. The constraints with the highest mean scores indicate the most severe or widely experienced issues, while those with lower means are considered less significant by respondents. The most critical constraint identified is lack of access to credit facilities ($\bar{x}$ = 3.41, SD = 0.64). This finding aligns with the broader literature on agricultural finance in Nigeria, where smallholder farmers often face exclusion from formal credit systems due to lack of collateral, high interest rates, and limited financial literacy (Akinola, 2013; Oboh and Ekpebu, 2011). Credit is essential for acquiring inputs, labour, and agrochemicals, and its absence severely limits productivity and farm expansion. Unfavourable weather conditions ($\bar{x}$ = 3.38, SD = 0.60) also ranked highly. This is consistent with findings from Nwajiuba (2012), who emphasised the vulnerability of perennial crops like kola-nut to climate variability, particularly erratic rainfall and increasing temperatures, which affect flowering, fruiting, and disease resistance. The high cost of pesticides ($\bar{x}$ = 3.20, SD = 0.99) and poor access to improved kola-nut seedlings ($\bar{x}$ = 3.17, SD = 0.90) are major production challenges. These highlight the systemic issues of input supply and technology dissemination in the kola-nut value chain. According to Agwu, Anyanwu, and Mendie (2012), input affordability and accessibility remain significant constraints to smallholder farmers, especially in tree crop production where costs are sustained over several years before returns are realized. Old and moribund trees ($\bar{x}$ =3.07, SD = 0.92) point to the ageing nature of kola plantations, indicating low replanting rates and inadequate rejuvenation efforts. This suggests a need for targeted intervention in farm rehabilitation programs, as suggested by Adebayo *et al*. (2020), who emphasised the role of public-private partnerships in revitalizing tree crop plantations in West Africa. Furthermore, inadequate extension services ($\bar{x}$ = 2.87) and lack of knowledge of improved farm practices ($\bar{x}$ = 3.01) reinforce the widespread concern over weak agricultural extension systems. Extension services are vital for transferring innovations and building capacity, yet coverage and specialization in crops like kola-nut remain poor (Arokoyo, 2003; Olowu and Oyedokun, 2000).

Lower scoring constraints like decline in cultural values of kola-nut ($\bar{x}$ = 3.03) and infertile farmland ($\bar{x}$ = 2.67) may reflect localized or more subjective factors. While cultural decline may affect kola-nut's ceremonial demand, physical production

constraints like pests and diseases ($\bar{x}$ = 2.66) and infertile soils continue to undermine productivity.

These findings reflect the complex interplay of biological, economic, environmental, and institutional constraints undermining kola-nut production. Comprehensive policy interventions are required, focusing on farmer training, access to improved planting materials, credit facilitation, disease management, and revitalisation of cultural relevance through agro-tourism and community engagement.

Table 3: Respondents' constraints to kola-nut production

Item	SA (%)	A (%)	U (%)	D (%)	Mean
Most of the kola-nut trees are old and unproductive	37.5	35.0	16.7	6.7	3.07
The kola trees host many diseases	17.5	40.0	14. 2	16.7	2.66
Infertile farmland	28.3	17.5	19. 2	18.3	2.67
Difficulty in establishing new farms	30.0	31.7	23.3	8.3	2.90
Decline in the cultural values of kola nut	43.3	23.3	10.0	15.0	3.03
High cost of pesticides	43.3	23.3	10.0	8.3	3.20
Lack of access to credit	49.2	42.5	8.3	0.0	3.41
Unfavourable weather conditions	43.3	48.3	5.8	0.0	3.38
Inadequate knowledge of improved practices	29.2	51.7	11.7	7.5	3.01
Poor information on preservation strategies	37.5	47.5	8.3	3.3	3.25
Unstable market prices	34.2	26.7	16.7	16.7	2.82
Lack of improved kola-nut seedlings	40.0	39.2	8.3	8.3	3.17
Lack/low extension services	25.8	34.2	21.7	8.3	2.87

Source: Field survey, 2021

Table 4: Socio-cultural factors influencing kola-nut production

The result of the OLS model in Table 4 shows that Income Generation (β=0.916, p=0.011) significantly and positively affects kola nut production. Respondents who perceive kola as a source of income are more likely to increase their production. This finding aligns with Asogwa *et al*. (2012) and Adetunji and Rauf (2015), who identified economic motivation as a primary driver for perennial crop cultivation, especially in rural Nigeria. The belief in the medicinal properties (B = 0.055, p = 0.008) of kola nut, such as its use in treating headaches, boosting energy, and aiding digestion, positively influences production. This supports Egharevba *et al*. (2015), who noted the ethnomedicinal relevance of kola nut in traditional medicine systems in West Africa. The use of kola nut in traditional ceremonies (B = 0.085, p = 0.000**),** especially marriage rites, was the most significant predictor with the highest beta coefficient (β = 0.444). This demonstrates that cultural practices remain strong motivators for kola nut cultivation, consistent with Ukaegbu (2019) and Ndukwe *et al.* (2017), who emphasised kola's role as a symbol of hospitality, peace, and respect in African culture. Kola nut's role in religious and spiritual rituals (B = 0.081, p = 0.000**)**, including sacrifices and prayers for longevity or guidance, significantly influences production. This finding is supported by Idowu *et al*. (2016), who reported the continued integration of kola nut in Yoruba cosmology and divination rituals.

The Non-significant Variables include age, sex and marital status of the respondents, an indication that they are not significant in influencing kola nuts production

The regression analysis underscores that cultural relevance, medicinal use, income-generating potential, and spiritual significance are the main socio-cultural factors influencing kola nut production. These findings align with the cultural-ecological model, which suggests that agricultural practices are shaped not only by economic conditions but also by values, beliefs, and traditions (Netting, 1993).

Table 4: Linear regression analysis of socio-cultural factors influencing kola-nut product1on

	Beta	t-value	Sig.
(Constant)		0.904	0.368
Age	-0.008	-0.085	0.933
Sex	0.135	1.733	0.086
Marital Status	-0.144	-1.698	0.092
Income generation	0.228	2.578	0.011
Medicinal values	0.034	4.503	0.008
Cultural value (traditional weddings)	0.444	5.813	0.000
Religious/ spiritual relevance	2.578	0.011	0.000

This highlights the need for agricultural and cultural policy frameworks that integrate indigenous values when promoting crop production, especially for culturally significant crops like the kola nut. Extension programs should leverage these socio-cultural motivations to revive interest, especially among youth and women, in the sustainable cultivation of kola.

CONCLUSION AND RECOMMENDATIONS

This study assessed the influence of socio-cultural values on kola nut production in Ekiti State, Nigeria, with specific attention to farmers' socio-economic characteristics, production levels, cultural motivations, and constraints limiting productivity. The findings reveal that kola nut farmers are predominantly elderly, married men with limited formal education, often combining kola farming with secondary occupations such as trading and artisanal work. Although not the primary source of income for many, kola nut production remains deeply embedded in local socio-cultural traditions.

Socio-cultural values were found to exert a substantial influence on kola nut production. As evidenced in Table 2, a majority of respondents associated kola nut cultivation with traditional ceremonies ($\bar{x}$ = 4.18), hospitality and friendship ($\bar{x}$ = 4.22), medicinal use ($\bar{x}$ = 4.10), and prayer for longevity ($\bar{x}$ = 3.95). These symbolic meanings highlight the crop's entrenched cultural and spiritual significance, particularly in community cohesion, rituals, and heritage preservation. Such findings confirm that kola nut farming is not merely economically motivated but culturally driven, especially among older farmers who uphold traditional values.

However, as shown in Table 3, kola nut production is constrained by multiple challenges. Prominent among these are lack of access to credit ($\bar{x}$ = 3.41), unfavourable weather conditions ($\bar{x}$ = 3.37), inadequate knowledge of improved practices ($\bar{x}$ = 3.34), high cost of pesticides ($\bar{x}$ = 3.13), and ageing, unproductive trees. These constraints are compounded by weak extension services and limited youth interest, threatening the long-term sustainability of kola nut farming.

Regression analysis further affirmed that income generation (β = 0.916, p = 0.011), cultural relevance (β = 0.085, p = 0.000), medicinal value (β = 0.055, p = 0.008), and spiritual significance (β = 0.081, p = 0.011) were statistically significant drivers of kola nut production. This underscores the need to address both the socio-cultural and agronomic dimensions of kola farming in development efforts.

To revitalise kola nut production in Ekiti State, a multi-pronged strategy is necessary. First, rejuvenation of existing kola farms should be prioritised through the distribution of improved, high-yielding seedlings and hands-on training in modern agronomic techniques. Strengthening cultural education by integrating kola nut's symbolic importance into school curricula and community programmes can help sustain youth interest and intergenerational knowledge transfer. Financial inclusion initiatives such as kola-specific low-interest credit schemes and cooperative-based savings and loans structures should be implemented to ease capital constraints. Agricultural extension systems should be strengthened with a focus on pest and disease management, post-harvest practices, and adaptation to changing weather conditions. Establishing value chains through processing, packaging, and branding of kola nut and its derivatives can increase profitability and attract new markets. Additionally, the cultural, medicinal, and spiritual relevance of kola nut should be leveraged in branding and public awareness campaigns to boost domestic consumption and heritage tourism. Finally, state and national agricultural policies must incorporate kola nut into strategic development plans, with support for research into climate-resilient varieties, sustainable land management, and digital technologies for smallholder farmers.

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PREVENTIVE STRATEGIES AND THEIR IMPACT ON PERCEIVED EFFECTS OF CRIMES ON RURAL FAMILY LIVELIHOODS IN OGBOMOSO AGRICULTURAL ZONE OF OYO STATE, NIGERIA

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ABSTRACT

The study therefore examined the preventive strategies in tackling the perceived effects of crimes in rural family livelihoods in Ogbomoso Agricultural zone of Oyo State. Multistage sampling procedure was employed to select 90 rural families for this study. Data was obtained with the aid of a questionnaire and data were analysed using frequency count, percentage, mean and Pearson Product Moment Correlation. The results showed that the major effects of crime on rural family livelihoods were loss of stored products (4.82), loss of resources (4.37), and loss of yield of crops (4.91). While major preventive strategies against crime were keeping farm area clean always (3.00), setting of traps around barns/stores (2.96) and the use of vigilante group for surveillance (2.92). Pearson's Products Moment Correlation (PPMC) analysis indicated that the perceived effects of crimes on rural family livelihoods were negative and significantly related to the frequency of preventive strategies against crimes (r=-0.221**; p= 0.037). The result showed that preventive strategies against various crimes/criminality were found to be inversely and significantly related to the perceived effects of crime/criminality on rural family livelihoods. It was therefore concluded that the preventive strategies against crime/criminality had decisive influence on perceived effects of crime/criminality on rural family livelihoods in Ogbomoso Agricultural zone of Oyo State. The study recommends the need to tackle rural crime effectively through adequate adherence to community rules and regulations so that the rural family could live in a relatively safe and low-crime environment to enhance rural family livelihoods.

Keywords: Crime, criminality, livelihoods, rural family, preventive strategies

INTRODUCTION

Rural areas in developing countries are often characterised by high rates of poverty and food insecurity. The rural areas are characterised by a high concentration of poverty: 70% of the extremely poor people live in rural areas. Most of the rural people depend on income and farming employment. While there is a lot of research on sustainability of livelihoods and farming in rural areas, hardly has any research considered the barriers to development in rural areas. One such barrier is related to rural crime in developing countries. Thus, crime hampers development of rural areas in a serious way. These findings remain relevant today, as recent studies continue to highlight the negative impact of insecurity—particularly in rural and conflict-prone regions—on household welfare, education, and health indicators (Krause and Krieger, 2023).

Recent studies affirm that the lack of standardized reporting mechanisms and the low prioritization of farm-related crimes hinder accurate data collection and analysis, both in developed and developing countries (Salerno *et al*., 2023).

Due to costs associated with crime in the rural area, there is need to adopt preventive strategies to address this menace to engender sustainable development in the rural area especially in ensuring food security. The concept of prevention today generally encompasses two dimensions: one that involves actions to "prevent, anticipate, and stop something from occurring," and another focused on "raising awareness and issuing warnings" (Cecceto 2016). In preventive criminology, prevention is used in its first meaning, that is; by using different techniques to prevent delinquency, the purpose is to prevent the crime of going and overcoming delinquency. There is clear evidence that well-planned crime prevention strategies not only prevent crime and victimisation but also promote community safety and contribute to the sustainable development of countries. Effective, responsible crime prevention enhances the quality of life of all citizens. It has long-term benefits in terms of reducing the costs associated with the formal criminal justice system, as well as other social costs that result from crime. Crime prevention offers opportunities for a humane and more cost-effective approach to the problems of crime. According to Mwaura and Irungu (2023), human (human presence or physical guardianship e.g. through neighbors, friends, relatives, passersby) and/or non-human (e.g. locks, alarms, cameras) have served as an obstacle to offenders thereby preventing intended crime/criminality) from occurring.

Despite the significance of rural crime, limited or no research on methods for preventing it in developing countries have been carried out. Thus, the aim of this paper is to report on the preventive strategies in tackling the perceived effects of crime on rural family livelihoods in Ogbomoso Agricultural zone of Oyo State. In more detail, the research has the following three objectives:

1. to examine the socio-economic characteristics of the rural family in the study area;
2. to determine the frequency of use of various preventive methods against crime/criminality in the study area; and
3. to investigate the perceived effects of crime/criminality on rural family livelihoods in the study area.

The hypothesis of the study was stated that there is no significant relationship between preventive strategies against crimes and perceived effects of crimes on rural family livelihoods

METHODOLOGY

The study was carried out in Ogbomoso Agricultural Zone of Oyo State. Ogbomoso Agricultural Zone is made up of five Local Government Areas (LGAs), namely Ogbomoso North Local Government Area (LGA), Ogbomoso South LGA, Ogo-Oluwa LGA, Oriire LGA and Surulere LGA. Ogbomoso North and South LGAs are the two urban ones, while the others are rural areas. The study was therefore carried out solely in these three rural LGAs. The geographical location of Ogbomoso is on latitude 81^0N and longitude 3 .29^0E (Map of Ogbomoso, 1998). The land area is about 3547.89 square metre which is bounded in the north by Irepodun LGA, in the west by Oyo LGA, in the south by Ejigbo LGA of Osun State and in the east by Asa LGA of Kwara State. The major arable crops cultivated include maize, melon, soybean, cassava, cowpea, yam, and various vegetables. In addition to agriculture, a significant portion of the population is engaged in trading, while a smaller percentage works in the civil service (Adenegan and Adepoju, 2022).

A Multistage sampling procedure was used to select 90 respondents. This first stage involves purposive selection of three Local Government Areas (Oriire, Surulere and Ogo-Oluwa) using purposive sampling technique. The purposive selection was due to the fact the three are in the rural areas of the zone. In the second stage, 3 wards out of 14 wards from each of the selected Local Government Areas were randomly selected using a simple random sampling technique totaling 12 wards. Lastly, from the selected 12 wards, 10 rural families each were randomly selected wards were randomly selected using a simple random sampling technique. In all, 90 rural families were randomly selected for the study.

Data collection from the respondents was mainly through structured questionnaire. Information contained in the structured questionnaire were based on the objectives of the study. Data were analysed using frequency count, percentage, mean and Pearson Product Moment Correlation.

RESULTS AND DISCUSSIONS

Socioeconomic characteristics

Table 1 below shows that 44.5% of the respondents were above 50years of age which means that the age range above 50years is the dominant age of rural families, and this implies that majority of these respondents are still in their active years and productive age. This finding aligns with the report of Adeoye *et al*. (2022) and Yusuf *et al*. (2023) who noted that many rural dwellers are still within their active and productive age range and derive satisfaction from engaging in agricultural activities. The distribution of the households by marital status shows that 4.4% of the respondents were single, 90.1% were married, 1.1% divorced and 4.4. were widowed. This finding is in collaboration with other findings which established the fact that most rural households are married with the sole aim of childbearing. The mean value of the household size is approximately 6. This is in line with the report of Ololade and Olagunju (2021) which affirmed that households with larger family sizes are more likely to diversify their livelihood strategies to enhance income and ensure food security The education distribution of the respondents shows that 15.6% of the respondents had no formal educational, 42.2% of the respondents had primary school education, 31. 1% had secondary education while 10% had tertiary education. This result shows that respondents are not illiterate, the high education level can increase the productivity of the respondents because it has been shown that farmers with high education level will be able to adopt new technologies in production. This agrees with the findings of Otekunrin *et al*., (2023) that education improves one's ability to understand and assimilate information. Majority (70%) of the respondents engaged primarily in farming with mean farming experience of 23years and mean farm size of 2.1 hectares. This shows that farmers in the study area are very experienced in their production and can make many observations in their productivity level. The small farm size cultivated can result in the yield/output being small thereby affecting the level of productivity and their income.

Table 1: Distribution of respondents by Socio-economic Characteristics (n = 90)

Socio-economic Characteristics	Frequency	Percentage	Mean
Age			
≤ 30	2	2.2	
31 – 40	9	10.0	
41 – 50	39	43.3	**50.1**
Above 50	40	44.5	
Marital status			
Single	4	4.4	
Married	81	90.1	
Separated	1	1.1	
Widowed	4	4.4	
Household size			
1 – 2	2	2.2	
3 – 4	4	4.4	**6.0**
5 – 6	51	56.7	
Above 6	33	36.7	
Level of education			
No formal education	14	15.6	
Primary school education	38	42.2	
Secondary school education	28	31.1	
Tertiary education	9	10.0	
Non-formal education	1	1.1	
Primary occupation			
Farming	63	70.0	
Herding	6	6.7	
Trading	11	12.2	
Civil services	6	6.7	
Artisan activities	4	4.4	
Years of participating in farming			
≤ 10	3	3.3	
11 – 20	36	40.0	**23.2**
21 – 30	49	54.4	
Above 30	2	2.2	
Farm size			
1.0 – 2.0	64	71.1	
2.1 – 3.0	21	23.3	**2.1**
3.1 – 4.0	2	2.2	
Above 4.0	3	3.3	

Perceived effects of crime/criminality on rural family livelihoods in the study area

Table 2 shows that respondents strongly agreed that loss of soil fertility (WMS = 4.97), loss of yield of crop (WMS = 4.91), increased in migration patterns of youth (WMS = 4.87), crop destruction (WMS = 4.81), loss of work time (WMS = 4.73), financial and personal losses for farmer (WMS = 4.69) were their main perceived effects of crime in the study area. It was revealed that the major effects of crime range from loss of soil fertility, loss of yield of crop, increased in migration patterns of youth and crop destruction in the study area. Crime poses a lot of threat to rural families which could be both direct and indirect effects. Similarly, some researchers (Ceccato, 2016) claimed that the indirect costs also occur as psychic cost and loss in work time if people affected by burglary or theft feel suspicious and unsafe at home.

Various preventive strategies against crime

Table 3 reveals that keeping farm area clean always (WMS = 3.00), setting of traps around the barns/stores (WMS = 2.96), adherence to community rules and regulations (WMS = 2.92), the use of vigilante group for surveillance (WMS = 2.92), immediate sales of farm products at maturity (WMS = 2.89), intervention of community leaders and traditional leaders with the local government (WMS = 2.87) were the main preventive measures used against crime in the study area. It was therefore revealed that several methods have been found useful in preventing crime in the study area. In line with the result from this research work, Smith and Holmes (2020) emphasised that rurality and the

absence of effective surveillance systems contribute significantly to farm-related thefts.

Table 2: Distribution of respondents by perceived effects of the crime/criminality (n = 90)

Perceived effects of the crime	SA	A	U	D	SD
Loss of household resources	86.7	13.3	0.0	0.0	0.0
Increased in migration patterns of youth	36.7	63.3	0.0	0.0	0.0
Displacement/migration of labour	44.4	55.6	0.0	0.0	0.0
Increased prices of goods/agricultural products	60.0	40.0	0.0	0.0	0.0
Loss of stored products	82.2	17.8	0.0	0.0	0.0
Loss of yield of crop	91.1	8.9	0.0	0.0	0.0
Loss of soil fertility	96.7	3.3	0.0	0.0	0.0
Loss of land	22.2	61.1	0.0	0.0	0.0
Destruction of houses, property and farm stead	2.2	33.3	0.0	0.0	0.0
Loss of self-esteem	45.6	53.3	0.0	0.0	0.0
Job dissatisfaction/unwillingness to invest in agriculture beyond subsistence level	38.9	61.1	0.0	0.0	0.0
Reduction in food quality\quantity	45.6	54.4	0.0	0.0	0.0
Emotional exhaustion/ Psychological stresses e.g. fear of shock	42.2	18.9	0.0	0.0	0.0
Crop destruction	81.1	31.1	0.0	0.0	0.0
Financial and personal losses for farmer	68.9	26.7	0.0	0.0	0.0
Loss of work time	73.3	66.7	0.0	0.0	0.0
Loss of future breeding herbs and blood lines	44.4	55.6	0.0	0.0	0.0
Increased incidence of deforestation through illegal felling of timber	44.4	63.3	0.0	0.0	0.0
Losses of animals	33.3	10.0	0.0	1.1	2.2
Loss of life	12.2	45.6	1.1	5.6	74.1
Relocation/migration of affected farmers	17.8	45.6	1.1	7.8	27.8

SA = Strongly Disagree; A = Agree; U = Undecided; D = Disagree; SD = Strongly Disagree

Table 3: Distribution of respondents by frequency of use of preventive methods against various of the crime/criminality (n = 90)

Preventive strategies	Always	Occasionally	Rarely	Not at all	WMS
Keeping farm area clean always	100.0	0.0	0.0	0.0	3.00
Fencing farm area or around the barns/stores	2.2	17.8	4.4	31.1	0.91
Barricade of routes leading to farm area	4.4	18.9	53.3	23.3	1.04
The use of scare scroll	82.2)	7.8	4.4	5.6	2.67
Physical combat/ Personal intervention	12.2	50.0	26.7	11.1	1.63
Intervention of community leaders and traditional leaders with the local government	91.1	4.4	4.4	0.0	2.87
Changing the routes of herding	18.9	40.0	38.9	2.2	1.76
Police patrol	5.6	22.2	67.8	4.4	1.29
Adherence to community rules and regulations	92.2	7.8	0.0	0.0	2.92
The use of vigilante group for surveillance	93.3	5.6	1.1	0.0	2.92
The use of court order	5.6	58.9	28.9	6.7	1.63
The use of strong padlocks on the barn entrance	93.3	1.1	3.3	2.2	2.86
The use of traditional charms that prevent thieves from stealing properties	1.1	8.9	35.6	54.4	0.57
Location of the barns/stores around homestead	20.0	22.2	33.3	24.4	1.38
Immediate sales of farm products at maturity	94.4	1.1	3.3	1.1	2.89
Setting of traps around the barns/stores	97.8	0.0	2.2	0.0	2.96
The use of specially trained dogs to watch over the properties	65.6	3.3	24.4	6.7	2.28

Table 4 indicated that there was a significant but negative between preventive strategies against crimes and perceived effects of crimes on rural family livelihoods (r=-0.221**; p= 0.037). The inverse and significant relationship implying that the probability of rural families experiencing minimal crime with little or no effects on their livelihoods with increasing implementation of preventive measures against various crime. Similarly, Donnermeyer (2023) also stresses the importance of

both, isolation and the proximity to urban centres as two major predictors for farm crime. They point out that isolation refers to the distance from one farm to another with direct implications for guardianship, while proximity to urban centres implies that there might be many people including potential offenders passing by from urban centres, thus providing opportunities for crime.

Table 4: Correlation between the perceived effects of crimes/criminality on rural family livelihoods and frequency of preventive strategies against crimes/criminality

Variable	r-value	p-value
Perceived effects of crimes/criminality on rural family livelihoods	0.31***	0.002

***Significant at 1% level

CONCLUSION AND RECOMMENDATIONS

It was found that preventive strategies helped to minimise rural crime incidence thereby boosting sustainable development of rural area in a serious way. Based on the finding, it was concluded that the preventive strategies against crime/criminality had decisive influence on perceived effects of crime/criminality on rural family livelihoods in Ogbomoso Agricultural zone of Oyo State.

The following recommendations are pertinent:

1. There is need to keep farm area clean always and setting of traps around the barns/stores in order to prevent potential crimes in rural area so as to expedite efforts to address menace of crime/criminality in the rural area.
2. Adequate adherence to community rules and regulations so that the rural family could live in a relatively safe and low-crime environment in order to enhance rural family livelihoods.

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FACTORS INFLUENCING WOMEN PARTICIPATION IN AGRO-ENTREPRENEURSHIP ACTIVITIES IN KOGI STATE, NIGERIA

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ABSTRACT

The role of women in agricultural production can never be over emphasised. If the problem of food insecurity is to be tamed, women entrepreneurs must be empowered to compete effectively with their male counterparts. The study analysed factors influencing women participation in agro-entrepreneurship in Kogi State, Nigeria. Three-stage sampling procedure was used to select 433 rural women. Structured questionnaire complimented with interview schedule was used for data collection. Information was garnered on agro-activities of rural women, level of participation in agro-entrepreneurship activities, factors influencing women participation in agro-entrepreneurship and constraints facing women agro-entrepreneur. Data were analysed using descriptive statistics (frequency, percentage, and mean) and Ordered Logit Regression Model. The result showed that the mean age and mean households of women agro-entrepreneurs were 46.3 and 10.0 years respectively. The main agro-entrepreneurship activities performed by woman were crop farming (97.2%) and poultry farming (55.7%). Also, 89.4% of rural women had low level of participation in agro-entrepreneurship activities. Age (β=-0.05), household size (β=0.03), farming experience (β=0.03) and membership of association (β=0.43) influenced women participation in agro-entrepreneurship activities. The major constraints facing women agro-entrepreneurship were limited access to resources ($\bar{X}$=2.65), insufficient funds ($\bar{X}$=2.53) and lack of access to infrastructure ($\bar{X}$=2.50). It is recommended that women should venture into other agro-entrepreneurship activities apart from farming for improved livelihood. Also, women should have the same access to incentives and other resources like men to boost their interest in agro-entrepreneurship.

Keywords: Women participation, Agro-entrepreneurship, Activities

INTRODUCTION

Agricultural is a key sector in Nigeria, employing a significant portion of the population and contributing to national development (Pelemo *et al*., 2022). Entrepreneurship is a dynamic process of creating incremental wealth for the betterment of the populace (Esiobu *et al.*, 2024). Women entrepreneurship is one of the fastest growing enterprises worldwide, and this has received maximum attention from scholars and academicians on their roles in economic development (Giuseppina, 2020). Agro-entrepreneurship combines elements of agriculture and entrepreneurship for better development. The goal of agro-entrepreneurship is to create value, generate income, and enhance agricultural development. Women agro-entrepreneurs are those involved in agricultural activities through risk-taking in the effective utilisation of human and material resources in a unique way by taking advantage of the opportunities identified in their immediate environment in the production of goods and services for the benefits of mankind (Egwuonwu and Iwunwanne, 2020). Women in Nigeria contribute substantially to agriculture through food production, processing, marketing, and distribution. Okezie *et al*. (2023) revealed that the role of women entrepreneurs in the economic and social development of a nation cannot be overemphasised for various reasons. Women entrepreneurs have been recognised as an important untapped source of economic growth and national development. Women entrepreneurs create new jobs for themselves and others, and by being different, also provide society with different solutions to management, organisation, and business problems, as well as to the exploitation of women entrepreneurial opportunities (Okezie *et al.*, 2017). Participation of women in agro-entrepreneurship activities in Nigeria has skyrocketed in recent years due to the federal government initiatives to promote women's economic empowerment, and changing the social norms has been one of the motivating factors. The role of women in Nigeria over the years has not been limited to domestic activities alone. Women have contributed amazingly to economic and social development like their male counterparts. Women farmers and those involved in agro-entrepreneurship have played active roles in addressing the problem of food insecurity in Nigeria. However, despite the contribution of women in shaping the economy of rural and urban centres in Nigeria, they have been traditionally involved in agricultural activities but have been often marginalised and excluded in decision-making and access to production resources. Nigerian government efforts at empowering women have not yielded positive results. Women continue to face barriers such as limited land, inadequate access to finance, lack of adequate training, cultural and social norms. It is therefore necessary to

consider the factors influencing women's participation in agro-entrepreneurship activities. The main objective of the study is to determine factors influencing women's participation in agro-entrepreneurship activities Kogi State, Nigeria. The specific objectives are to:

1. describe the socio-economic characteristics of women agro-entrepreneurs;
2. identify the agro-entrepreneurship activities performed by women;
3. determine factors influencing women's participation in agro-entrepreneurship; and
4. identify the constraints facing women agro-entrepreneurs.

METHODOLOGY

The study was carried out in Kogi state of Nigeria. The State is between latitude 6^0 33^1 and 8^0 44^1 N and longitude 5^0 22^1 and 7^0 49^1E. Kogi has a total population of 3,278,487 in (NPC, 2006) and with growth rate of 7.7%, the state is projected to be around 4,809,743 in 2025. The state has land area of about 30,354.74 square kilometres (Kogi State Ministry of Information Working Document, 2016). It is blessed with 2 million hectares of cultivable land with 0.5 million hectares currently under cultivation (Kogi State Ministry of Information working document, 2016). The state is well endowed with river valleys and swamp lands for dry season farming. The major food crops grown in the State are yam, cassava, maize, sorghum, rice, millet, cowpea, pigeon pea, groundnut, Bambara nut, cocoyam, sweet potato, benniseed, melon, banana, plantain and cotton. The major agro entrepreneurship activities performed by women in the state include poultry, farming, processing, fishery, snail farming, livestock production, and organic farming. Three-stage sampling procedures were employed for this study. The first stage involved random selection of one Local Government Area (LGAs) each from the four agricultural zones in the State. The second stage involved a random selection of five villages, each from the selected LGAs making a total of 20 villages. The third stage involved the use of proportional sampling to select 10% of rural women from the sampling frame which now gave a total of 433 respondents.

Table 1: Sample of women entrepreneurs in Kogi State

Agricultural Zones	LGA	Villages	Sample population	Sample size
A	Ijumu	Aiyetoro Gbede	251	25
		Ekinrin Adde	200	20
		Iffe	153	15
		Iyara	225	23
		Okoro	150	15
B	Dekina	Abocho	302	30
		Adokolo	205	26
		Ajiyolo	180	18
		Egume	168	17
		Ojodu	280	28
C	Adavi	Nagazi	262	26
		Karaworo	276	28
		Ogaminana	165	17
		Kuroko	280	28
		Adavi-Eba	207	21
D	Idah	Ichala	293	29
		Akpo	151	15
		Akuta	150	15
		Icheke	162	16
		Nwajaba	210	21
Total			4270	433

Primary data was employed for this study. Objectives i, ii, iii and v were achieved using descriptive statistics (frequency, percentages and mean).

Level of participation in agro-entrepreneurship activities

Level of participation in agro-entrepreneurship (Objective III) was measured based on number of activities performed by women. The agro-entrepreneurship activities include poultry farming, selling farm produce, organic farming, fishery, fruit farming, fertiliser application, selling of herds, selling of seeds, bee keeping, crop farming, agricultural supplies, snail farming, farm consultant, livestock and mushroom farming. A total number of 15 activities were categorised into high medium and low. The respondents fell into the range of 1 and 5=low, 6 and 10=medium, and more than 10=high. Constraints facing women agro-entrepreneurs was measured using a 3-point Likert type scale of very

severe 3, severe 2 and not severe 1. The overall constraint was classified into severe when the score is more than or equal to 2 and not severe when it is less than 2.

Ordered Logit Regression

Ordered Logit Regression was employed to achieve Objective IV: that is factors influencing women participation in agro-entrepreneurship. Both the implicit and the explicit forms of the models are specified below:

Level of participation in agro-entrepreneurship (Y) is a function of =f (X_1, X_2, X_3, X_4, X_5, X_6, X_7.....X_n)

The model is explicitly expressed as:

$Y= b_o + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_n X_n + U$

Y = Level of participation in agro-entrepreurship (1-5=low, 6-10=medium, >10=high),

X_1 = Age (years),

X_2= Household size (number)

X_3 = Experience (years)

X_4= Education (years)

X_5 = Annual income (naira)

X_6= Agro-entrepreneurship activities (number)

X_7= Membership of association (number)

RESULTS AND DISCUSSION

Socioeconomic characteristics

Table 2 shows that the mean age of respondents was 46.3 years. This implies active and productive year where passions for agro-entrepreneurs are activated for better livelihood status. This finding is in agreement with Egwuonwu and Iwunwane (2022) who reported that a mean age of 37 years among women agro-based entrepreneurial in Imo State, Nigeria. Table 2 indicates that the mean household size of the respondents was 10.0 persons. This implies large household size that supply households with unpaid family labour for entrepreneurs' activities. Table 2 reveals that the mean farming experience of respondents was 8 years. This indicates many years in farming which is expected to enhance women involvement in agro-entrepreneurs activities. Table 2 indicates that 75.8% were literate while 24.2% had non-formal education**.** This shows that larger proportion of women were literate. High level of education is expected to influence women participation in agro-entrepreneurs for better opportunities. Table 2 shows that 42.6% of the respondents had annual income of > N300,000 while 33.5% had annual income of between N201000- N300000. The man annual income of the respondents in the study area was N226,000. This finding agrees with Egwuonwu and Iwunwane (2022) who reported that women participation in agro-entrepreneurs are influence by their income level. Table 2 indicates that 66.7% of the respondents belong to cooperative while 33.3% did not belong to cooperative society. This shows that larger proportion of the respondents belong to cooperative society. Membership of cooperative is expected to affords members opportunities to access information and incentives and capital that will enhance their standard of living

Table 2: Distribution of respondents according to socio-economic characteristics (n=433)

Categories	Variables	Percentage	Mean
Age	<30	17.8	46.3
	31-40	39.9	
	41-50	28.9	
	51-60	13.4	
Household size	1-5	22.9	10.0
	6-10	61.4	
	11-15	12.1	
	>15	3.7	
Experience	1-5	36.5	8.0
	6-10	58.9	
	>10	4.6	
Educational status	Non formal	24.2	
	Primary	20.7	
	Secondary	48.9	
	Tertiary	6.0	
Annual income	<100000	5.1	226,000
	101000-200000	19.2	
	201000-300000	33.5	
	>300000	42.6	
Membership of cooperative	Yes	66.7	
	No	33.3	

Sources: Field survey, 2023

Agro-Entrepreneurship Activities Participated by Women

Table 3 reveals that crop farming (97.2%) and poultry farming (55.7%) were the agro-entrepreneurship activities in which most of the respondents participated in the study area. This shows that most of the women produce crops and poultry. This might be attributed to the fact that farming and poultry were the common activities among rural dwellers in Nigeria. This finding aligns with that of Egwuonwu and Iwunwanne (2020) who reported that crop farming and poultry are few of the most participated agro-based entrepreneurial activities in Imo State, Nigeria. Also, 51.7% and 44.3% of women engaged in marketing of agricultural produce and organic farming. This finding concurs with that of Odebode *et al.* (2023) who reported that marketing of farm produce is one of the most participated agro-entrepreneurship activities in Lagos State, Nigeria. Other agro-entrepreneurship activities in which women involved include; fruit (28.9%), agricultural supplies (13.6%), and selling of seeds (12.2%). The least agro-entrepreneurship activities they participated were mushroom farming (0.9%) and bee keeping (0.6%). This shows that women do not participate as such in some activities other than farming in the study area. This finding contradicts that of Odebode *et al.* (2023) who reported active involvement of women in fishery, livestock farming, fruit selling, snail farming and input dealers in Lagos State, Nigeria.

Table 3: Agro-entrepreneurship activities participated by women (n=433)

Variables	Percentages	Ranking
Crop farming	97.2	1st
Poultry farming	55.7	2nd
Marketing of farm produce	51.7	3rd
Organic farming	44.3	4th
Fruit selling	28.9	5th
Agricultural supplies	13.6	6th
Selling of seeds	12.2	7th
Fertilizer	7.6	8th
Fishery	7.1	9th
Selling of herbs	6.2	10th
livestock farming	3.2	11th
Snail farming	2.8	12th
Farm consultant	2.3	13th
Mushroom farming	0.9	14th
Bee keeping	0.6	15th

Sources: Field survey, 2023

Level of participation of women in agro-entrepreneurship activities

Table 4 indicates that 86.4% of the respondents had low participation in agro-entrepreneurship activities while 10.5% had medium participation. This signifies that larger proportion of women had low participation in agro-entrepreneurship activities. Low participation is expected to negatively affect the wealth creation and livelihood status of the women agro-entrepreneurs in the study area. This finding is in consonance with that of Egwuonwu and Iwunwanne (2020) that women were not adequately involved in agro-based entrepreneurial activities in Imo State, Nigeria. This finding contradicts that of Odebode *et al*. (2023) who reported that women were actively involved in fish production, livestock farming, snail farm and bee keeping in Lagos State, Nigeria.

Table 4: Level of participation of women in agro-entrepreneurship activities (n=433)

Variables	Percentage
High	3.2
Medium	10.5
Low	86.4

Sources: Field survey, 2023

Factors influencing women participation in agro-entrepreneurship

Table 5 shows the results of factors influencing women's participation in agro-entrepreneurship using the Ordered Logit Regression Model. The result indicated that pseudo R2 is 0.269. This signifies that 26.9% of the variation in women's participation in agro-entrepreneurship was explained by the independent variables included in the model, while the remaining 73.1% was due to

external factors not captured. Table 3 reveals that age (-0.05) was negatively significant at the 10% level of probability, indicating that as women advance in age, their level of participation in agro-entrepreneurship reduces. This shows that older women may likely have less interest in agro-entrepreneurship activities unlike younger ones. This finding agrees with that of Okezie *et al*. (2017), who stated that age influences women's participation in entrepreneurship in Abia State. Household size (0.03) was positively contributed to women's participation in agro-entrepreneurship activities in the study area, which was significant at the 10% level of probability. This implies that an increase in household size will increase women's participation in agro-entrepreneurship activities in the study area. Women with large households have a high probability of participating in agro-entrepreneurship activities. This might be because of the need to cater for their wards. This finding is in consonance with Abdi (2014), who stated that household size is one of the factors influencing women's participation in agro-entrepreneurship. Experience (0.03) was found to significantly contribute to women's participation in agro-entrepreneurship activities at the 10% level of probability. This shows that women with many years of experience are likely to participate in agro-entrepreneurship activities. Years of experience is very vital because it represents practical knowledge gathered over many years. Membership of cooperative (0.43) also positively contributed to women's participation in agro-entrepreneurship activities, which was significant at the 1% level of probability. This shows that women who are members of associations are likely to participate in agro-entrepreneurship activities. The interaction with members of the cooperative can encourage their agro-based business and expand their business. This finding agreed with that of Egwuonwu and Iwunwanne (2020), who reported that cooperative membership influences participation in agro-entrepreneurship in Imo State.

Table 5: Factors Influencing Women Participation in Agro-Entrepreneurship (n=433)

Variables	Coefficient	Z-value
Age	-0.0474204	-1.95**
household size	0.0290101	1.81*
Experience	0.0258905	1.87*
Years in education	-0.0173825	-0.92
Annual income	2.29e-07	1.17
Numbers of agro-entrepreneurship activities	-0.0654102	-1.03
Membership of cooperative	0.4333091	3.53***
Log likelihood	-419.4067	
Chi^2	23.17***	
Pseudo R^2	0.269	

Sources: Field survey, 2023

*** Significant at 1% level of probability, and *=Significant at 10% level of probability

Constraints facing women agro-entrepreneurs

Table 6 reveals that limited access to resources ($\bar{X}$=2.65), insufficient funds ($\bar{X}$=2.53), and lack of access to infrastructure ($\bar{X}$=2.50) were the most significant constraints facing women's participation in agro-entrepreneurship. Women in Nigeria have been discriminated against in access to resources due to custom and traditional beliefs and are at major disadvantages when it comes to access to resources. The finding is in agreement with that of Esiobu *et al.* (2015) who stated that inadequate access to resources and funds is one of the problems facing women entrepreneurs in Imo State of Nigeria. Family responsibilities ($\bar{X}$=2.49) and gender discrimination ($\bar{X}$=2.31) were constraints facing women agro-entrepreneurs. Women in some families are the ones shouldering the responsibilities of care for their wards and the overall livelihood of the family. This is common among the single mothers and widows. Also, gender discrimination is a common problem affecting women in Nigeria, which led to situation where women do not have access to productive resources and supports like men. This is attributed to culture and tradition that most times limited women to domestic activities. This finding is in consonance with of Sasa *et al.* (2022) who reported that gender discrimination is one of the constraints to women's participation in agriculture and economic development in Nigeria. Other constraints facing women agro-entrepreneurs were cultural norms ($\bar{X}$=2.21) and climate change ($\bar{X}$=2.09). The cultural norm that does not recognise women as decision-makers and prevents equitable access to resources is a major constraint facing women. Also, climate change issues such as excessive rainfall, drought, high temperature, and floods are part of the problem facing women agro-entrepreneurs in the study area. This finding agrees with that of Musafiri *et al.* (2022) who stated that climate change is a serious factor affecting the farming populace in Sub-Saharan Africa. Lack of networking ($\bar{X}$=2.05) and lack of technical skills ($\bar{X}$=2.00) were part of the severe constraints facing women agro-entrepreneurs.

Table 6: Constraints facing women agro-entrepreneurs (n=433)

Variables	Very severe	Severe	Not severe	Weighted score	Mean	Ranking
Limited access to resources	74.1	17.1	8.8	1149	2.65	1st
Insufficient funds	59.4	34.6	6.0	1097	2.53	2nd
Lack of access to infrastructure	65.8	18.7	15.5	1084	2.50	3rd
Family responsibilities	58.4	32.6	9.0	1080	2.49	4th
Gender discrimination	50.6	30.0	19.4	1001	2.31	5th
Cultural norms	39.3	42.9	17.8	959	2.21	6th
Climate change	32.1	44.8	23.1	905	2.09	7th
Lack of networking activities	35.1	34.4	30.5	886	2.05	8th
Lack of technical skills	30.9	36.9	33.0	867	2.00	9th
Lack of access to incentives	22.4	53.1	24.5	857	1.97	10th
Limited access to market	29.8	24.0	46.2	795	1.83	11th

Sources: Field survey, 2023

CONCLUSION AND RECOMMENDATIONS

It can be concluded that crop farming and poultry farming were the activities participated in by most women in the study area. The women had low participation in agro-entrepreneurship activities. Age, household size, farming experience, and membership of association had an influence on women's participation in agro-entrepreneurship. Limited access to resources and insufficient funds were the most severe constraints facing women agro-entrepreneurs. It is recommended that women should venture into other agro-entrepreneurship activities apart from farming for improved livelihood. Also, women should have the same access to incentives and other resources like men to boost their interest in agro-entrepreneurship. Lastly, the government should make provisions for infrastructures that will assist women in the study area.

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ANALYSIS OF THE TOXICOLOGICAL, HISTOPATHOLOGICAL, AND BIOLOGICAL EFFECTS OF IVERMECTIN ON JUVENILE *CLARIAS GARIEPINUS*

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ABSTRACT
The study analysed the toxicological, histopathological, and biological effects of Ivermectin on juvenile *Clarias gariepinus*. The toxic effects of Ashiver 5 Ivermectin bolus drug on *Clarias gariepinus* was tested. The fish was acclimated for 3 days before conducting a range-finding test with various concentrations (0bolus, 0.25bolus, 0.50bolus, 0.75 bolus, 1.00 bolus, 1.50 bolus and 2.00 bolus) in a plastic tank (26 x 20 x 30cm), each filled with 10 litres of water. Each concentration was tested in triplicates and 10 fish were introduced into each tank. Upon exposure to the toxicant, the fish displayed erratic swimming pattern, loss of reflex, and a colour change. Mortality increased with higher concentrations of Ashiver 5 Ivermectin bolus. The definitive (acute) test was carried out for 96 hours, and the concentrations used were 0, 1.20, 1.40, 1.60, and 1.80 bolus/10 liters of water. The lethal median concentration (LC_{50}) was graphically determined to be 1.35 bolus/10litres. As the concentration of Ashiver 5 Ivermectin bolus increases, the number of mortalities increased. The histological analysis of the gill, skin and liver of *C. gariepinus* at 0bolus/10L of water appeared normal, while at higher concentrations, organs architecture was deformed. Water quality was poor in treatments with higher concentrations. These results indicates the need for careful use of Ashiver 5 Ivermectin bolus medicines in aquatic ecosystems to improve fish and water quality in rural environments.
Keywords: Histopathology, Ashiver 5 Ivermectin, aquatic ecosystems, toxicant, water quality

INTRODUCTION

Aquaculture is the commercial cultivation of aquatic creatures, primarily fish that occupy a greater share of the aquatic environment. Aquatic environment can be polluted when there are quantitative and qualitative changes in physical, chemical and biological properties of water (Lv. *et al.,* 2024). Water pollution may arise from agricultural practices with attendant negative effect on aquatic organisms (Bonfanti *et al*., 2004). Herbicides, medicines and pesticides can enter water courses intentionally and unintentionally thus posing serious problem to fauna and human health, *(Rahman et al.,2002).*

The African Catfish (*Clarias gariepinus*) is a choice food fish species in Nigeria (Adeyemo *et.al*, 1997; Fagbenro *et al.*, 1999). It commands high demand from consumers and is mostly preferred by food fish aquaculturists (Britz and Pienaar, 1992). This is due to the ideal characteristics of this species which include high growth rate at high stocking densities, a high food conversion, good meat quality and smoking characteristics as well as year-round production. Because fish is a cheap source of protein, there has been an increase in demand for fish, which has led to an intensification of aquaculture methods and an outbreak of illnesses. Moreover, the usage of novel medications and pharmaceuticals has surged to address the current as well as newly developing illnesses. Biologically active compounds known as pharmaceuticals are employed in the treatment, prevention, and cure of illnesses. One such medication used to treat illnesses in animal husbandry and aquaculture is ivermectin (Schwarzenbach *et al*., 2006). Fish and some aquatic creatures, such as crustaceans and benthic polychaetes, are negatively impacted by free ivermectin, and even lower concentrations of the pesticide can have negative effects on aquatic organisms because they take longer to decompose. Therefore, it is crucial to evaluate the harmful consequences of ivermectin using appropriate models at lower dosages.

One of the most popular antiparasitic medications in both human and veterinary medicine is ivermectin (Horsberg, 2012). The impact of IVM on the biometric traits and organ biomarkers of African catfish, *Clarias gariepinus,* is biochemical, oxidative stress, and biometric changes. As a result, extreme measures must be taken when using the medication to manage fish parasites in aquaculture (Odo *et al.,* 2020). One common veterinary medication that is used extensively to treat animals is ivermectin (IVM). The increasing worldwide contamination of freshwater systems with thousands of industrial and natural chemical compounds is one of the key environmental problems facing humanity. Although most of these compounds are present at low concentrations, many of them raise considerable toxicological concerns, particularly when present as components of complex mixtures, *(Schwarzenbach et al., 2006).*

Ivermectin may wipe out aquatic habitats (Adeyemo *et al*., 2012). In light of this, the current study's objective was to evaluate the toxicity of ivermectin on the behavior, mortality and histopathological impact on the liver, skin, and gills, and haematology of *Clarias gariepinus* raised on varying medicine levels. The use of the ivermectin in aquaculture for the control of parasites requires stringent precautions, even though Ivermectin is generally considered safe and effective when used as directed, there are some potential side effects associated with its use.

The specific objectives of this research were to;

1. ascertain the percentage mortality (range finding) of the effect of Ivermectin on *Clarais gariepinus* juvenile;
2. determine the LC_{50} of Ivermectin on *Clarais gariepinus* juvenile;
3. analyse the histopathological effects on some of the vital organs (heart, skin, gills) of *Clarais gariepinus* juvenile exposed to varying concentration of Ivermectin, and,
4. assess the behavioural changes in *Clarais gariepinus* exposed to Ivermectin.
5. Carry out the organoleptic test of *C.gariepinus* exposed to Ivermectin

METHODOLOGY

The materials used were dissecting set, plastic tanks, microscope, slides and slips, formalin, Ashiver 5 Ivermectin, well water, *Clarias gariepinus* juvenile, conical flasks, mortar and pestle.

The experiment was carried out at the Wet laboratory of the Department of Fisheries and Aquaculture Management, Ekiti State University, Ado Ekiti Ekiti State, using 15 rectangular plastic tanks (26 x 20 x 30cm), each filled with 10 litres of water. *Clarias gariepinus* juvenile was purchased from a reputable farm with a well-known breeding practice. Healthy three hundred (300) juvenile of *Clarias gariepinus* of the same genetic stock were obtained and transported to the wet laboratory of Fisheries and Aquaculture Management Department. Ivermectin was purchased from a reputable pharmaceutical store in Ibadan, Oyo State and the preparation was achieved by diluting the desired concentrations in de-chlorinated water, ensuring accurate and consistent dosages for each experimental group.

Plate 1: Ashiver5 Ivermectin

Range finding test was carried out to determine the concentration to be used in the acute (definitive) test and five treatments was used for acute (definitive) and each of the treatment was replicated thrice.

The fish was held in plastic vast containing non-chlorinated water. The fish was allowed to acclimatize for 3 days in the laboratory under controlled temperature (24º c).

During the period of acclimatization, the water was changed after two days to remove faucal and unconsumed diet. Feeding was discontinued during the 96-hours test period. There was a preliminary test to find the harmful alteration in C*larias gariepinus* subjected to varying amounts of Ivermectin, a range finding test was performed on the species after the static bioassay outlined by Parish (1985). The test material was milled using mortar and pestle and added directly into the test water. The mixture was allowed to dissolve for 10 (ten) minutes before adding the juvenile of *Clarias gariepinus*. The fish was exposed to seven (7) different treatments. The seven (7) treatments used are; 0bolus, 0.25, 0.50bolus, 0.75bolus, 1.00bolus, 1.50bolus, 2.00bolus / 600g ±0.50g of fish respectively. The fish were simultaneously weighed with a top loading Metler balance and added to the 10liters rectangular glass tank of water that has already been mixed with the test items in varying proportions. The trial was run for ninety-six (96) hours and was monitored every three hours and twelve (12) hours overnight.

The Acute toxicity test was conducted under standard bio-assay procedure with five (5) treatments (0bolus, 1.20bolus, 1.40bolus, 1.60bolus, and 1.80bolus / 10liters of water / 600g ±0.50g of fish). Experimental design that was used in range finding test was also applied in definitive test. Mortality was monitored for 96 hours and temperature, pH and dissolved oxygen level were also monitored using standard methods. According to Akin-obasola, 2022. The histological analysis of the heart, gills and skin of *Clarias gariepinus* was studied in order to determine the toxic effect of Ivermectin on them. After four (4) days, the fish were weighed and two fish were taken from each tank, killed by decapitation and the gill, heart and skin was removed, sectioned and examined. The organs were put in cassettes after which they were embedded in wax, trimmed and sectioned. Section were fixed on clean slides and stained with haemotoxylin and eosin stains. Photomicrographs

were taken with Heitz (Ortholux II) microscope and camera, standard model; BHTVII. Data analysis was carried out using both descriptive statistics (percentage) and also analysis of variance (ANOVA) to determine significances between means using SPSS. Duncan multiple range test was used for post-Hoc test.

RESULTS AND DISCUSSIONS

Range finding test showed the percentage mortality of *Clarias gariepinus* exposed to different concentrations of Ashiver 5 Ivermectin bolus.

The percentage mortality of *Clarias gariepinus* is as shown in the Table 1. Mortality increased as the concentration and number of hours increased. This report supports Al-Otaibi *et al*., (2018) who studied the toxicity bioassay and sub-lethal effects of diazinon on blood profile and histology of liver, gills and kidney of *Clarias gariepinus*. High mortality (100%) was recorded at concentration 2.00bolus/10litres while after 24 hours into the experiment, concentration 1.50bolus/10litres had 70% mortality. Concentration 1.00bolus/10litres had no mortality. These range of mortality informed the concentration used in definitive test following Ayoola, (2008) method.

Table 1: Range finding test showing the percentage mortality of *Clarias gariepinus* exposed to different concentrations of Ashiver 5 Ivermectin bolus.

Time elapsed (hr)	Concentrations (Bolus)/10litres of water						
	0	**0.25**	**0.50**	**0.75**	**1.00**	**1.50**	**2.00**
24	00	00	00	00	00	40	100
48	00	00	00	00	00	30	00
72	00	00	00	00	00	00	00
96	00	00	00	00	00	00	00
Total Mortality	00	00	00	00	00	70	100

Definitive Test (Acute toxicity test) of Percentage mortality of *Clarias gariepinus* exposed to Ashiver5 Ivermectin bolus within 96 hours Bioassay

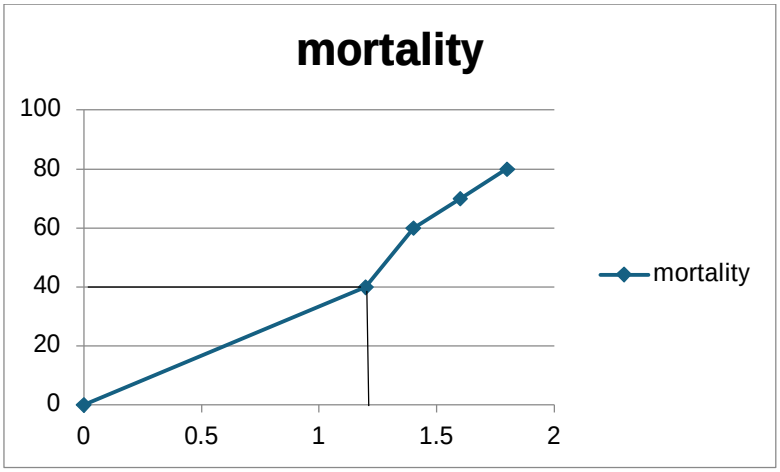
As shown in table 2, the results revealed that as the concentration of Ivermectin increases, the percentage mortality also increased (Ezenwaji, 2017). Within the first 48 hours, the mortality rate was at 0, 20% and 40% in concentrations 1.20bolus, 1.40bolus and 1.60bolus respectively but as the time increased to 96-hour, mortality increased in higher concentrations. At concentration 1.80bolus, the highest mortality of 80% was recorded at 96 hours into the experiment while 40, 60 and 70%, total mortality were recorded at concentration, 1.20, 1.40 and 1.60bolus/10liters respectively, this agrees with Akin-Obasola *et al.*, (2022) who recorded total mortality within 24 hours when *Clarias gariepinus* fingerlings was exposed to higher concentrations of Caterpillar granules. The percentage and number of survivors decreased with increasing concentrations of toxicant in the water and the accumulation of Ashiver 5 Ivermectin in fish tissue increased with increasing toxicant concentration in water, this result agreed with Bala *et al*., (2024) observations.

Table 2: Definitive test (Acute toxicity test) of Percentage mortality of *Clarias gariepinus* exposed to Ashiver5 Ivermectin bolus within 96 hours Bioassay

Time elapsed (hr)	Concentrations (bolus of Ashiver 5) / 600 ±0.50g of fish				
	0	**1.20**	**1.40**	**1.60**	**1.80**
24	00	20	40	50	50
48	00	20	20	10	20
72	0-0	00	00	10	10
96	00	00	00	10	00
Total Mortality	00	40	60	70	80

LC_{50}: Median lethal concentration

A stressed condition was experienced immediately the medicine was introduced to the water. Mortality increased within the first 24 hours as the concentration of the medicine increased. At concentrations less than 1.20bolus/10L, the mortality rate was less than 50% but increased greatly to 75-100% at concentrations higher than1.40bolus/10L as also reported by Ogueji *et al*., (2020). The 96 hours LC_{50} was recorded graphically at 1.35bol concentrations as shown in Graph 1.



Graph 1: $LC_{50,}$ Median lethal concentration = 1.35 bolus of Ashiver5 Ivermectin/10L

Behavioral changes in acute toxicity test

As shown in Table 3, the higher the concentration of Ashiver 5 Ivermectin bolus the fish were exposed to, the more the behavioral changes experienced by the fish. The fish showed aggressiveness, erratic swimming pattern, loss of reflex and change in color. These reactions increased with increase in concentrations used. This result corroborates Akin-Obasola *et. al*, (2022). However, at concentration 0bolus/10L, there was no form of aggressiveness, erratic swimming, loss of reflex and change in color but when the concentration increased to 1.60 and 1.80 bolus/10L, there was an abnormal increase in aggressiveness, erratic swimming, loss of reflex and change in color of the fish. This report support Bala *et. al*, (2024) when juvenile *Clarias gariepinus* was exposed to higher concentrations of atrazine.

Table 3: Behavioral changes in acute toxicity test of *Clarias gariepinus* within 96 hours bioassay.

Conc. (bolus of Ashiver5 Ivermectin/600±0.50g)	Aggressiveness	Eratic swimming	Loss of reflex	Change in colour
0	–	–	–	–
1.20	+	+	+	+
1.40	+	+	+	++
1.60	+	+	+	++
1.80	+	+	+	++

Key: Not present = -
Present = +
Highly present = ++

Histopathological findings

The gills, liver and skin of *Clarias gariepinus* exposed to higher concentration (1.80bolus/ 10L of water) of Ashiver 5 Ivermectin is as shown in the plates. There were deformation in the skin of *Clarias gariepinus* exposed to different levels of Ashiver 5 Ivermectin and this support Akin-Obasola, (2019) research who recorded deformation in the epidermal cells in the skin of *Clarias gariepinus* exposed to higher concentrations of petrol and engine oil mixture tested for acute and range finding and Akin-Obasola *et al*., (2022) who tested the effects of Caterpillar granules on *Clarias gariepinus* fingerlings. African catfish (*Clarias gariepinus)* had the presence of the toxicant in the gills and liver. This suggests that these organs could be useful as a marker for the presence of toxicants in the aquatic environment, this work corroborates Ray *et al.*, (1999) who recorded a high concentration of mercuric in the liver and other organs of *Clarias*

gariepinus while the concentration of mercuric in the tissues increased with its concentration in the aquatic environment and exposure time.

The increasing presence of pharmaceuticals and personal care products may exert detrimental impacts on aquatic life (Ogueji,*et al*., 2020). In the present study, HSI responded weakly in *Clarias gariepinus* exposed to ivermectin while there was no effect in CF. Some authors such as Al-Otaibi *et al*., (2018) have reported that pharmaceuticals, pesticides, metals and other substances induce changes in the HIS. Elela *et al*., (2025) reported that diclofenac, an anti–inflammatory drug causes a reduction in HSI of the freshwater fish Hoplias malabaricus whereas dexamethasone, another anti–inflammatory drug, had no effect on HSI. Other non-drug toxicants have also been reported to affect HSI. Hossain *et al*., (2016) reported an increase in HSI of common carp from 7- to 21 days of exposure to sumithion.

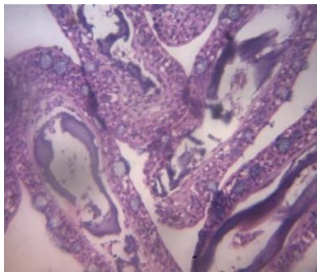


Plate 2: Plate 2a: Section of gills

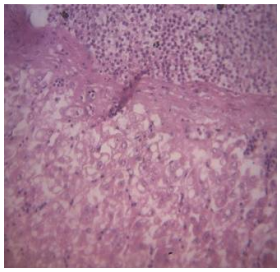


Plate 2b: Section of liver

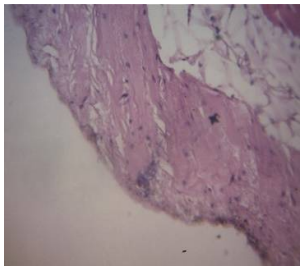


Plate 2c: Section of skin

Organoleptic test of *C. gariepinus* at 1.20/10L

Assessment of colour, taste, odour and texture were based on uncooked fish samples. Questionnaires for the panelists were prepared using the modified 5 - point hedonic scale described by Eyo (2001) as follows:

Table 4: Hedonic scale for organoleptic test of *C.gariepinus*

Modified scores	Remark
1-1.9	Unacceptable
2-2.9	Fair
3-3.9	Medium
4-4.9	Good
5-6.0	Very good

The test revealed very good colour, taste, odour and texture at 0, 24, 48, 72 and 96 hours except that the colour was milky black on the dorsal part at 96 hours and the texture was viscous at the same time.

Table 4: Organoleptic analysis of *C. gariepinus* at 1.20/10L concentration (lesser than LC_{50}: Median lethal concentration = 1.35 bolus of Ashiver5 Ivermectin/10L)

Time (Hours)	Colour	Taste	Odour	Texture
0	6	6	6	6
24	6	6	6	6
48	6	6	6	6
72	5	6	5	6
96	4.9	6	5	4.5

CONCLUSION AND RECOMMENDATIONS

The study concludes that Ashiver 5 Ivermectin is toxic to *Clarias gariepinus* at all concentration therefore there is a need for more work to set maximum permissible levels of medicines such as Ashiver 5 Ivermectin for fish meant for human consumption**.** Though Ivermectin has been recognised as one of the most widely used antiparasitic drugs in human and veterinary medicine, the present finding indicates that it is toxic and elicits alterations in the biometric, biochemical and oxidative stress parameters in the tissues of *Clarias gariepinus.*

The 96 hours LC_{50} value for *Clarias gariepinus* suggests that the fish showed a quick response to the toxicant therefore, the safe level (LC_{50}) of 1.35 bol/10L is recommended to fish farmers. The organoleptic analysis of the fish in concentration less than the LC_{50} revealed a very good quality fish.

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IMPACT OF NIGERIAN INCENTIVE-BASED RISK SHARING AND LENDING SCHEME (NIRSAL) LOAN ON WOMEN FARMERS' WELFARE STATUS IN OYO STATE NIGERIA

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ABSTRACT
The Nigerian Incentive-Based Risk Sharing and Lending Scheme (NIRSAL) aims to improve access to finance and technical assistance for smallholder farmers in Nigeria. The scheme has been implemented but the welfare status of women farmers beneficiaries is yet to be documented. Hence, this study assessed the impact of NIRSAL loan on women farmers' welfare status in Oyo state. Multistage sampling procedure was used to select 172 respondents for the study. The interview guide was used for data collection and analysed using mean, Chi-square, Pearson Product Moment Correlation and t-test. Respondents' age was 37.2±13.0 years with average family size and income of 4.8±1.5 persons and ₦28,091.16±₦21,669.0. The average loan acquired by beneficiaries was ₦457,233.40± ₦293,978.40. Level of knowledge on NIRSAL activities was higher among beneficiaries (91.8%). Bureaucracy and slow processing of loan applications ($\bar{X}$=1.64), delays in the disbursement of funds ($\bar{X}$=1.48), discriminatory practices against certain beneficiaries ($\bar{X}$=1.36), difficulty in validating information provided by counterparties ($\bar{X}$=1.29) were major constraints to accessing NIRSAL loans. More of beneficiaries (61.2%) were better-off. Household size (r=-0.313), income (r=0.152), educational qualifications (χ2= 12.482), knowledge of NIRSAL activities (r=0.433) and access to loan (r=0.336) significantly related to the welfare status of respondents. Significant variation (t= 11.2) existed between the welfare status of beneficiaries and non-beneficiaries. Nigerian Incentive Based Risk Sharing and Lending Scheme loan impacted more on the welfare of the beneficiaries. Establishing more accessible service points, improving outreach programs, and addressing discriminatory practices will improve the impact of the scheme.
Keywords: Beneficiaries of NIRSAL, women farmers, welfare status, loan

INTRODUCTION

Globally, agriculture has been identified as a major component in the achievement of the second Sustainable Development Goals - to eradicate extreme poverty and hunger (Kersten, Harms, Liket, and Maas 2017; United Nations, 2015), and as such the world's government has placed so much focus on the development of agriculture across the world. The agricultural sector in many developing countries is underperforming, in part because women, who represent a crucial resource in agriculture and the rural economy through their roles as farmers, labourers and entrepreneurs, face more severe constraints than men in access to productive resources (Shaikh and Shinde (2019).. Aggregate data shows that women comprise about 43 per cent of the agricultural labour force globally and in developing countries (Ejike, Osuji, Effiong and Agu, 2018). Women farmers often manage complex households and pursue multiple livelihood strategies. Women in rural areas often juggle multiple livelihood strategies, including crop and animal production, food processing, wage labour, and household management. Despite their contributions, structural inequalities continue to limit their access to agricultural opportunities and economic benefits. Women's economic security is rooted in the consistent ability to meet basic needs such as food, shelter, and education. Beyond these essentials, financial security includes access to education, vocational training, and employment opportunities.

Paid employment is one of the benchmarks for financial security, but in the circumstances where many women have either sporadic or minimal opportunities to engage in paid work or farming activities throughout their adult life, a government-provided, broadly based, financial safety net is essential if economic security for women is to be enhanced. Jones and Ejeta (2016) asserted that if the focus of the world's governments is to eradicate poverty using agriculture as a medium, new investment in agricultural research, and perhaps, technological developments directed towards enhanced agricultural farming systems are required. This is because about three-quarters of the world's poor live in rural areas The rural areas account for the majority of the agricultural products (crops and animal) consumed in the cities across the world. In the light of global population growth, estimated at 1.7% annually (World Bank, 2016), it is imperative that smallholder farmers shift from traditional methods to more technologically advanced and efficient systems (Ellinger and Penson, 2014). Lawanson (2018) posited that various researches conducted on the contribution of farmers to agricultural development in the country suggest that women's contribution to farm work is as high as between 60 and 90% of the total farm tasks performed. Despite their contributions, women are often excluded from certain occupational categories due to gender imbalance created by formal as well as informal barriers The formal barriers which continue to hinder the entry of women into such occupational categories include: lack of educational

or technical training, labour laws and trading customs; while the informal barriers include: customs and religious practices, difficulties in combining domestic and labour market activities, and management and worker attitudes (Adisa, Mordi, Simpson, and Iwowo, 2020) These obstacles also hinder women's access to financial services. Many are excluded from loan schemes due to lack of collateral, the small scale of their operations, or difficulties navigating complex administrative procedures. However, initiatives like the Nigerian Incentive-Based Risk Sharing Scheme for Agricultural Lending (NIRSAL) are beginning to address these issues. According to Sadiq and Akume (2021), even though the objectives of the NIRSAL COVID-19 loan scheme were not fully achieved, it significantly improved the livelihoods of beneficiaries and helped cushion the pandemic's impact on small enterprises.

Despite these positive strides, many Nigerian women farmers remain economically insecure and unaware of available financial opportunities. M'Kaibi, Steyn, Ochola, and Du Plessis (2017) noted that while some African countries, such as Kenya, have made progress in closing gender gaps through increased female participation in paid employment, disparities in income and access to financial resources persist. In Nigeria, awareness and uptake of NIRSAL's services remain uneven. While some farmers reported tangible benefits, others lacked knowledge of the programme entirely. This study was therefore undertaken to empirically examine the impact of NIRSAL loans on the welfare of women farmers in Oyo State. Specifically, it aims to describe their socio-economic profiles, assess their knowledge of NIRSAL, identify barriers to access, and compare welfare status between beneficiaries and non-beneficiaries. To achieve this, the study tests two hypotheses: first, that there is no significant relationship between socio-economic characteristics and welfare status; and second, that there is no significant difference in welfare status between NIRSAL beneficiaries and non-beneficiaries.

METHODOLOGY

The study was conducted in Oyo State, Nigeria—an inland state located in the southwestern region of the country. Its capital, Ibadan, is one of Nigeria's largest cities and was once the second most populous city in Africa. Oyo State shares borders with Kwara State to the north, Osun State to the east, and Ogun State and the Republic of Benin to the southwest. With a projected population of 7,840,864 as of 2016, the state ranks as the fifth most populous in Nigeria. The majority of its residents are Yoruba, and the Yoruba language dominates across communities. The economy is primarily agrarian, with production of key crops such as cassava, cocoa, and tobacco.

The study utilised a multistage sampling procedure. In the first stage, 40% of the agricultural zones in the state—Ibadan and Oyo—were purposively selected. This was followed by the random selection of three blocks from each zone: Oyo East, Afijio, Oyo West, Lagelu, Oluyole, and Akinyele. In the third stage, two cells were randomly selected from each block, after which women farmers within these cells were stratified into beneficiaries and non-beneficiaries of the NIRSAL programme. From each group, 30% of farmers were randomly selected, given 225 respondents (93 beneficiaries and 132 non-beneficiaries). Propensity Score Matching (PSM) was applied using the nearest neighbour method to control for selection bias, resulting in a matched sample of 172 respondents (85 beneficiaries and 87 non-beneficiaries). Primary data were collected through an interview schedule, and monthly household expenditures were estimated. Per Capita Expenditure (PCE) was calculated by dividing total household expenditure by household size, and welfare status was categorized using the National Bureau of Statistics (NBS, 2005) method. Respondents were classified as "worse-off" if their PCE fell below two-thirds of the mean, and "better-off" if it was above that threshold.

RESULTS AND DISCUSSION

The socioeconomic characteristics of the respondents in Table 1 show that the average age of the respondents was 37.2±13.0 years. Forty-three per cent of the respondents were within the age brackets of 31 and 40 years, while 29.7% and 27.3% of respondents were below 30 years and above 40 years, respectively. Disaggregated data reveal that the average age of beneficiaries was 35.6±10.8 years, and that of non-beneficiaries was 38.7±14.8. The result revealed that the average household size for all the respondents were 4.8±1.5 persons. Most (66.2%) of the respondents had household sizes between 4 and 6 persons, while 19.8% of respondents had households between 1 and 3 persons and 14.0 % had households of more than 6 persons. The average household size of beneficiaries and non-beneficiaries was 4.9 ±1.5 and 4.6 ± 1.5 respectively. This analysis implies that the average household size is relatively large having six person and even more. It also implies that the average household size of the beneficiaries is slightly higher than the average household size of the non-beneficiaries. This could indicate that households who receive benefits are likely to have more members, which could lead to greater economic burden on the household. This could mean that, even after receiving benefits, the households still struggle to meet their needs and provides for their household

members with the limited resources they have. This result is similar to that of Olutayo (2019) who reported a fairly large family size among rural households in Southwest, Nigeria. According to the findings in Table 1, it is evident that a significant proportion of the respondents have monthly incomes that fall below the national minimum wage, with 45.3% earning between ₦10,000 and ₦29,999. Furthermore, 31.4% of the respondents earn between ₦30,000 and ₦49,999, while 8.7% earn below ₦10,000 and 14.6% earn above ₦50,000. The average monthly income of the respondents was ₦28,091.16±₦21,669.0. By examining the disaggregated data in Table 1, it becomes evident that the average monthly income of NIRSAL beneficiaries was ₦33,229.41±₦22,273.94, whereas for non-beneficiaries, the average income is ₦24,672.41±₦20,308.50. The results suggest that the average monthly income of beneficiaries of the NIRSAL was higher than that of the non-beneficiaries. This implies that the NIRSAL scheme may have a positive impact on the income levels of women farmers who are beneficiaries of the program. This difference provides strong evidence that the increase in income among beneficiaries can be attributed to their access to and utilisation of loans provided through the NIRSAL scheme. The financial support offered by the programme appears to have enhanced the productive capacity of women farmers, enabling them to expand their farming activities and generate higher returns. This finding highlights the potential effectiveness of the scheme in improving the welfare status of beneficiaries.

Table 1: Socioeconomic characteristics of respondents

	Beneficiaries	%	Beneficiaries	%	Overall	%
Age						
<30		28.2		31.0		29.7
31-40 years		50.6		35.6		43.0
41-50 years		15.3		10.3		12.8
51-60 years		3.5		18.5		11.0
> 60 years		2.4		4.6		3.5
Mean±SD	35.6±10.8		38.7±14.8		37.2±13.0	
Household size						
1-3		11.3		24.1		19.8
4-6		70.6		62.1		66.2
>6		14.1		13.8		14.0
Mean±SD	4.9±1.5		4.6±1.5		4.8±1.5	
Income (N)						
<10,000		7.1		10.3		8.7
10,000-29,999		50.0		50.6		45.3
30,000-49,999		32.9		29.9		31.4
50,000 and above		20.0		9.2		14.6
Mean±SD	₦33,229.41± ₦22,273.94		₦24,672.41± ₦20,308.50		₦28,091.16 ±₦21,669.0,	

Source: Field survey, 2023

Respondent's level of knowledge of NIRSAL activities

Table 2 reveals a notable difference in the level of knowledge of NIRSAL activities among respondents. Overall, 54.7% of the respondents demonstrated a high level of knowledge, while 45.3% had a low level. However, when disaggregated, a significant disparity becomes evident: 91.8% of beneficiaries reported a high level of knowledge, in sharp contrast to 81.6% of non-beneficiaries who exhibited a low level of knowledge. This substantial gap suggests that the beneficiaries of NIRSAL initiatives are far more informed about the organisation's activities than non-beneficiaries. This disparity in knowledge is significant and may have important implications for economic welfare and access to opportunities. Those with a higher level of awareness are better positioned to engage with and benefit from NIRSAL's offerings, including financial support, training, and agricultural services. In contrast, limited knowledge among non-beneficiaries can hinder their ability to participate in such programs, potentially widening the gap in income and economic opportunities. Over time, this could exacerbate existing inequalities, especially among already disadvantaged groups, thereby reinforcing cycles of poverty and limiting the overall effectiveness of inclusive development efforts. This result aligns with the findings of Abebe (2020), who reported that farmers who participated in a cash-for-work and food-for-work programme in Ethiopia were better informed about the objective of the programme than the non-participants.

Table 2: Respondents' knowledge of NIRSAL activities

	Beneficiary %	Non-beneficiary %	Overall %	Min value	Max value	Mean±SD
Low (0-4.6)	8.2	81.6	45.3	0	10	4.7±2.2
High (4.7-10.0)	91.8	18.4	54.7			

Constraints to accessing NIRSAL loans among beneficiaries

Table 3 reveals a multitude of constraints that beneficiaries face in accessing NIRSAL loans. The top constraint was identified as bureaucracy and slow processing of loan applications, with a mean score of 1.64. This was closely followed by the delays in the disbursement of funds ($\bar{X}$=1.48). Other constraints included discriminatory practices against certain beneficiaries ($\bar{X}$ =1.36), difficulty in validating information provided by counterparties ($\bar{X}$ =1.29), and difficulty in coming up with good proposals ($\bar{X}$ =1.19). However, inadequate personnel ranked the least of these concerns, with a mean score of 0.72. This implies that bureaucratic and administrative processes are hindering potential beneficiaries from accessing NIRSAL loans, and that the process is slower than would be ideal when the goal is to effectively support women farmers. This can lead to psychological factors such as discouragement and disempowerment, as well as decreased income and financial hardship. Delays in the disbursement of funds can further exacerbate this issue, as women farmers may not be able to hold onto the opportunity once it has been presented. In addition, discriminatory practices and difficulty in validating information can further limit access to potential beneficiaries. Discriminatory practices against certain beneficiaries can also create tensions and negative attitudes towards the loan scheme, which can discourage affected groups from applying for the loans. These issues can have a profound negative impact on the welfare of these individuals if they are not addressed quickly in order to ensure that the loans are granted in a timely manner. This result aligns with the findings of Agbo, Iroh and Ihemezi (2015) that bureaucratic and administrative obstacles pose a significant hurdle for farmers when attempting to acquire loans from formal credit sources

Table 3: Constraints to accessing NIRSAL loan

Constraints	Not a constraint	Mild	Severe	Mean	Rank
Low rate of loan repayment	27.1	51.8	21.2	1.06	6th
Inadequate of fund for women farmers	30.6	41.2	28.2	1.02	7th
Delays in disbursement of funds to women farmers	68.2	11.8	20.0	1.48	2nd
Criticised for being discriminatory against certain beneficiaries and types of women farmer enterprises	41.2	54.1	4.7	1.36	3rd
NIRSAL are reluctant to give loans due to poorly packaged proposals from applicants	42.4	34.1	23.5	1.19	5th
Bureaucracy and slow processing of loan applications	77.6	8.2	14.1	1.64	1st
NIRSAL having difficulty in validating information provided by counterparties	40.0	49.4	10.6	1.29	4th
Lack of information technology infrastructure	7.1	67.1	25.9	0.81	8th
Inadequacy of personnel, insufficient training of required staff, and deficiencies in equipping the staff	10.6	51.8	37.6	0.72	10th
Misunderstandings around the modalities of the NIRSAL program operations	22.4	36.5	41.2	0.81	8th

Source: Field survey, 2023

Level of welfare status

Table 4 shows that overall, most (51.7%) were better off, while 48.3% were worse off. On the other hand, disaggregated data indicate that most (61.2%) of the beneficiaries of NIRSAL were better-off, while a large percentage (57.5%) of non-beneficiaries of NIRSAL were worse-off relative to their welfare status. This suggests that the Nigerian Incentive-Based Risk Sharing and Lending Scheme (NIRSAL) loan had an overall positive effect on the welfare of the beneficiaries, as most of them were better off than non-beneficiaries. Additionally, it indicates that the program may not have had as great an impact on those who were not beneficiaries, as a significantly larger percentage of them were worse off. The results thus suggest that the NIRSAL program was effective in helping the beneficiaries improve their well-being, while having a lesser effect on non-beneficiaries. This result is consistent with the findings of Alawode and Oluwatayo (2019) that beneficiaries of the agricultural financing

programme had better welfare than non-beneficiaries.

Table 4: Distribution according to welfare status of beneficiaries and non-beneficiaries of the NIRSAL scheme

Category	Beneficiary %	Non-Beneficiary %	Overall	Minimum	Maximum	Mean/SD
Low (<194,666,67)	38.8	57.5	48.3	59,666.67	196,666.67	₦114,771.26±24,329.35
High (≥196,666,67)	61.2	42.5	51.7			

Source: Field survey, 2023

Relationship between selected socioeconomic characteristics and respondents' welfare status

Results from Table 5 indicate that there is a significant negative relationship between household size and the welfare status of respondents ($r = -0.313$, $p < 0.05$). Similarly, a significant relationship exists between respondents' monthly income ($r = 0.152$, $p< 0.05$). This aligns with the findings of Akaakhol and Aye (2014) that access to credit increases farming households' welfare. These results suggest that access to loans and other sources of financial aid may be an important factor in improving the welfare status of women farmers. This finding is line with the study of Lakhan, Channa, Magsi, Koondher, Wang and Channa (2020), who reported an inverse relationship between family size and farmers' welfare status.

Table 5: Relationship between selected socioeconomic characteristics and respondents' welfare status

Variables	r-value	p-value	Decision
Household size	-0.313	0.001	Significant
Farm size	0.006	0.940	Not significant
Income	0.152	0.018	Significant
Loan from NIRSAL	0.411	0.004	Significant

Source: Field survey, 2023

Relationship between selected socioeconomic characteristics and respondents' welfare status. The Chi-squared analysis as shown in Table 6 suggests that only the respondents' educational qualifications were significantly associated with their welfare level ($\chi 2= 12.482$, p0.05). This implies that educational qualifications are key to the welfare level of respondents. Women farmers with higher educational qualifications are more likely to have a higher welfare level compared to those who have lower educational qualifications. This result corroborates the finding of Daudu, Abdoulaye, Bamba Shuaib and Awotide (2023) that a significant relationship exists between educational qualification and farmers' welfare status.

Table 6: Chi-square analysis showing the relationship between selected socioeconomic characteristics and respondents' welfare

	χ 2	df	p-value	Decision
Education	12.482	3	0.029	Significant
Marital status	0.394	2	0.821	Not significant
Mode of land acquisition	5.363	3	0.147	Not significant

Source: Field survey, 2023

Difference in welfare status of beneficiaries and non-beneficiaries

Table 7 shows that there is a significant difference in the welfare status of beneficiaries and non-beneficiaries of NIRSAL scheme ($F= 41.3$, $p<0.05$). This implies that the women farmers who benefited from the NIRSAL scheme have a better welfare status compared to those who did not benefit. The result suggests that the NIRSAL scheme has had a positive impact on the welfare of women farmers. There could be several factors responsible for this result. Firstly, the NIRSAL scheme may have provided financial support to women farmers, allowing them to invest in their farms and improve their productivity. This could lead to higher incomes and an improved welfare status. Secondly, the NIRSAL scheme may have provided training and technical assistance to women farmers, improving their knowledge and skills in farming practices. This could result in higher yields and greater efficiency, leading to improved welfare. This corroborates the finding of Sadiq and Akume

(2021) that the NIRSAL scheme has a significant positive impact on the socio-economic well-being of the recipients and their family members.

Table 7: t-test analysis showing the variation in welfare status of beneficiaries and non-beneficiaries

	N	Mean	Standard deviation	Standard error	t	df	P
Beneficiaries	85	130221.18	23385.71	2536.54	11.2	170	0.000
Non-beneficiaries	87	98808.43	11434.22	1225.88			

CONCLUSION AND RECOMMENDATIONS

The study revealed that the income levels were relatively low. Beneficiaries of the NIRSAL scheme were more knowledgeable about its activities but faced challenges such as bureaucratic processes, delays in loan disbursement, and difficulty in validating information. However, their overall welfare status was better compared to non-beneficiaries. The findings also indicated that factors such as educational qualification, income, knowledge, and access to NIRSAL activities contributed to the improved welfare of women farmers. Conversely, larger household sizes and constraints in accessing NIRSAL activities were associated with lower welfare status. The findings underscore the importance of considering factors such as educational qualification and income when targeting beneficiaries for the NIRSAL scheme.

Based on the findings of the study, the following recommendations are hereby provided:

1. There is a need to address the challenges faced by beneficiaries, such as bureaucratic processes and delays in loan disbursement. Hence, there is a need to streamline these processes and ensure timely disbursement of funds to enhance the effectiveness of the scheme in supporting women farmers.
2. While beneficiaries were more knowledgeable about NIRSAL activities, there is still a need to enhance awareness of loan under NIRSAL scheme among both beneficiaries and non-beneficiaries. NIRSAL should invest in targeted communication strategies to ensure that women farmers are well-informed about the scheme's benefits, eligibility criteria, and application processes.
3. NIRSAL should provide clearer guidelines and support mechanisms to assist women farmers in providing accurate and verifiable information during the loan application process.
4. NIRSAL should consider designing targeted interventions and support programs that address the specific needs and capacities of women farmers with lower income levels.

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COPING STRATEGIES EMPLOYED FOR FOOD SECURITY AMONG URBAN HOUSEHOLDS IN IBADAN METROPOLIS, OYO STATE, NIGERIA

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ABSTRACT
Food security is a critical issue faced by urban households due to various factors such as limited access to fresh and affordable food, rising food prices, and reliance on external food sources. It therefore becomes imperative to determine the coping strategies employed for food security among urban households in Ibadan Metropolis, Oyo State, Nigeria. A multistage sampling procedure was used to select 101 respondents for the study and data collected through questionnaires were analysed using both descriptive such as frequency and percentage and inferential statistics such as Pearson Product Moment Correlation (PPMC). Results show that the respondents' mean age was 32±10 years; while 69.3% were female; with 57.4% and 49.5% practicing Islamic religion and married, respectively. Mean household size was 5±3 persons; majority of the respondents (72.3%) had tertiary education; 26.7% engaged in trading; majority of the respondents (54.5%) were not engaged in secondary occupation, and majority earn a mean monthly income of N95, 000±50,000. The more than half of the respondents (54.5%) had low levels of household food security. The findings shows that the most severe constraint faced by the majority of respondents was inflation, specifically the high cost of food and groceries, with a mean score of 1.15, ranking it first. This was followed by seasonal or unforeseen food shortages, which had a mean score of 0.92 and was ranked second. A reduction in annual income emerged as the third major constraint, with a mean score of 0.86. Lastly, conflict and insecurity were identified as the fourth most significant challenge, with a mean score of 0.70.The majority of respondents employed rationing money between food and other necessities (0.97) as coping strategies. Constraints faced by urban households in ensuring food security correlated with coping strategies employed by households in the study area ((r=0.505, p=0.001)). The study concludes that rationing money between food and other necessities was the most used coping strategies in ensuring food security in the study area. It is therefore recommended that households adopt basic budgeting and financial literacy training tailored to low-income and rural populations.
Keywords: Coping Strategies, Food Security, Urban Households, Ibadan Metropolis.

INTRODUCTION

Food security is achieved when all individuals, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs for an active and healthy life (Sumsion *et al*., 2023). The Food and Agriculture Organisation (FAO, 2024) echoes this in its report *The State of Food Insecurity in the World*, emphasising consistent access to adequate quantity and quality of food. Despite global efforts, food insecurity remains a pressing issue, particularly in sub-Saharan Africa. The World Food Programme (2022) estimates that over 828 million people go to bed hungry each night, with 278 million of them residing in Africa—equivalent to about 20% of the continent's population. The World Bank (2022) also highlights that approximately one in five Africans experience daily hunger, with about 140 million facing acute food insecurity, making Africa's food insecurity rate twice the global average.

In Nigeria, urban centers like Ibadan, a major metropolitan hub in the southwest, are not spared from the growing food insecurity crisis. Despite its strategic location, commercial vibrancy, and population strength, Ibadan grapples with challenges such as high food prices, infrastructural deficits, widespread poverty, and the far-reaching effects of climate change. The increasing rural-to-urban migration also puts additional pressure on the city's already strained food system. Nationally, over 53 million Nigerians—about 30% of the population—are estimated to be food insecure (Oni *et al*., 2022), and 70% of the population live below the poverty line. This situation marks a sharp contrast to pre-oil boom Nigeria, when the country was largely food self-sufficient (Fawole and Ozkan, 2018). Over the years, food-insecure households in Nigeria have risen steeply, from 18% in 1986 to over 40% by 2005 (Oni *et al*., 2022), reflecting a deepening crisis.

A number of structural issues contribute to this worsening situation. These include poor access to agricultural credit, land scarcity, declining soil productivity, limited off-farm income opportunities, and inadequate food storage and processing infrastructure (Abhulimen *et al*., 2021). In cities like Ibadan, where many households depend entirely on markets for food, these problems are intensified. Urban households are particularly vulnerable to fluctuations in food prices and supply disruptions. Nigeria currently ranks 103rd out of 121 countries on the Global Hunger Index (2022), with a score of 27.3, indicating a serious level of hunger. The COVID-19 pandemic further compounded the problem, pushing millions more into severe food insecurity (Omotayo *et al*., 2022). In these settings, food insecurity often leads to poor nutrition, compromised health, and weakened human capital, especially in low-income urban communities.

To cope with food insecurity, many urban households in Ibadan resort to a mix of behavioral and cognitive strategies (Lazarus and Folkman, 2019). These include rationing food, skipping meals, consuming less-preferred foods, and stretching limited income across multiple needs. Some engage in informal work to supplement their income, while others make psychological adjustments to endure hunger. Although these strategies may offer temporary relief, they carry long-term implications for nutrition, child development, and overall well-being (Thomas *et al*., 2019). Maxwell and Caldwell (2018) caution that while coping mechanisms may mask the depth of food insecurity, they are not sustainable substitutes for structural solutions. Against this backdrop, the present study sought to explore the nature and extent of food insecurity in Ibadan by describing the socio-economic characteristics of respondents, identifying the constraints they face, assessing household food security levels, and documenting the coping strategies they employ. The study also tested the hypothesis that there is no significant relationship between the constraints faced by urban households and the coping strategies they adopt to manage food insecurity.

METHODOLOGY

The study was conducted in Ibadan, Oyo State, Nigeria. Ibadan, the capital city of Oyo State, is the third most populous city in Nigeria after Lagos and Kano, and it holds the distinction of being the largest in terms of landmass. Geographically, the city lies approximately at longitude 3°55′00″ East and latitude 7°23′47″ North, about 128 kilometres northeast of Lagos. Ibadan falls within the tropical wet and dry climatic zone, experiencing a lengthy wet season, stable temperatures averaging 26.46 °C, and relative humidity of 74.55% (Jagtab and Alabi 1997a). The city comprises eleven local government areas (LGAs), with five designated as urban: Ibadan North, Ibadan Northeast, Ibadan Northwest, Ibadan Southeast, and Ibadan Southwest. The study focused on the urban LGAs, where the estimated population of the metropolitan area is around 4,144,130 in the year 2025 (World Population Review, 2025). The study population consisted of all heads of urban households—particularly mothers—residing in the Ibadan metropolis.

A multi-stage sampling procedure was adopted to select respondents. In the first stage, two out of the five urban LGAs—Ibadan North and Ibadan Southwest—were randomly selected, representing 40% of the LGAs. The second stage involved the random selection of one ward from each selected LGA, yielding Ward 11 in Ibadan North and Ward 08 in Ibadan Southwest. These wards comprised a total of 1,010 households, from which 10% (101 households) were randomly selected. All selected household heads (mothers) were surveyed using a structured questionnaire designed to address the study objectives. To ensure the validity of the instrument, it was subjected to face and content validation by academic experts from the Department of Agricultural Extension and Rural Development at the University of Ibadan. The reliability of the instrument was confirmed using the split-half method, resulting in a reliability coefficient of 0.80. Data analysis was conducted using SPSS, applying both descriptive statistics (frequency, mean, standard deviation, percentages) and inferential statistics such as Pearson's Product Moment Correlation (PPMC).

The dependent variable for the study was the coping strategies adopted by households to manage food insecurity. Respondents were asked to identify strategies they had used in the past 30 days when food was insufficient or when there was no money to purchase food. These strategies included borrowing food or money, eating with relatives, skipping meals, purchasing on credit, reducing meal portions or quality, consuming less-preferred food, and not eating for an entire day. Following Kyaw (2009), an index of coping strategies was calculated based on the frequency and diversity of strategies used. Each strategy was weighted by its frequency of use per month: households that never used any strategy were scored 0; those that used strategies 1–2 times were scored 1 (low index); and those using strategies 3–4 times or more were scored 2 (high index). This classification enabled the categorization of households into two groups—those with low coping strategy index (used strategies occasionally) and those with high coping strategy index (used strategies frequently), indicating extreme food insecurity.

RESULTS AND DISCUSSION

Socioeconomic characteristics

The socio-economic characteristics of respondents as presented in Table 1 show that the majority (45.5%) were aged 40–49 years, followed by 28.7% aged 30–39, 18.8% aged 20–29, and 6.9% aged 50 and above, with a mean age of 32±10 years, indicating a predominantly youthful population in their active years, consistent with Victoria and Benjamin (2012). Most respondents (69.3%) were female, aligning with Olajide *et al*. (2016) who noted the greater involvement of women in food-related responsibilities. The household size averaged 5±3 persons, with most households (55.4%) having 4–6 members, a size that could support family labour but also increase food demand, in line with Ifeoma and Agwu (2018). Regarding education, a significant majority (72.3%) had tertiary education, suggesting a high literacy level that may positively influence food security coping strategies, as supported by Tashikalma *et al*.

(2015). Primary occupation data showed 26.7% were traders, 25.7% students, 14.9% artisans, and smaller proportions in civil service, self-employment, and teaching, while 54.5% had no secondary occupation; among those who did, trading (12.9%) and student status (10.9%) were common. Monthly income revealed that 47.5% earned less than ₦50,000, with an average income of ₦95,000±₦50,000, indicating a relatively high-income bracket among respondents, supporting Ogedegbe's (2016) assertion that income level can enhance the adoption of food security strategies.

Table 1: Distribution of respondents based on Socio-economic characteristics (n=101)

Variables	Frequency	Percentage	Mean	SD
Age			28	10
20-29	19	18.8		
30-39	29	28.7		
40-49	46	45.5		
50 and above	7	6.9		
Sex				
Male	31	30.7		
Female	70	69.3		
Household size			5	3
1-3	35	34.7		
4-6	56	55.4		
7-9	7	6.9		
Above 9	3	3.0		
Level of education				
Secondary education	28	27.7		
Tertiary education	73	72.3		
Primary occupation				
Trading	27	26.7		
Students	26	25.7		
Civil servant	12	11.9		
Self-employed	12	11.9		
Teaching	9	8.9		
Artisans	15	14.9		
Secondary occupation				
None	55	54.5		
Trading	13	12.9		
Students	11	10.9		
Self-employed	8	7.9		
Teaching	3	3.0		
Artisans	11	10.8		
Monthly income			49,000	45,000
Less than 50,000	48	47.5		
50,000-100,000	22	21.8		
100,001-150,000	16	15.8		
150,001-200,000	7	6.9		
Above 200,000	9	7.9		

Source: Field Survey 2023

Level of household food security among urban households in the study area

Table 2a reveals a significant level of food insecurity among urban households in the study area over the past four weeks. A considerable proportion of respondents (43.6%) reported that they *rarely* ate smaller meals (1–2 times) than they felt they needed due to insufficient food availability. Similarly, 42.6% indicated that they had to eat fewer meals in a day because there was not enough food to go around, reflecting the pressure households face in managing limited food resources. Furthermore, 39.6% stated that they were compelled to eat foods they did not desire due to a lack of resources to obtain their preferred options, while another 39.6% had to consume whatever food was available in their homes for the same reason. Additionally, 37.0% reported eating a limited variety of food, a common symptom of food insecurity, which often leads to poor dietary diversity and nutritional deficiencies. Alarmingly, 36.6% of the respondents expressed concerns that their household might not have enough food, while an equal proportion stated they were unable to eat their preferred types of food due to

financial constraints. These indicators underscore the multidimensional nature of food insecurity, encompassing not only food quantity but also quality, variety, and emotional stress related to food access.

Table 2b further categorizes the level of household food security, showing that the majority of respondents (54.5%) fall into the *low food security* category, while only 45.5% were classified as having *high food security*. This distribution reflects a worrying trend in urban food systems, particularly in metropolitan areas like Ibadan, where rapid urbanization, fluctuating income levels, and rising food prices exacerbate vulnerability to food insecurity. The dominance of low food security among respondents indicates that many households struggle to maintain consistent access to sufficient and nutritious food, often resorting to negative coping strategies such as skipping meals, reducing food variety, or consuming less-desirable foods. These findings align with those of Danmaigoro, Yahaya, and Maikasuwa (2020), who also observed that a significant proportion of urban households in their study exhibited low levels of food security, suggesting that food insecurity is not only persistent but also widespread in urban Nigeria.

This situation is indicative of broader structural issues, including economic instability, insufficient household income, limited access to food markets, and inadequate social protection systems. The results also highlight the urgent need for targeted interventions and policies to address urban food insecurity through strategies such as urban agriculture promotion, food price stabilization, improved livelihood opportunities, and enhanced social safety nets. Importantly, food security is not merely about availability but also about accessibility, affordability, and nutritional adequacy, all of which appear to be compromised for a significant number of households in the study area. Hence, addressing food insecurity in Ibadan and similar urban settings requires a multidimensional and inclusive approach that takes into account both economic and social determinants of food access.

Table 2a: Distribution Respondents' based on the household's food security in the study area (n=101)

Questions	Always	Sometimes	Rarely	Never	Mean
In the past 4 weeks (30 days), how often do you worry that your household would not have enough food	2.0	30.7	36.6	30.7	1.03
In the past 4 weeks (30 days), how often were you or any household member not able to eat the kinds of food you preferred because of a lack of resources	5.0	32.7	36.6	25.7	1.16
In the past 4 weeks (30 days), how often did you or any household member have to eat a limited variety of foods due to a lack of resources	4.0	35.6	37.0	22.8	1.30
In the past 4 weeks (30 days), how often did you or any household member have to eat some food that you really did not want to eat because of a lack of resources to obtain other types of food	1.0	29.7	39.6	29.7	1.01
In the past 4 weeks (30 days), how often did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food	2.0	18.8	3.6	35.6	0.87
In the past 4 weeks (30 days), how often did you or any household member have to eat fewer meals in a day because there was not enough food	3.0	20.8	42.6	33.7	0.93
In the past 4 weeks (30 days), how often was there ever no food to eat of any kind in your house because of lack of resources to get food	2.0	4.0	39.6	54.5	0.53
In the past 4 weeks (30 days), how often did you or any household member go to sleep at night because there was not enough food	1.0	6.9	26.7	65.3	0.43
In the past 4 weeks (30 days), how often did you or any household member for a whole day and night without eating anything because there was not enough food	1.0	5.9	13.9	79.2	0.28

Source: Field Survey 2023

Table 2b: Categorization of the level of household food security among urban households in the study area (n=101)

Level of household food security	Frequency	Percentage	Minimum	Maximum	Mean	SD
Low (0-7.4)	55	54.5	0	22	7.5	3.2
High (7.5-22)	46	45.5				
Total	101	100.0				

Source: Field Survey, 2023

Constraints faced by households in ensuring food security in the study area

Table 3 highlights the major constraints undermining food security among urban households in the study area, with inflation—particularly the rising cost of food and groceries—emerging as the most severe challenge($\bar{x}$ = 1.15). This underscores the impact of Nigeria's persistent economic instability, where inflation has significantly reduced household purchasing power, limiting access to sufficient and nutritious food. Seasonal and unforeseen food shortages followed closely ($\bar{x}$ = 0.92), reflecting the consequences of climate variability, poor storage infrastructure, and inefficient supply chains that disrupt food availability and fuel price volatility in urban markets. A reduction in annual household income ($\bar{x}$ = 0.86) ranked third, pointing to the financial vulnerability of family's dependent on unstable or low-wage jobs—a trend consistent with widespread underemployment across the country. Conflict and insecurity ($\bar{x}$ = 0.70) also presented a considerable barrier, highlighting how social unrest indirectly affects food access through disrupted supply routes and heightened market uncertainty. On the other hand, less impactful constraints included the death of a breadwinner ($\bar{x}$ = 0.43) and cultural restrictions like food taboos ($\bar{x}$ = 0.38), which, though still relevant, affected fewer respondents and appeared more situational than systemic. Overall, the findings reflect a complex web of economic, environmental, and social factors influencing food security in urban Nigeria, reinforcing the urgent need for multidimensional policy interventions—including inflation control, income stabilization, improved food systems, and stronger social safety nets—to enhance household resilience and ensure long-term food access.

Table 3: Constraints faced by Respondents in ensuring food security in the study area (n=101)

Constraints	Severe	Mild	Not a constraint	Mean
Inflation (high cost of food and groceries)	31 (30.7)	55 (54.5)	15 (14.9)	1.15
Reduction in annual income	19 (18.8)	49 (48.5)	33 (32.7)	0.86
Seasonal/unforeseen food shortages	16 (15.8)	61 (60.4)	24 (23.8)	0.92
Culture (food taboo, etc.)	4 (4.0)	23 (22.8)	74 (73.3)	0.30
Unemployment	19 (18.8)	29 (28.7)	53 (52.5)	0.66
Storage facilities	13 (12.9)	40 (39.6)	48 (47.5)	0.65
Conflict/insecurity	15 (14.9)	41 (40.6)	45 (44.6)	0.70
Death of breadwinner	13 (12.9)	18 (17.8)	70 (69.3)	0.43

Source: Field Survey, 2023

Coping strategies employed by households for food security in the study area

Table 4a presents a variety of coping strategies adopted by households in the study area to navigate food insecurity, revealing the difficult compromises families often make to sustain access to food. The most frequently employed strategy was rationing money between food and other basic needs ($\bar{x}$ = 0.97), reflecting the intense financial pressure on households to balance limited resources across essentials like healthcare, housing, and education. This was followed by reducing the quality ($\bar{x}$ = 0.78) and quantity ($\bar{x}$ = 0.77) of food consumed and turning to less-preferred food options ($\bar{x}$ = 0.73), indicating that dietary compromises are a common short-term response to financial stress. However, more severe measures such as borrowing money for food ($\bar{x}$ = 0.26), buying on credit ($\bar{x}$ = 0.26), or skipping meals for an entire day ($\bar{x}$ =0.25) were less frequently used, possibly due to the stigma, social discomfort, or risks associated with such actions. Table 4b further shows that 53.5% of respondents fell into the low-level coping strategy category, while 46.5% utilised high-level strategies, suggesting that although a majority have not yet resorted to extreme measures, a significant portion are engaging in behaviors that could undermine their long-term health and resilience. These findings align with Oluwaseun (2015), who observed that many urban households rely on market-based food purchases and lack sustainable coping mechanisms. Altogether, the data underscores the urgent need for policy interventions such as targeted food aid, livelihood support, and community-based nutrition

programs to prevent further deterioration in food security among vulnerable urban populations.

Table 4a: Coping strategies employed by households in the study area (n=101)

Coping strategies	Never	Occasionally	Always	Mean
Eating meals at the homes of friends or relatives	54.5	45.5	-	0.45
Borrowing money for food from friends or relatives	69.3	29.7	1.0	0.31
Purchasing food on credit	75.2	22.8	2.0	0.26
Skipping meals	42.6	51.5	5.9	0.63
Rationing money between food and other necessities	19.8	63.4	16.8	0.97
Reducing the quality of food prepared and consumed in your household	30.7	60.4	8.9	0.78
Reducing the quantity of food prepared and consumed in your household	30.7	61.4	7.9	0.77
Not eating for a whole day	80.2	13.9	5.9	0.25
Consumption of less-preferred food	4.0	65.3	30.7	0.73
Reduction of food served to children	63.4	31.7	5.0	0.41

Source: Field Survey, 2023

Table 4b: Categorization of coping strategies employed by households in ensuring food security the study area (n=101)

Level of coping strategies Employed	Frequency	Percentage	Minimum	Maximum	Mean	SD
Low (0-5.5)	54	53.5	0	16	5.6	3.3
High (5.6-16)	47	46.5				
Total	101	100.0				

Source: Field Survey, 2023

Pearson correlation results between constraints faced by urban households and coping strategies employed by households in the study area

Table 5 shows that a significant relationship exists between constraints faced by urban households (r=0.505, p=0.001) and the coping strategies employed for food security in the study area. This implies that the more the respondents faced severe constraints in ensuring food security, the less they tend to utilise the coping strategies in the study area

Table 5: Pearson correlation results between constraints faced by urban households in ensuring food security and coping strategies employed by households (n=101)

Variables	r value	p value
Constraints faced/coping strategies	0.505	0.001

Source: Field Survey, 2023

CONCLUSIONS AND RECOMMENDATIONS

The study concludes that rationing money between food and other necessities was the most used coping strategies in ensuring food security in the study area. Majority of the respondents had low level of household food security. They were faced with constraints such as inflation (high cost of food and groceries), seasonal/unforeseen food shortages, reduction in annual income and conflict/insecurity. The constraints faced influenced the coping strategies employed for food security in the study area.

Based on the findings of this study, the following recommendations:

1. Government and development agencies should introduce food subsidy schemes or price control mechanisms, especially on staple foods, to cushion the effect of inflation and make essential food items more affordable for vulnerable urban households.
2. Government and relevant stakeholders should organise programs that support household income stability, such as conditional cash transfers, skills development, and access to credit for small businesses, particularly for women-headed households, to reduce reliance on negative coping strategies.
3. The government through extension services should promote backyard gardening, urban farming, and community-based food production can lessen the impact of seasonal shortages and lessen household reliance on erratic food markets.
4. Government and relevant stakeholders should invest in strategic food reserves and improve market infrastructure to ensure

food availability during unforeseen shortages or periods of conflict and insecurity.

5. In order to combat food insecurity, peace building initiatives and conflict-sensitive policies are needed to safeguard food supply chains, particularly in regions that are prone to crises, while also setting up early warning and response mechanisms for households that are at danger.

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SMALLHOLDER FARMERS' PERCEPTION OF SUSTAINABLE AGRICULTURAL PRACTICES (SAP) IN ILORIN EAST LGA, KWARA STATE, NIGERIA

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ABSTRACT
The study examined Smallholder farmers' perception of sustainable agricultural practices (SAP) in Ilorin East LGA, Kwara State, Nigeria. The study specifically examined the socio-economic characteristics of respondents, identified farmers' sources of information on SAP, examined farmers' perception of SAP, and identified the constraints faced by farmers in the adoption of SAP. Using a multistage sampling procedure, a total of 175 smallholder farmers were sampled. The primary data was obtained through interview schedule. The obtained data collected were analysed using descriptive statistics such as frequency count, percentages, mean, and standard deviation; and inferential statistic used was Logit regression. The mean age was 43.2 years with standard deviation of 10.4, and majority were males (63.4%) and married (61.7%). Only 12.5% lacked formal education, a total of 87.4% had formal education and extension agency (86.2%) was the most common source of information on SAP. Respondents had a favourable perception towards SAP such as low chemical input (±4.51), minimise adverse effects on health, safety, wildlife, water quality and environment (±4.42) and abundant food production without depleting the earth's resources (±4.41). Foremost constraints include …Lack of awareness of SAPs (M = 2.73) and Lack of adequate capital for SAPs (M= 2.70). It is therefore concluded that most of the farmers perceive SAPs as beneficial, with only a few disagreeing and their main. sources of information on SAPs are extension agencies, providing farmers with accurate and relevant information to improve farmers' understanding of SAPs, their benefits and implementation by Ministry of Agriculture and relevant Agricultural agencies is recommended.
Keywords: Sustainable Agricultural Practices (SAP), smallholder farmers, perception and extension Services.

INTRODUCTION

Agriculture is a crucial driver of economic growth and progress, especially in developing countries where most people rely on it for their income and sustenance. Smallholder farmers produce most of the food in low-income and developing countries, forming the backbone of Nigeria's food supply (Chiaka *et al*., 2022). Agriculture provides food for the population, ensuring food security and reducing dependence on imports. However, the sector faces numerous challenges, including climate change, soil degradation, and economic instability. To address these challenges and ensure long-term agricultural sustainability, the perception of sustainable agricultural practices is essential. Sustainable agricultural practices encompass a range of techniques and approaches aimed at maintaining or enhancing agricultural productivity while minimising negative environmental impacts (Food and Agriculture Organisation, 2020). These practices include organic farming, agroforestry, integrated pest management, conservation agriculture, and efficient water management, among others. Agricultural Intensification can lead to environmental degradation and decreased crop yields if not managed sustainably.

Soil degradation particularly top soil removal, has far-reaching consequences for both soil productivity and environmental health, exacerbating land degradation, disrupting nutrient cycling and impacting biodiversity Jose Telo da Gama's (2023). Farmers' perception of sustainable agriculture is a crucial aspect of promoting environmentally friendly practices.

A study by R. G. Adeola and S. I Adetunbi (2022) found that smallholder farmers in South-Western Nigeria perceive sustainable agriculture as a profitable venture that can provide a healthy family income and improve the rural economy. They realized its potential as an alternative to industrial agriculture, which often favors rich farmers at the expense of poor ones. These studies highlight the importance of understanding farmers' perceptions and contexts to promote sustainable agriculture effectively.

Smallholder farmers in sub-Saharan Africa have varying perceptions about sustainable agricultural practices (SAPs). While some see the benefits, others have negative perceptions. Many smallholder farmers lack knowledge about SAPs, which influences their perception of these practices. According to Ally Sithole and Oluwasogo David Olorunfemi's (2024) study, challenges such as land tenure insecurity, lack of knowledge, and training shape farmers' perceptions.

Some farmers perceive SAPs like conservation tillage and agroforestry as labor-intensive. A study by Sithole and Olorunfemi, 2024) found that smallholder farmers in Nigeria had negative perceptions about conservation agriculture due to its perceived labor requirements.

Many smallholder farmers prefer traditional farming practices, which they are familiar with. This preference can lead to negative perceptions about SAPs, which are seen as unfamiliar or complicated.

According to Danso-Abbeam *et al*. (2022), Ghanaian farmers showed a strong preference for traditional seed varieties, indicating a potential bias towards familiar practices.

This study is justified by the urgent need to address environmental degradation caused by unsustainable agricultural practices. Smallholder farmers often rely on traditional farming methods that involve excessive use of chemical fertilizers, pesticides, and improper land management techniques. These practices contribute to soil erosion, water pollution, loss of biodiversity, and greenhouse gas emissions. By examining their perception of sustainable agricultural practices, this study can identify effective strategies to mitigate environmental degradation and promote sustainable resource management.

The findings of this study will contribute to evidence-based policy recommendations to overcome perception barriers and promote sustainable farming in the region. Additionally, this study is justified by the potential for knowledge transfer and capacity building. By conducting thorough research on smallholder farmers' perception of sustainable agricultural practices, valuable insights can be generated for dissemination among farmers, agricultural extension workers, and other stakeholders.

The objectives of the study are as follows:

1. examine the socio-economic characteristics of the respondents;
2. identify farmers' sources of information on SAP;
3. examine smallholder farmers' perception of SAP in the study area;
4. identify the constraints to the perception of SAP in the study area.

METHODOLOGY

The research was carried out in Ilorin East Local Government Area (LGA) in Kwara State, Nigeria. The research employed a multi-stage sampling procedure to select participants. In the first stage, Ilorin East LGA was purposively selected in order to understand specific challenges, opportunities, and cultural context that shape smallholder farmers' perception of SAPs. In the second stage, five (5) villages were randomly selected from Ilorin East LGA, namely, Oke-oyi, Oloje, Ogidi, Isale Osin, and Okelele villages. In the third stage, a simple random sampling was used to select 40% of the registered smallholder farmers from each of the five randomly selected villages in Ilorin East LGA to give a total of One Hundred and seventy-five (175) respondents. The comprehensive breakdown of the total number of selected participants for the study includes: Oke-oyi = 58, Oloje = 29, Ogidi = 25, Isale Osin = 28, and Okelele = 35. The list of registered smallholder farmers was obtained from the Kwara State Agricultural Development Project (ADP), Nigeria. An interview schedule was used for data collection. The data were elicited through an interview schedule and analysed using both descriptive and inferential statistics such as frequency counts, percentages, means, ranks, charts and Logit regression.

RESULTS AND DISCUSSION

Socioeconomic characteristics

Results from Table 1 reveals that a higher proportion were males (63.4%) compared to females (36.6%), This implies that majority of the smallholder farmers in the area are male, a fact that suggests that males are more involved in farming than their female counterparts in the study area. The Respondents' age distribution shows that majority (44.0%) of the respondents are within the age of 31-40 years (22.3%) between 41-50 years, while the mean age was 43.2 years, Which implies that most of the smallholder farmers sampled are in their productive age and this is expected to have a positive influence on their level of perception of various sustainable agricultural practices, this is in line with the study of Danso-Abbeam *et al.* (2022) who found out that farmers' perception of SAPs are influenced by factors such as age. In terms of Marital status, (61.7%) of the respondents were married, suggesting that most respondents were responsible and knowledgeable in their perception of sustainable agricultural practices in respect to farming in the study area. Regarding educational attainment, About 12.5% of the respondents had no formal education with 44.5%, 34.9%, and 8.0% of the respondents having primary, secondary and tertiary education respectively. This suggests that most of the farmers in the study area are moderately literate which shows that they may have a better understanding of SAPs leading to a more positive perception, Muma *et al.*, (2022) found out that education and knowledge of SAPs can influence perception. Majority (61.1%) of the respondents have more than 15 years of farming experience, implying most of the respondents have extensive farming experience; hence farmers are more likely to make choices that will boost their output and income. Furthermore, majority (73.1%) of the respondents were not registered members of any cooperative society while the remaining (26.9%) were registered members Alalade et. al. (2019) in their study asserts that most of the activities carried out in agricultural production are influenced by membership of formed group and so, creating an enabling environment for farmers to have access to come up with innovative ideas on sustainable agricultural practices to solving problems regarding agricultural production as well as make key decisions that affects them. The implication for respondents not belonging to any cooperative society is that they only get to handle challenges in agricultural production singly since they operate at individual level. This could lead to inefficiency in the allocation and use of resources consequently leading to low production.

Table 1: Socio-economic characteristics of the respondents (n=175)

Variables	Category	Percent
Age (in years)	≤ 30	9.14
	31 – 40	44.0
	41 – 50	22.3
	51 – 60	13.1
	> 60	11.4
Mean Age		43.2
Gender	Male	63.4
	Female	36.6
Marital Status	Single	16.5
	Married	61.7
	Widowed	16.0
	Divorced	5.71
Educational Level	No formal education	12.5
	Primary education	44.5
	Secondary education	34.9
	Tertiary education	8.0
Years of Experience	≤ 4	7.4
	5 – 9	12.6
	10 – 14	18.9
	15 – 19	32.0
	≥ 20	29.1
Cooperative Membership	No	73.1
	Yes	26.9
Total		100.0

Farmers' sources of information on SAPs

The results in Table 2 shows the distribution of respondents based on their sources of information on sustainable Agricultural practices. The findings show that extension agency (86.2%) was the most prominent and reliable source of information on sustainable agriculture practices in the study area. The finding is in line with Arowosegbe *et al.* (2024) who reported that extension workers bridge the gap between research, innovation and on-the-ground farming practices, enhancing productivity, promoting sustainability and encouraging the diffusion of innovative technologies.

This result was closely followed by radio (79.4%) indicating that extension agents and radio were the primary sources of information on sustainable agricultural practices in the study area. This finding is in consonant with Madugu *et al.* (2024) where it was observed that radio remains the most cost-effective means of building awareness on new farming practices for small-scale farmers for sustainable development and sustainability in agriculture.

More than half (56%) of the farmers reported television and fellow farmers (51%) as their sources of information on SAP. These findings supported the view of Manzano (2022) that the rise in farmers preferring other famers as a firsthand information source may be due to the ineffectiveness of public extension services in developing countries. The print media (12.6%) and bulletins (26.3%) were not important sources of information often used by the respondents, this is not surprising as a good number of the respondents had low level of education, therefore were not able to read.

Family and friends (38.9%), non-governmental organisation (36.0%), Agro dealers (27.4%), Mobile phone (22.3%), Field Day (10.8%) had low utilisation rates of information sources on SAPs which may be due to factors such as limited coverage and inadequate resources (Kibirige, 2023).

Farmers' perception of SAPs

Table 3 presents the perception of farmers regarding sustainable agricultural practices (SAPs). The results show that most respondents had a generally positive outlook, as reflected in the response patterns.

The statement "using SAPs has reduced how much I depend on chemicals, and I feel better about what I grow" received the highest support, with 66.5% strongly agreeing and 21.4% agreeing, while only 3.7% disagreed and none strongly disagreed. This indicates that farmers clearly associate SAPs with reduced chemical use, a perception consistent with the environmental advantages of SAPs highlighted by Pretty *et al.* (2022), who emphasised their role in minimising chemical pollution.

Table 2: Farmers' sources of information on SAPs

Sources of Information	No (%)	Yes (%)
Extension agency	13.8	86.2
Radio	20.6	79.4
Television	44.0	56.0
Non-governmental organisation	64.0	36.0
Fellow farmers	49.1	50.9
Family and friends	61.1	38.9
Print media	87.4	12.6
Bulletin	73.7	26.3
Field day	89.2	10.8
Mobile phone	77.7	22.3
Agro-dealers	72.6	27.4

Similarly, for "I feel safer and more confident knowing that SAPs help protect my health, my water, and the environment around me", 51.4% strongly agreed and 34.3% agreed, showing strong support. Only 3.4% disagreed and 0.6% strongly disagreed, reflecting a high level of awareness about SAPs' positive contributions to health and the environment. This finding aligns with WHO (2022), which pointed out the public health benefits of sustainable agricultural practices.

The statement "I feel that SAPs help me produce enough food without destroying the land or harming nature" was also well received, with 56.4% strongly agreeing, 28.4% agreeing, and no respondents expressing disagreement or strong disagreement. This suggests that farmers recognize SAPs' potential to promote long-term food security, corroborating the position of FAO (2022) on the role of sustainable practices in safeguarding future food supplies. On the other hand, perceptions were less positive regarding economic and productivity aspects. The statement "I feel more financially secure because SAPs give me a steady and dependable income provide adequate and dependable income" saw 38.4% strongly agreeing and 42.0% agreeing, but 19.6% were neutral, and no respondents expressed disagreement. The neutral stance points to some uncertainty about whether SAPs can consistently deliver reliable income, a concern that may stem from market challenges or transitional costs associated with adopting sustainable methods.

Most notably, the statement "I have noticed that SAPs make my work more productive and efficient" attracted the lowest support: only 4.8% strongly agreed and 14.0% agreed, while 24.0% disagreed and 35.0% strongly disagreed. This suggests that farmers largely do not see SAPs as directly improving productivity or operational efficiency. Such skepticism might be due to limited access to modern technologies or insufficient extension support, an issue similarly highlighted by Pretty *et al*. (2022), who reported that productivity gains in sustainable systems often depend on supportive policies and infrastructure.

Table 3: Farmers' perception of sustainable agricultural practices

Statements	SA	A	N	D	SD
I feel that SAPs help me produce enough food without destroying the land or harming nature	56.4	28.4	15.2	0	0
I believe that practicing SAPs allows me to protect the environment and conserve what we have	45.0	41.0	10.0	3.1	0.9
Since I started using SAPs, I feel my family's life has become more stable and fulfilling	41.8	40.1	14.3	3.0	0.8
I have noticed that SAPs make my work more productive and efficient	4.8	14.0	22.2	24.0	35.0
Using SAPs has reduced how much I depend on chemicals, and I feel better about what I grow	66.5	21.4	8.4	3.7	0
I feel more financially secure because SAPs give me a steady and dependable income	38.4	42.0	19.6	0	0
With SAPs, I use fewer non-renewable resources and spend less on farm inputs, which makes things easier for me	41.8	39.4	12.6	5.1	1.1
I see SAPs as a chance to explore new and profitable opportunities for both myself and my customers	39.1	38.9	14.3	6.3	1.4

I feel safer and more confident knowing that SAPs help protect my health, my water, and the environment around me	51.4	34.3	10.3	3.4	0.6

SA- Strongly Agree, A- Agree, N- Neutral, SD- Strongly Disagree, D- Disagree

Constraints to the perception of sustainable agricultural practices

Results in Table 4 reveals that respondents identified several constraints limiting the respondents' perception of sustainable agricultural practices in the study area. From the results using mean score to rank the constraints level according to their order of severity as indicated by the respondents, the highest rated challenge was Lack of awareness of SAPs with a mean score of 2.73 was ranked 1st and categorised as severe constraint. Farmers may prioritize conventional practices over SAPs due to their lack of awareness. This supports the findings of Mgomezulu *et al*., (2023) which suggests that farmers' limited understanding and awareness of SAPs benefits can serve as a constraint to their perception Also, "Lack of adequate capital for SAPs with a mean score of 2.70 ranked 2nd, Financial constraints can limit farmers' ability to invest in SAPs, affecting their perception of feasibility. Bwalya *et al.*, (2023) also noted that limited financial resources can hinder farmers' ability to invest in SAPs Inadequate knowledge of SAPs with a mean score of 2.69 ranked 3rd, insufficient understanding of SAPs can lead to negative perceptions of SAPs. Research by Nkomoki *et al.*, (2022) emphasised the importance of knowledge and education in promoting SAPs, Little or no government economic incentive with a mean score of 2.66 ranked 4th. The lack of Government incentives can create financial barriers, making it difficult for smallholder farmers to invest in sustainable practices (Nkegbe *et al.*, 2022; Awotide *et al*., 2022). "Low literacy level (MS = 2.61)", "Inadequate extension SAPs content (MS = 2.59)", and "Climatic factors do not support SAPs (MS = 2.42)" "Unavailability of required input (MS =1.99)" "Land tenure system that does not support SAPs (MS =1.72)" "Little or no contact with extension agent (MS =1.49)" ranked 5th, 6th, 7th, 8th,9th and 10th respectively. These constraints highlight the need for targeted interventions to support smallholder farmers' perception of SAPs. As noted by FAO (2022), strengthening extension services and improving access to relevant information and inputs are critical for promoting SAPs,

Table 4: Constraints to the Perception of Sustainable Agricultural Practices

Constraints	Very Severe (%)	Severe (%)	Not Severe (%)	Mean	Rank
Lack of awareness of SAPs	58.5	31.3	10.2	2.73	1st
Lack of adequate capital for SAPs	52.4	33.2	14.4	2.70	2nd
Inadequate knowledge of SAPs	49.9	39.9	10.2	2.69	3rd
Little or no government economic incentive	44.3	30.2	25.5	2.66	4th
Low literacy level	36.7	31.4	31.9	2.61	5th
Inadequate extension SAPs content	35.7	31.0	33.3	2.59	6th
Climatic factors do not support SAPs	33.3	29.9	36.8	2.42	7th
Unavailability of required input	29.7	48.5	21.8	1.99	8th
Land tenure system that does not support SAPs	19.9	22.7	57.4	1.72	9th
Little or no contact with extension agent	12.8	29.8	57.4	1.49	10th

CONCLUSION AND RECOMMENDATIONS

The study concludes that most smallholder farmers are in their productive age, moderately educated, and experienced, but limited by low cooperative participation, which restricts access to resources and support. While farmers generally perceive sustainable agricultural practices (SAPs) as beneficial, challenges such as a lack of awareness and limited capital hinder their adoption. It is therefore recommended that agricultural extension services be strengthened, farmers be given better access to credit and inputs, and awareness campaigns be intensified to promote a more accurate understanding and adoption of Sustainable Agricultural Practices (SAPs).

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GENDER DYNAMICS IN THE ADOPTION OF DIGITAL TOOLS IN UGANDA'S DAIRY SECTOR

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ABSTRACT

The adoption of digital tools in dairy farming has the potential to enhance productivity, efficiency, and market access. However, gender disparities exist in the utilisation of these technologies. This study examines gender differences in the adoption of digital tools, the willingness to adopt, and the barriers faced by male and female dairy farmers. Using a multistage sampling procedure, data were collected from 80 male and 40 female dairy farmers. Analytical techniques included frequency counts, percentages, t-tests, and the Ordinary Least Squares (OLS) regression model. Findings revealed that male dairy actors in Uganda have a slightly higher overall awareness of digital products (53.97 ± 14.7) than female actors (52.00 ± 20.69). Both men and women had low adoption levels of digital tools (females: 1.45 ± 3.83; Males: 1.75 ± 2.49), with male farmers slightly ahead in the use of mobile money applications (27.5%), digital marketing (22.5%), and e-learning platforms (27.5%). Willingness to adopt the unadopted digital tools was significantly higher among men (77.5%) compared to women (60.0%). Regression results showed the gendered barriers to technology adoption by women as limited access to technology (β = 1.425, p = 0.025), Cultural norms (β = 0.111, p = 0.026), and educational qualification (β = 0.111, p = 0.688), while men were only constrained by digital literacy (β = 0.124, p = 0.000). The study concludes that gender disparities in digital adoption are shaped by socioeconomic and cultural factors. To bridge this gap, targeted interventions such as women-focused digital literacy programs, subsidised access to digital tools, and gender-inclusive policy frameworks are recommended. Implementing these strategies will promote inclusive digital transformation in dairy farming, enhancing productivity and sustainability for both male and female farmers.

Keywords: Digitalisation, gendered barriers, inclusive growth, innovations, rural development

INTRODUCTION

Digitalisation in agriculture, often referred to as "digital agriculture," involves the use of digital tools and technologies such as mobile applications, internet platforms, and data analytics to enhance agricultural productivity, efficiency, and market access. Studies have shown that digitalisation has the potential to revolutionise farming practices by improving access to real-time information, optimising resource use, and enhancing the decision-making processes of farmers (Ferris *et al*., 2017). In the context of dairy farming, digital technologies can support the management of livestock, improve milk yield through precision agriculture, and facilitate market access through digital platforms (Aker *et al*., 2016). However, the level of digital adoption in developing countries remains limited, particularly in sectors like dairy, where traditional practices still dominate.

Uganda's dairy sector is a critical component of the country's agricultural economy, providing livelihoods for millions of smallholder farmers (Katungi *et al.*, 2017). According to the Dairy Development Authority (2020), dairy farming contributes significantly to rural employment, food security, and income generation. Despite the sector's potential, challenges such as low productivity, poor infrastructure, and limited market access have hindered its growth. Digital technologies offer solutions to some of these challenges by enhancing productivity, improving supply chain management, and providing better market linkages. However, these technologies are often under-utilised, with uptake being slow, especially among rural smallholders and marginalised groups like women.

In Uganda's dairy sector, men predominantly occupy roles in commercial production, processing, and marketing, often controlling access to critical resources such as land, capital, and livestock. However, the women occupy the subsistence production level. Despite the dominance, men face challenges including limited access to modern dairy technologies, fluctuating milk prices, and inadequate cold chain infrastructure (EADD, 2018; FAO, 2020). Additionally, climate variability and feed scarcity affect productivity and profitability, particularly for small-scale male farmers. A growing body of literature highlights the importance of addressing gender inequalities in agriculture to achieve inclusive growth. Women make up a substantial portion of the agricultural labour force, particularly in sub-Saharan Africa, yet they consistently face barriers that limit their productivity and income (FAO, 2011). These barriers include limited access to land, financial services, education, and technology (Doss, 2018). Gender norms often restrict women's decision-making power and access to resources, further exacerbating these inequalities (Meinzen-Dick *et al*., 2019). Women typically play a critical role in livestock care and milk production,

but they are often excluded from decision-making processes, market activities, and technology adoption, which are dominated by men (Njuki and Sanginga, 2013).

The gender digital divide refers to the gap between men and women in terms of access to and use of digital technologies. According to the International Telecommunication Union (ITU), women in low- and middle-income countries are 10% less likely to own a mobile phone and 26% less likely to use mobile internet compared to men (ITU, 2020). Several factors contribute to this divide, including socio-cultural norms, lower levels of digital literacy among women, affordability, and limited access to financial resources (World Bank, 2019). These factors significantly affect women's ability to adopt and benefit from digital technologies in agriculture.

In the context of Uganda's dairy sector, gendered differences in digital access are exacerbated by rural-urban disparities, with rural women being particularly disadvantaged in terms of digital literacy and infrastructure (Asiimwe and Kamwesiga, 2020). This digital divide limits women's ability to access critical information such as weather forecasts, market prices, and veterinary services, all of which can improve their productivity and income in dairy farming.

Existing literature underscores the transformative potential of digital tools for improving gender equality in the agricultural value chains. Digital platforms, mobile applications, and e-extension services can enhance women's access to markets, information, and financial services, thereby boosting their productivity and income (Wodon and De la Brière, 2018). Studies from Kenya, for example, show that mobile-based dairy information services have increased milk yields and income of smallholder farmers, particularly when tailored to the needs of women (Tsan *et al*., 2019). However, for digitalisation to deliver gender-inclusive benefits, interventions must address the underlying gender inequalities in access to technology, education, and decision-making processes (Doss and Meinzen-Dick, 2015).

In Uganda, few studies have examined the intersection of digitalisation and gender in the dairy sector. A study by Okello *et al.* (2021) highlights that while digital tools such as mobile money and market information services have the potential to improve market access for dairy farmers, women remain disproportionately disadvantaged in their access to and use of these tools. This is due to gendered differences in literacy, control over income, and access to mobile phones. Furthermore, the authors argue that the design of digital interventions often overlooks the specific needs and constraints of women farmers, thus limiting their effectiveness in addressing gender disparities. Hence, the study advocates for inclusive growth.

Inclusive growth refers to economic growth that is distributed fairly across society and creates opportunities for all, particularly marginalised groups like women (Kabeer, 2015). In the context of the dairy sector, inclusive growth means ensuring that both women and men benefit equally from digital innovations and that barriers to women's participation are actively addressed. Digitalisation, when implemented with a gender lens, can contribute to women's economic empowerment by increasing their access to resources, markets, and decision-making platforms (Buvinic and Furst-Nichols, 2016).

Several frameworks for inclusive digitalisation emphasised the importance of gender-sensitive policies and interventions that account for the distinct challenges women face in adopting and using digital technologies (Heeks, 2020). These include improving women's digital literacy, ensuring the affordability of digital tools, and addressing socio-cultural barriers that limit women's mobility and decision-making power. By fostering an enabling environment for women to participate in the digital economy, inclusive growth in Uganda's dairy sector can be achieved.

While there is a growing body of research on digitalisation and gender in agriculture, there are significant gaps in the literature specific to Uganda's dairy sector. Most studies on digital agriculture focus on crop farming, with limited attention given to livestock and dairy. Furthermore, there is limited empirical evidence on the gendered impacts of digital tools in dairy farming in Uganda. Most studies that do exist are concentrated on mobile financial services, with less focus on other digital innovations such as e-extension services, market platforms, or digital data management systems for livestock. This study aims to address these gaps by providing a gendered analysis of the adoption and utilisation of digital technologies in Uganda's dairy sector, offering insights into the specific challenges and opportunities for women in this context.

The research provides answers to the following questions:

1. What are the current levels of digital awareness and adoption in Uganda's dairy sector, and how do they differ between men and women?
2. Are the men and women dairy farmers willing to adopt digital technology?
3. What are the key barriers to digital adoption and utilisation by male and female dairy farmers

METHODOLOGY

This study was conducted in Southwest Uganda, a key dairy-producing region that significantly contributes to the country's total milk output. The region is home to a large population of

smallholder dairy farmers who depend on dairy farming as their primary source of income and livelihood. The dairy sector plays a crucial role in local economies by generating employment and improving food security. Southwest Uganda has a well-established dairy infrastructure, including milk collection centers, cooperatives, and processing plants. However, inefficiencies in the value chain limit the full utilisation of these facilities. Digitalisation presents an opportunity to enhance communication, reduce transaction costs, and improve coordination among stakeholders. Studying gender differences in digital tool adoption in this region would reveal the current state of digitalisation by gender and where concerted efforts should be made to enhance production efficiency in the dairy industry.

A multistage sampling procedure was used to select respondents. In stage one, the study identified the 16 districts in Southwest Uganda with significant dairy farming activities: Kabale, Kisoro, Rukungiri, Kanungu, Ntungamo, Mbarara, Bushenyi, Sheema, Mitooma, Rubirizi, Isingiro, Rubanda, Rukiga, Kiruhura, Rwampara, and Kazo. Stage two involves the random selection of four districts (Mbarara, Ntungamo, Kabale, and Rubanda) for data collection. Within these districts, extension agents working with dairy farmers were identified. The last stage involves a purposive sampling of 80 men and 40 women from the dairy value chain who could respond to an online questionnaire, while others were aided in filling out the questionnaire by trained enumerators. A structured survey questionnaire was used to collect data. The instrument included Likert scale items to measure the levels of digital adoption, willingness to adopt digital tools, and barriers to digital adoption, disaggregated by gender.

Data were analysed using descriptive statistics (frequency counts and percentages), Inferential statistics (t-tests to compare male and female adoption levels), and Ordinary Least Squares (OLS) regression analysis to identify factors influencing digital adoption among dairy farmers.

RESULTS AND DISCUSSIONS

Awareness of digital tools by gender

The data in Table 1 shows that male dairy actors have a slightly higher overall awareness of digital products (53.97 ± 14.7) than female actors (52.00 ± 20.69), suggesting men are more exposed to or involved in digital innovations across the milk value chain. Men ranked mobile money (2.85±1.43), digital payments (2.85±1.43), and digital marketing highest (2.58±1.42), highlighting their strong involvement in financial and commercial aspects of dairy farming. Women also prioritized finance (2.50±1.34) and learning tools (2.25±1.32), though their lower mean scores suggest relatively less engagement or access compared to men. Livestock management systems, automated milking systems, and inventory management tools received moderate attention from both groups. Interestingly, women ranked the awareness of automated milking systems slightly higher (1.80 vs. 1.70), possibly indicating increasing female involvement in handling livestock processes.

Both genders showed limited awareness (mean <1.6) of thermal cameras, gas sensors, 3d cameras, micro-doppler radar, ai-driven insights and predictive analytics. These tools are more advanced and less common, indicating gaps in exposure, affordability, or extension support. Farmer Apps were much more familiar to male respondents (1.98±1.11; 8th) than females (1.2±0.52; 31st), possibly due to men's greater phone ownership or control over digital devices. Digital logistics and process optimization tools were consistently low ranked for women, reflecting less involvement in transport and processing stages. AI-powered chatbots ranked higher among men (1.70±1.16; 9th) than women (1.48±0.75; 16th), suggesting greater male openness to AI-supported engagement.

Adoption of digital tools by gender

Table 2 shows that the only tools adopted by women (though at a much lower percentage) include online marketplaces (10.0%), digital marketing (10.0%), mobile money applications (15.0%) and digital payments (10.0%). It is important to note that no adoption was recorded for advanced precision dairy farming tools, such as automated milking systems, wearable health-monitoring devices, block-chain for traceability, AI-driven insights, predictive analytics and environmental sensors, as they all recorded 0.0% respectively. This suggests limited technological penetration in dairy farming, possibly due to high costs, lack of technical knowledge, and infrastructural constraints (Ferraz *et al*., 2024). It also shows gender differences in adoption, as men have a significantly higher adoption rate across most digital tools compared to women. These findings align with FAO (2021), which highlights that women in agriculture tend to adopt digital financial tools rather than technical farm management innovations due to lower access to capital and training. Most adopted tools by men include mobile money applications (27.5%), e-learning platforms (27.5%), digital marketing (22.5%), digital payments (22.5%), and online marketplaces (20.0%).

These tools focus on financial transactions, knowledge acquisition, and market access, reinforcing previous research that men are more likely to explore new income-generating digital solutions (GSMA, 2023). FSD, Uganda (2024), established the contributions of grants from FSD to onboard farmers onto a digital cooperative

information system that registers their deliveries, prices, and net-pay calculations.

Table 1: Awareness of digital tools by gender

Digital Products	Male		Female	
	Mean±SD	Rank	Mean±SD	Rank
Livestock management system	1.75±0.95	8th	2.13±1.11	7th
Inventory Management Systems to ensure timely and accurate stock levels at all stages of the value chain	1.6±0.87	13th	1.85±0.99	9th
automated milking system	1.8±0.76	7th	1.70±0.91	12th
Feed mix optimisation and consumption monitor	1.65±0.86	12th	1.70±0.75	11th
Wearable Devices for Cows to Track health indicators like temperature, activity levels, and rumination	1.65±0.8	11th	1.60±0.81	13th
Environmental Sensors to monitor barn conditions like temperature, humidity, and ammonia levels to ensure optimal living conditions.	1.45±0.81	21th	1.45±0.71	17th
Milk Quality Sensors for Real-time analysis of milk composition for fat, protein, and somatic cell counts	1.5±0.88	16th	1.53±0.78	14th
Eyes sensor -Thermal cameras (early detection of infection.	1.45±0.81	22nd	1.43±0.78	18th
Eyes sensor -Thermal cameras (early detection of infection of mastitis)	1.5±0.99	17th	1.35±0.66	26th
3D cameras and automated weighing platforms (growth; frame size; body condition)	1.5±0.99	18th	1.30±0.56	27th
Micro-doppler radar	1.55±0.99	15th	1.25±0.49	31st
Cameras or light beams for lying times	1.45±0.68	23rd	1.25±0.48	30th
Acoustic recorders (coughing for early detection of respiratory disease	1.4±0.67	28th	1.35±0.70	26th
Gas sensors for monitoring the environment of housed cows (methane; ammonia	1.4±0.74	29th	1.25±0.58	32nd
Gas sensors for milk taints	1.4±0.74	28th	1.28±0.64	29th
Animal sensors collar	1.55±0.81	15th	1.35±0.63	22nd
Blockchain Technology for traceability	1.2±0.69	31st	1.35±0.73	24th
Supply chain management for fraud detection	1.25±0.63	30th	1.40±0.67	19th
Predictive Analytics to Forecast milk yield, detect health issues early, and optimize breeding schedules.	1.3±0.65	29th	1.35±0.66	23rd
Artificial intelligence (AI) driven Insights to analyse large datasets to improve farm management and production process decision-making.	1.45±0.88	24th	1.38±0.70	20th
Farmer Apps to provide farmers with real-time information on market prices, weather forecasts, and best practices	1.2±0.52	31th	1.98±1.11	8th
Consumer Apps to Educate consumers on product origins, quality, and nutritional information.	1.5±0.82	19th	1.75±0.95	10th
Automated Quality Control Use sensors and cameras to detect contaminants or inconsistencies in dairy products	1.65±0.98	12th	1.35±0.62	21st
Process Optimization which Automates and monitor production lines for pasteurization, packaging, and distribution.	1.45±0.81	25th	1.50±0.71	15th
Digital Logistics to track and manage transportation of milk and dairy products	1.5±0.88	20th	1.30±0.51	28th
Online Marketplaces to connect producers directly with consumers or retailers	1.95±1.22	6th	2.38±1.50	5th
Digital Marketing --use social media and digital campaigns to reach a wider audience	2.00±1.2	5th	2.58±1.42	3rd
mobile network money application	2.50±1.34	2nd	2.85±1.43	1st
Digital Payments of instant transactions between farmers, suppliers, and buyers	2.50±1.22	1st	2.80±1.34	2nd
Insurance Products	2.0±1.11	5th	2.33±1.13	6th

E-learning Platforms for training and accessing material expert advice	2.25±1.32	3rd	2.48±1.25	4th

No women reported using e-learning platforms or insurance products, even though digital education could enhance their skills and resilience in dairy farming. FAO (2022) suggests that lower digital literacy and fewer training opportunities for women contribute to this gap. Possible barriers limiting women's adoption include lack of access to devices and internet connectivity (Meemken and Bellemare, 2021), lower control over farm resources and decision-making (Kassie *et al*., 2020) and cultural norms that restrict women's participation in technology-driven activities (World Bank, 2021).

Table 2: Adoption of digital tools by gender

Digital Practices	Male (%)	Female (%)
Automated Milking Systems	0.0	0.0
Livestock Management Systems	5.0	0.0
Feed optimisation and consumption monitor	5.0	0.0
Wearable devices for cows to track health indicators like temperature, activity levels, and rumination	0.0	0.0
Environmental Sensors to monitor barn conditions like temperature, humidity, and ammonia levels to ensure optimal living conditions	10.0	0.0
Automated Quality Control Use sensors and cameras to detect contaminants or inconsistencies in dairy products	0.0	0.0
Process Optimisation, which automates and monitors production lines for pasteurisation, packaging, and distribution	5.0	0.0
Thermal cameras (early detection of infection of mastitis	0.0	0.0
3D cameras and automated weighing platforms (growth, frame size, body condition	0.0	0.0
Gas sensors for milk taints	0.0	0.0
Animal sensors collars	0.0	0.0
Digital Logistics to track and manage the transportation of milk and dairy products	0.0	0.0
Inventory Management Systems to ensure timely and accurate stock levels at all stages of the value chain	10.0	0.0
Online Marketplaces to connect producers directly with consumers or retailers	20.0	10.0
Digital Marketing-use social media and digital campaigns to reach a wider audience	22.5	10.0
Mobile money application	27.5	15.0
Digital Payments of instant transactions between farmers, suppliers, and buyers	22.5	10.0
Insurance Products	12.5	0.0
E-learning Platforms for training and accessing material, expert advice	27.5	0.0
AI-powered chatbots to answer farmers' questions and provide support	0.0	0.0

Adopted = 1, not adopted = 0

Level of adoption of digital practices

Data in Table 3 shows that 95.0% of women and 100.0% of men fall into the low adoption category. Only 5.0% of women reached a moderate adoption level, while no respondent (0.0%), male or female, achieved a high adoption level. The mean scores are very low (Females: 1.45 ± 3.83; Males: 1.75 ± 2.49). This suggests that digitalization in dairy farming remains minimal and underutilised, regardless of gender.

Although men have a marginally higher mean score (1.75 vs. 1.45), the difference is statistically significant (t = 2.187; p = 0.024). This indicates that men are marginally more engaged with digital tools than women, possibly due to better access to resources, education, and decision-making power. However, the overall adoption remains low among genders. It aligns with previous findings (FAO, 2021; GSMA, 2023) that even when men have greater access to technology, overall digital adoption in rural agricultural settings remains weak due to infrastructural, financial, and knowledge barriers.

Table 3: Level of adoption of digital practices

Obtained score ranges		Female		Male	
	Level	Frequency	%	Frequency	%
0 – 10	Low	38	95.0	80	100.0

11 – 20	Moderate	2.0	5.0	0.0	0.0
21 – 32	High	0.0	0.0	0.0	0.0
Mean		1.45±3.83		1.75±2.49	
T-test		t = 2.187; Sig. = 0.024			

Possible score range 0 – 32

Table 1 already indicated that most digital innovations (e.g., AI-driven insights, blockchain, predictive analytics, and automated milking systems) were completely unadopted. The low scores further confirm that most farmers, regardless of gender, are not engaging with digital solutions in their dairy enterprises. The World Bank (2022) affirmed Infrastructure deficits in rural areas. Fadeyi *et al*. (2022) affirmed the low level of adoption of digital technology among male and female dairy farmers in Uganda

The low level of adoption of digital tools implies limited productivity and efficiency, reduced market access, deepened gender inequality, inefficient resource management and hindered adoption of best practices (Fadeyi *et al*. 2022: Rural Finance and Investment Learning Centre (RFILC), 2024).

Level of willingness of non-adopted digital practices

Table 4 shows that 77.5% of men are in the "fully willing" category compared to 60.0% of women. Only 10.0% of men reported being "not willing", whereas 35.0% of women expressed unwillingness. The mean willingness score for men (24.55 ± 7.95) is higher than that of women (19.45 ± 11.94), indicating a significant difference in enthusiasm for adopting digital practices. The T-value (2.784) and p-value (0.006) indicate a significant gender gap in willingness to adopt digital tools. This suggests that while both men and women face adoption challenges, men are generally more willing to explore digital innovations than women. Women's lower willingness may be linked to existing socio-cultural barriers, lower digital literacy, and limited access to financial resources (FAO, 2021; GSMA, 2023). The fact that a majority of women (60%) are "fully willing" suggests that with proper interventions (e.g., training, access to credit), their adoption rates could increase.

Table 4: Level of willingness of non-adopted digital practices

		Female		Male	
	Categories	**Frequency**	**Percentage**	**Frequency**	**Percentage**
0 – 10	Not willing	14	35.0	8	10.0
11 – 20	Somewhat willing	2	5.0	10	12.5
21 – 32	Fully willing	24	60.0	62	77.5
Mean		19.45±11.94		24.55±7.95	
T-test		t = 2.784; Sig. = 0.006			

Possible score 0 – 32

Barriers to adoption of AI tools

The findings in Table 5 highlight that both men and women face multiple systemic, technical, and socio-cultural barriers to digital adoption in the milk value chain, though the ranking and perceived severity differ across gender lines. The top three barriers for male respondents are insufficient training and knowledge (4.65±0.48), Fluctuation in milk prices and market demand (4.65±0.48) and Limited technical support and expertise (4.65±0.58). These suggest that men are more concerned with technical capacity building, economic risks, and infrastructure-related support, which directly influence their decision to invest in digital tools. Other high-ranking barriers include high investment costs (4.60±0.59), low literacy levels (4.60±0.50) and lack of awareness (4.55±0.60). These point to structural and economic constraints, particularly for small-scale male producers.

For female respondents, the top barriers are language barriers and literacy challenges (4.48±0.55), poor coordination among value chain actors (4.45±0.55), traditional mindsets and resistance to change (4.45±0.56), inadequate strategic vision and leadership (4.43±0.55) and high investment costs (4.43±0.74). This indicates that women are particularly affected by social, institutional, and educational challenges, including gendered cultural norms and limited access to inclusive leadership structures. Notably, lack of training, which ranks 1st for men, ranks 20th for women (4.20±0.88), possibly due to limited training access rather than awareness of its absence. Misconceptions about digitalization complexity are much lower-ranked for women (21st) than for men (8th), suggesting women may be less exposed to digital options to even develop such misconceptions.

Men face more barriers related to investment, market dynamics, and technical knowledge, likely reflecting their higher involvement in commercial and operational aspects of dairy farming. Women are more constrained by socio-cultural barriers, language and literacy issues, and limited strategic

inclusion, underscoring their marginalized access to decision-making spaces and resources.

Table 5: Barriers to the adoption of digitalisation in the milk value chain

Barriers	Male		Female	
	Mean±SD	Rank	Mean±SD	Rank
Lack of awareness about the benefits and potential of digital technologies.	4.55±0.60	6th	4.43±0.9	7th
Misconceptions about the complexity and necessity of digitalization	4.50±0.61	8th	4.18±0.9	21st
Lack of internet connectivity in rural areas.	4.45±0.75	10th	4.33±0.76	16th
Insufficient access to reliable electricity	4.35±0.82	19th	4.35±0.73	14th
Lack of access to credit facilities/ financial aids	4.40±0.75	14th	4.30±0.79	17th
High investment requirement for purchasing and implementing digital technologies	4.6±0.59	5th	4.43±0.74	5th
Fluctuation in milk prices and market demand impacting investment decision	4.65±0.48	2nd	4.35±0.74	14th
Insufficient training and knowledge among farmers and workers.	4.65±0.48	1st	4.20±0.88	20th
Limited availability of technical support and expertise.	4.65±0.58	3rd	4.28±0.84	18th
Lack of coordination and communication among different stakeholders in the value chain	4.50±0.75	9th	4.45±0.55	2nd
Language barrier and literacy, particularly in regions with low education levels.	4.45±0.60	11th	4.48±0.55	1st
Low literacy level	4.60±0.50	4th	4.35±0.66	11th
Unavailability of most digital tools in the region	4.50±0.59	7th	4.38±0.62	9th
Difficulty in understanding and utilising digital tools and interfaces	4.4±0.74	13th	4.35±0.48	10th
Disparities in digital adoption rates among producers, processors, and distributor	4.35±0.81	18th	4.40±0.49	8th
Difficulty in managing and integrating digital technologies into existing operations.	4.45±0.50	12th	4.43±0.63	6th
Inadequate leadership and strategic vision for digital transformation	4.35±0.80	17th	4.43±0.55	4th
Traditional mindsets and practices that resist technological adoption.	4.35±0.58	16th	4.45±0.56	3rd
Lack of trust in new technologies and their impact on livelihood	4.35±0.48	15th	4.20±0.82	19th
Inequity in digital technologies and internet access between urban and rural areas.	4.15±0.74	20th	4.35±0.66	11th
Socioeconomic disparities affecting the ability to adopt digital solutions	4.15±0.86	21st	4.33±0.65	15th

Regression analysis of gendered barriers to the adoption of digital tools

Findings in Table 6 show that limited access to technology was not significant for men (*β = -0.254, p = 0.212*) but was significant for women (*β = 1.425, p = 0.025*), indicating that limited access is a major barrier for female farmers. FAO (2022) reports that women in rural areas often face more barriers to accessing digital tools due to affordability and infrastructural constraints. Abate *et al.* (2023) highlights that gender gaps in access to mobile phones and the internet persist, limiting women's ability to engage in digital agriculture. Also, cultural norms were significant for men (*β = 5.477, p = 0.028*), suggesting that cultural factors may influence men's adoption, possibly through expectations around traditional farming methods and also, significant for women (*β = 0.111, p = 0.026*), indicating that cultural restrictions such as societal gender roles affect their digital adoption. GSMA (2023) finds that cultural biases often limit women's ability to access digital tools, as men are more likely to control household technology. Kassie *et al.* (2020) show that in Africa, traditional gender norms discourage women from engaging in modern farming practices that require digital tools.

Education (highest qualification) was significant for men (*β = 1.071, p = 0.010*), indicating that higher education boosts digital adoption, however, it was negative but not significant for women (*β = -1.42, p = 0.206*), implying that formal education alone does not

necessarily lead to digital adoption among female farmers. World Bank (2021) suggests that while education enhances digital literacy, other barriers (such as access and cultural constraints) may prevent women from utilising digital tools effectively. Aker and Ksoll (2019) argue that education alone is insufficient for women if they lack decision-making power within households. Specialisation in the Dairy Value Chain was not significant for men or women, though a negative trend is observed for women (*β = -1.283, p = 0.087*). FAO (2020) states that sector-specific constraints (such as labour division in dairy farming) might affect digital adoption differently across value chains. Meemken and Bellemare (2021) note that women in dairy farming may have limited control over financial decisions, reducing their likelihood of investing in digital tools. Digital Literacy was highly significant for both men (*β = 0.124, p = 0.000*) and women (*β = 0.125, p = 0.028*), indicating that literacy is crucial for adoption. UNESCO (2022) reports that digital literacy is a key enabler for technology use, but women often lag due to educational and infrastructural barriers. Aker *et al.* (2019) highlight the importance of digital training programs in increasing adoption rates, particularly for women.

Model Fit: The R^2 value is slightly higher for men (*0.601*) than for women (*0.520*), suggesting that other unmeasured barriers might influence women's adoption. The F-statistic is significant for both groups, but the model performs better for men (*F = 10.441, p = 0.000*) than for women (*F = 2.641, p = 0.030*).

Table 6: Gendered barriers to the adoption of digital tools (Linear regression (OLS) analysis)

Adoption of Digital Tools	Male			Female		
	Coef. (β)	p-value	Sig.	Coef.(β)	t-value	Sig.
(Constant)	86.819	8.242	0.000	53.591	8.348	0.000
Limited access to technology	-0.254	-1.272	0.212	1.425*	0.092	0.025
Cultural Norms	5.477	2.303	0.028	0.111*	0.688	0.026
Highest qualification	1.071	2.732	0.010	-1.42**	-1.276	0.206
Specialization in the dairy value chain	0.352	0.762	0.451	-1.283	-1.732	0.087
Digital literacy	0.124**	4.720	0.000	0.125**	0.011	0.028
R square	0.601			0.520		
F	10.441			2.641		
Sig.	0.000			0.030		

Severity of barriers to adopting digital practices

The distribution of severity levels in Table 7 shows that among females, 90.0% reported experiencing "very severe" barriers, while 10.0% faced "severe" barriers. No female respondents categorised the barriers as "less severe." For males, 87.5% reported "very severe" barriers, 10.0% faced "severe" barriers, and 2.5% considered the barriers "less severe." The mean Scores for females were 93.40 ± 8.67 and for Males 91.40 ± 8.68, which suggests that, on average, women perceive slightly higher barriers to adopting digital practices than men. The t-value of 1.189 and p-value of 0.237 indicate that the difference in perceived severity between males and females is not statistically significant ($p > 0.05$). This implies that while women report slightly higher severity, the difference is not large enough to be considered statistically meaningful.

Table 7: Severity of barriers to adopting digital practices

28		Female		Male	
Obtained score	Severity	Frequency	Percentage	Frequency	Percentage
21 – 49	Less severe	0	0.0	2	2.5
50 – 77	Severe	4	10.0	8	10.0
78 – 105	Very severe	36	90.0	70	87.5
Mean		93.40±8.67		91.40±8.68	
T-test		t-value = 1.189; Sig. = 0.237			

CONCLUSION AND RECOMMENDATIONS

The study concludes that gender disparities exist in awareness, adoption and willingness to adopt digital tools among dairy farmers, with men having slightly higher levels of awareness, adoption rates and greater willingness to adopt digital innovations. Women face greater socio-economic and cultural barriers, which hinder their ability to adopt and utilise digital tools effectively. Although awareness positively influences adoption for both genders, women require targeted interventions to bridge the digital divide in dairy farming.

There is a need to improve women's digital literacy and awareness through training programs to enhance technical skills. Peer learning and mentorship should be promoted to increase adoption rates among female farmers. Also, the government should enhance accessibility to digital tools for

women through subsidized access to digital technologies. cooperative-based technology sharing models could be facilitated to reduce costs. The government and NGO should engage community leaders and policymakers to challenge restrictive norms that limit women's participation in digital agriculture, while gender-inclusive policies should be enacted to encourage equal access to digital tools. Mobile money services and digital payment systems tailored to women's needs should be expanded. Financial incentives and microcredit programs for female farmers to invest in digital technologies could be introduced. Government and private-sector partnerships should be developed to enhance the availability and affordability of digital tools while integrating gender-sensitive frameworks into national agricultural digitalization strategies.

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