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**THE NIGERIAN JOURNAL OF RURAL EXTENSION AND DEVELOPMENT  
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## Land encroachment and coping strategies of smallholder crop farmers in Ilorin east local government area of Kwara state, Nigeria

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### ABSTRACT

Over the years, a noticeable decline in land availability for agricultural purposes has unfolded, driven by factors such as urbanisation, population growth and industrial development. This study examined the land encroachment and coping strategies of smallholder crop farmers in Ilorin East Local Government Area (LGA) of Kwara State, Nigeria. A total of 139 smallholder crop farmers were selected for this study. The data was obtained with a structured interview schedule. The data collected were analysed using frequency count, percentages, mean, standard deviation and paired sample t-test. The findings show that about 46.0% of the farmers had moderate extent of land encroachment, 63.3% of farmers had high livelihood status, and there was a significant reduction in the size of farmland in hectares following encroachment in crops like Yam from a mean size 0.54 to 0.26 (ha), Maize 0.84 to 0.45 (ha), Sorghum 0.48 to 0.23 (ha), Rice 0.54 to 0.27 (ha), and Cassava 0.70 to 0.40 (ha). Land encroachment has effects ( $p=0.000$ ) on the size of land cultivated for different crops. The study also shows that the key coping strategies employed by the farmers were participating in value-adding activities and advocacy campaigns (91.4%) and engaging in off-farm employment (89.2%). The study concluded that there is a substantial decrease in farm size after land encroachment. The study therefore recommended that farmers should engage in value-adding initiatives in their farming practices in order to earn more income to reduce the effects of land encroachment.

**Keywords:** Smallholder, Crop Farmers, Coping Strategies, Land Encroachment, Livelihoods.

### INTRODUCTION

The agricultural sector plays a vital role in Nigeria's economy by providing food, industrial raw materials, employment opportunities, and foreign exchange earnings (Ifabiyi, Adisa, Komolafe & Awarun 2023; Abdulrahman, Adebayo, Ogunlade, Bello, Oyediran & Olowolayemo, 2023). Agriculture in Nigeria has numerous unexploited capacities for development in the availability of land, water, labour and a large population. However, low productivity, conflicts between farmers and herders, and disputes over agricultural land and resources are major issues affecting the Nigerian agricultural sector (Abdulrahman, Yusuf, Komolafe, Abdulrahman & Ukpi, 2025; Ifabiyi, et al., 2023; IITA, 2017).

Land serves as the most critical resource for food production. Access to and control over land is increasingly threatened by land encroachment, which is gradually becoming a major constraint to sustainable agricultural development and smallholder farmers' livelihoods (Owusu & Agyei, 2007). Land encroachment refers to the unauthorized or illegal occupation, use or misuse of a piece of land that often leads to conflicts, displacement and reduced land holdings. Adisa (2012) identified migration, overpopulation, agricultural commercialisation and urbanisation as some of the factors causing land disputes in Nigeria.

According to Jimoh et al. (2020), residential buildings and industrial development initiatives are intruding into lands that are originally meant for farming activities at an alarming rate annually. Coping strategies are the steps people take to handle stressful

or challenging situations (Ifabiyi and Banjoko, 2018). Folkman (1984) theorised two comprehensive steps for people facing stress: emotion-focused coping and problem-focused coping. Problem-focused coping is more applicable as Ifabiyi & Adisa (2022) stated that personal belief in one's ability will help a person to overcome difficult situations. According to Abegunde et al. (2020), land matters are the main reason for conflict in Nigeria. The encroachment of agricultural land for non-agricultural purposes limits food production (Appiah et al., 2019), and continuous encroachment would decrease the productivity of farmers (Zaky, 2019).

There is a paucity of information on smallholder farmers' coping strategies against land encroachment in the study area. This study aims to provide evidence-based recommendations that would guide policy makers and community leaders in addressing land encroachment and safeguard farmers' livelihoods. The specific objectives were to:

- i. describe the socio-economic characteristics of farmers in the study area;
- ii. determine the land size and crops grown before and after encroachment;
- iii. examine the effects of land encroachment on crop production; and
- iv. assess coping strategies against agricultural land encroachment.

### METHODOLOGY

The study was carried out in Ilorin East LGA of Kwara State, Nigeria, situated between Latitudes 8.57111 and Longitudes 4.72833. Oke-oyi is the headquarters with

an area of 486 km<sup>2</sup> and a population of 204,310 people at the 2006 census (NPC, 2006). The population for this study consists of all farmers whose farmlands were encroached.

The sampling procedure involved two stages. The first stage involved a purposive selection of five affected communities: Oke-oyi, Oke-ose, Agbede, Ile-Apa and Lajolo. The second stage involved the proportionate random selection of 139 respondents (Oke-oyi=39, Oke-ose=30, Agbede=30, Ile-Apa=30 and Lajolo=10).

To determine coping strategies, a 4-point Likert scale was used: high extent = 4, moderate extent = 3, low extent = 2 and no extent = 1. A Yes/No scale (Yes = 2, No = 1) was used to determine coping strategies employed. Paired sample t-test was used to determine the effects of land encroachment on availability of agricultural land.

Data were collected with a well-structured questionnaire. Descriptive statistics such as frequency counts, percentages, means and paired sample t-test were used to analyse the findings of the study.

## RESULTS AND DISCUSSION

### Socioeconomic characteristics of the farmers

Table 1 shows that about 70.5% of the farmers were males while 29.5% were females. The mean age was 50.1 +/- 6.4 years, indicating the sampled farmers were within the economically active age bracket. Almost all (97.1%) were married. About 38.8% had primary education, 40.3% secondary education and 17.3% tertiary education, meaning almost all (96.4%) were literate. The mean farm size was 1.2 +/- 0.4 hectares, with 16.2 +/- 6.8 years of farming experience. Findings further reveal land had been encroached for an average of 9 +/- 2.5 years, and 46.0% experienced moderate extent of encroachment.

**Table 1: Distribution of respondents based on their socio-economic characteristics**

Variables	Frequency (n=139)	Percentage (%)	Mean (SD)
<b>Sex</b>			
Male	98	70.5	
Female	41	29.5	
<b>Age (Years)</b>			50.1+/-6.4 yrs
<= 40	8	5.8	
41-50	70	50.4	
51-60	46	33.1	
> 61	15	10.8	
<b>Marital Status</b>			
Single	4	2.9	
Married	135	97.1	
<b>Educational Level</b>			
No Formal Education	5	3.6	
Primary Education	54	38.8	
Secondary Education	56	40.3	
Tertiary Education	24	17.3	
<b>Secondary Occupation</b>			
Self Employed	5	3.6	
Trading	48	34.5	
Retired	4	2.9	
Farming	34	24.5	
Artisan	46	33.1	
Students	2	1.4	
<b>Farm Size (ha)</b>			1.2+/-0.4 ha
0-1	59	42.4	
1-5	59	42.4	
> 5	21	15.1	
<b>Years of Experience</b>			16.2+/-6.8 yrs
<= 10	40	28.8	
11-20	72	51.8	
21-30	20	14.4	
> 31	7	5.0	
<b>Years Since Encroachment</b>			9.2+/-2.5 yrs
1-5	8	5.8	
6-10	96	69.1	
> 11	35	25.2	

**Extent of Encroachment**

High	36	25.9
Moderate	64	46.0
Little	36	25.9
None	0	0.0

Source: Field survey, 2024

**Size of farmland cultivated before and after encroachment**

Table 2 shows that there was a reduction in the size of farmland after encroachment. Crops like yam dropped from an average of 0.54 to 0.26 (ha) and maize from

0.84 to 0.45 (ha). Land encroachment significantly reduces the quantity of land available for crop cultivation, thus reducing overall output and income. This result agrees with Owusu & Agyei (2007), who reported that several agricultural lands have been converted to non-agricultural purposes.

**Table 2: Distribution of respondents based on land sizes and crops grown before and after encroachment**

Crops	Before (ha) x (SD)	After (ha) x (SD)
Yam	0.54 +/- 0.32	0.26 +/- 0.19
Maize	0.84 +/- 0.36	0.45 +/- 0.22
Sorghum	0.48 +/- 0.24	0.23 +/- 0.14
Rice	0.54 +/- 0.43	0.27 +/- 0.27
Cassava	0.70 +/- 0.24	0.40 +/- 0.14
Cashew	0.72 +/- 0.28	0.29 +/- 0.11
Groundnut	0.20 +/- 0.00	0.10 +/- 0.00
Melon	0.26 +/- 0.12	0.11 +/- 0.09
Others	0.89 +/- 0.14	0.44 +/- 0.18

Source: Field survey, 2024

**Effects of land encroachment**

The results in Table 3 reveal significant differences ( $p < 0.05$ ) between the quantity of land cultivated before and after land encroachment for all crops. Since the p-value was less than 0.05, the differences in the sizes of the land before and after encroachment were

significant, confirming that land encroachment influences the size of cultivated agricultural land and would reduce the quantity of output. This result is in agreement with Temesgen, Tebarek and Amsalu (2024), who reported that dispossession of peoples' land leads to loss of livelihoods.

**Table 3: Paired sample t-test of differences of size of farmland before and after encroachment**

Pair	Mean Diff.	Std. Dev.	Std. Err.	95% CI Lower	95% CI Upper	T	df	Sig.
Yam	0.273	0.191	0.020	0.234	0.313	13.897*	93	0.000
Maize	0.398	0.239	0.021	0.357	0.439	19.202*	132	0.000
Sorghum	0.246	0.147	0.015	0.217	0.277	16.260*	93	0.000
Rice	0.268	0.196	0.042	0.181	0.355	6.414*	21	0.000
Cassava	0.305	0.166	0.016	0.274	0.336	19.235*	109	0.000
Cashew	0.430	0.211	0.041	0.346	0.516	10.399*	25	0.000
Groundnut	0.157	0.128	0.034	0.083	0.231	4.580*	13	0.001
Melon	0.442	0.113	0.043	0.338	0.548	10.333*	6	0.000

Source: Field survey, 2024. \*Significant at 1% level

**Coping strategies to land encroachment**

The findings in Table 4 show that 91.4% of farmers took part in value-adding activities and advocacy campaigns, and 89.2% engage in off-farm employment as an alternative source of income. Furthermore, 84.9% used climate-smart agricultural

practices and 54.0% relied on community collaboration. Value addition, advocacy campaigns and off-farm employment were the main coping strategies. This corroborates the findings of Chibundu et al. (2022), who reported that off-farm employment and diversification of farm enterprises were the main

coping strategies to land-related conflicts in Imo State, Nigeria.

**Table 4: Distribution of respondents based on coping strategies employed to mitigate the effect of land encroachment**

Coping Strategies	Frequency	Percentage (%)
Land title verification	49	35.3
Legal action	50	36.0
Dialogue with encroachers	67	48.2
Community collaboration	76	54.7
Fencing and boundary making	69	49.6
Guarding and surveillance	82	59.0
Diversifying crops	94	67.6
Intensifying crops	95	68.3
Agroforestry practices	103	74.1
Soil conservation	112	80.6
Efficient irrigation	111	79.9
Rainwater harvest	32	23.0
Crop resilience	33	23.7
Climate-smart agricultural practices	118	84.9
Off-farm employment	124	89.2
Value-adding activities	127	91.4
Training programs	113	81.3
Accessing information	117	84.2
Advocacy campaigns	127	91.4
Support networks	112	80.6

Source: Field survey, 2024

## CONCLUSION AND RECOMMENDATIONS

The study concluded that land encroachment has significant effects on the size of agricultural land, leading to a substantial decrease in farm sizes. The reduction in available farmland has implications on crop yields, incomes, and food insecurity among farming households. Value addition initiatives, advocacy campaigns and off-farm employment were the main coping mechanisms adopted by the respondents. Farmers should be encouraged to engage in value-adding initiatives such as training in food processing, packaging, and marketing. There is also a need for stronger efforts by all stakeholders to address agricultural land encroachment, and for provision of training on smart farming practices such as sack and bucket farming.

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## Proclivity to entrepreneurship among agricultural undergraduates in Ondo state, Nigeria

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### ABSTRACT

Entrepreneurship is one of the economic self-reliance tools for addressing youth unemployment and sustainable agricultural livelihoods in Nigeria. This study examined agricultural undergraduates' proclivity toward agricultural and non-agricultural entrepreneurship in Ondo State. Using a multistage sampling procedure, data were collected from 153 undergraduates through a structured questionnaire. The study reveals that the mean age of respondents was 23.1 +/- 3.4 years, with most being male (51%). Specifically, 51.6% had favourable perceptions of agricultural entrepreneurship, while 58.6% held favourable perceptions of non-agricultural entrepreneurship. The respondents' motivating factors for agricultural entrepreneurship were interest in agricultural technology and innovation ( $x = 1.66$ ) and desire for independence and self-employment ( $x = 1.65$ ), while desire for independence and self-employment ( $x = 1.77$ ) and passion for social impact ( $x = 1.69$ ) were the motivating factors for non-agribusiness. It was also revealed that 60.1% of the respondents showed high proclivity for agricultural entrepreneurship, while a higher proportion, 69.9%, had high proclivity for non-agricultural entrepreneurship. The t-test result ( $t = -1.68$ ,  $p = 0.095$ ) reveals no significant difference between students' proclivity toward agricultural and non-agricultural entrepreneurship. The study concluded that undergraduates exhibit higher proclivity toward non-agricultural ventures, recommending increased institutional support, practical exposure, and incentives to enhance youth engagement in agricultural entrepreneurship.

**Keywords:** Agricultural entrepreneurship, non-agricultural entrepreneurship, proclivity, perception, undergraduate engagement.

### INTRODUCTION

Nigeria faces a persistent crisis of graduate unemployment, with a rate up to 8.6% especially among the youth aged 15-24, as recorded by the National Bureau of Statistics (2023). The joblessness persists despite tertiary qualifications due to the gap between academic training and industry requirements. Aminu (2019) noted that theoretical learning in Nigerian institutions limits workplace readiness. Entrepreneurship is promoted as a viable solution, with government initiatives such as N-Power, the Government Enterprise and Empowerment Programme (GEEP), Youth Enterprise with Innovation in Nigeria (YouWIN), and the National Youth Investment Fund (NYIF) introduced to stimulate youth entrepreneurship (Omoju et al., 2023).

Agriculture employs 70-75% of the labour force and contributes 20.9% to GDP (Ajekwe & Ibiame, 2020). Yet, many youths perceive agriculture as strenuous and unattractive. They prefer non-agricultural sectors such as ICT, fashion, and media due to their perceived profitability, modern appeal, and innovation opportunities (Komolafe et al., 2022; Chah et al., 2023). Undergraduates, as future entrepreneurs, are key to transforming Nigeria's business environment. Adelowo, Joshua, and Ilevbare (2018) noted that entrepreneurship education improves opportunity recognition and business planning skills. Ondo State presents a suitable case due to its educational institutions, agricultural base, and youthful population. The specific objectives are to:

- i. describe the personal and enterprise characteristics of the undergraduates;
- ii. assess the perceptions of the respondents towards agricultural and non-agricultural entrepreneurship;
- iii. identify the motivations for considering agricultural and non-agricultural entrepreneurship; and
- iv. examine the proclivity to agricultural and non-agricultural entrepreneurship after graduation.

The study hypothesised that there is no significant difference in the undergraduates' proclivity to agricultural and non-agricultural entrepreneurship.

### METHODOLOGY

The study was conducted in Ondo State, Nigeria, located in the South-Western geopolitical zone with a population of over 3.4 million. The target population comprised final-year students in tertiary institutions offering agriculture-related programs. A multi-stage sampling procedure was adopted: seven institutions were purposively selected, followed by proportional sampling, and then simple random sampling to select a total of 153 students. Proclivity was assessed on a 2-point scale of "willing" (1) and "not willing" (0). Perceptions were evaluated using a 5-point Likert scale. Motivation was measured on a 3-point scale. Data were analysed using descriptive and inferential statistics, including paired sample t-test.

**Table 1: Sampled tertiary institutions and number of selected respondents in Ondo State**

Tertiary institution	Final year students	Proportion selected	Sampled (n)
Adekunle Ajasin University, Akungba (AAUA)	198	10%	20
Adeyemi University of Education	83	20%	17
Federal University of Technology, Akure (FUTA)	808	5%	40
Federal Polytechnic, Ile Oluji	60	20%	12
Olusegun Agagu University of Science and Technology (OAUSTECH), Okitipupa	268	10%	27
Rufus Giwa Polytechnic, Owo	96	20%	19
Wesley University, Ondo	85	20%	17
Total	1,598		153

Source: Selected tertiary institutions administration unit

## RESULTS AND DISCUSSION

### Personal characteristics of the undergraduates

Table 2 shows balanced gender representation (51% male; 49% female), and the respondents' mean age was 23.10 +/- 2.04 years. The majority came from moderately large households ( $x = 7.43 \pm 1.77$ ). Fathers were mainly artisans (19.6%), government

workers (18.3%), or teachers (13.7%), while mothers worked mostly in government (22.2%), trading (20.3%), or teaching (15.7%). Given that 69.3% of respondents were sponsored by both parents, such family structures may reinforce motivation for youth entrepreneurship (Ilevbare et al., 2022).

**Table 2: Personal characteristics**

Variables	Frequency	Percentage (%)	Mean	SD
Sex				
Male	78	51.0		
Female	75	49.0		
Age (years)			23.10	2.04
< 21	10	6.5		
21-25	128	83.7		
> 25	15	9.8		
Marital status				
Single	147	96.1		
Married	6	3.9		
Household size			7.43	1.77
< 6	17	11.1		
6-10	129	84.3		
> 10	7	4.6		
School upkeep sponsor				
Father	15	9.8		
Mother	15	9.8		
Father and mother	106	69.3		
Self	6	3.9		
Family member	8	5.2		
Philanthropist	3	2.0		

Source: Field Survey, 2023

### Enterprise characteristics of the undergraduates

Table 3 reveals that 94.8% of respondents planned to start an enterprise after graduation. A notable 69.9% had previous entrepreneurial experience. All

respondents (100%) reported receiving entrepreneurship training, primarily from workshops and seminars (58.2%). The results further show that 30.7% were moderately confident and 27.5% were very confident in running an enterprise.

**Table 3: Enterprise characteristics**

Variables	Frequency	Percentage (%)
<b>Starting entrepreneurship after graduation</b>		
Yes	145	94.8
No	8	5.2
<b>Type of entrepreneurship starting</b>		
Agricultural entrepreneurship	66	43.1
Non-agricultural entrepreneurship	79	51.6
<b>Previous entrepreneurship experience</b>		
Yes	107	69.9
No	46	30.1
<b>Level of success of previous experience</b>		
Not successful	2	1.3
Somewhat successful	38	24.8
Moderately successful	42	27.5
Very successful	25	16.3
<b>Training in entrepreneurship</b>		
Yes	153	100
No	0	0
<b>Type of training received</b>		
Formal education	64	41.8
Workshop or seminars	89	58.2
<b>Confidence in ability to run enterprise</b>		
Not at all confident	20	13.1
Somewhat confident	44	28.8
Moderately confident	47	30.7
Very confident	42	27.5

Source: Field Survey, 2023

### Perceptions towards agricultural entrepreneurship

As shown in Table 4, a slight majority (51.6%) held favourable perceptions of agricultural entrepreneurship, while 48.4% were classified as having unfavourable perceptions. This split indicates a fairly balanced divide in how undergraduates view agriculture as an enterprise option. Such mixed perceptions resonate with studies of youth agricultural

engagement: for example, Ikebuaku & Dinbobo (2023) found that Nigerian youths generally display positive perceptions and intentions toward agripreneurship, but that structural factors (e.g., market access, infrastructure) mediate their commitment. Consequently, while many students see agriculture as viable and promising, nearly half remain skeptical, signaling the need for deeper interventions (e.g., awareness campaigns, exposure programs) to shift perception among those hesitant.

**Table 4: Perceptions towards agricultural entrepreneurship**

Perception statements	SA	A	N	D	SD
Agricultural entrepreneurship is a viable career option	51	35.3	9.2	3.9	0.7
Agricultural entrepreneurship is a lucrative and profitable business	50.3	37.9	10.5	0.7	0.7
Agricultural entrepreneurship is a way to connect with nature	45.1	42.5	11.8	0.0	0.7
Agricultural entrepreneurship can help bridge the gap between urban and rural communities	55.6	34.6	7.2	1.3	1.3
Agricultural entrepreneurship is an opportunity to apply entrepreneurial skills	55.6	39.2	3.9	1.3	0.0
Agricultural entrepreneurship provides a high degree of autonomy and independence.	45.8	45.8	7.2	1.3	0.0
Agricultural entrepreneurship is a risky business	34.0	66.0	0.0	0.0	0.0
Agricultural entrepreneurship is an innovative and dynamic	41.8	47.7	5.9	3.9	0.7
Agricultural entrepreneurship is a field that requires a strong sense of commitment and dedication.	47.7	36.6	8.5	5.9	1.3
Agricultural entrepreneurship is a field with a lack of social status.	11.8	21.6	8.5	30.7	27.5
Agricultural entrepreneurship is a low-income profession	12.4	24.8	9.2	26.8	26.8
There is need for education and training to succeed in agricultural entrepreneurship	43.8	33.3	6.5	11.8	4.6

Perception statements	SA	A	N	D	SD
Agricultural entrepreneurship is an opportunity to introduce new technologies and practices to the field.	54.9	30.1	7.8	5.2	2.0
Agricultural entrepreneurship as a challenging field, requiring significant investment in terms of time, money, and effort.	0.7	0.7	11.8	34.6	52.3
Many students were not aware of the potential and opportunities of agricultural entrepreneurship	1.3	3.3	9.8	37.9	47.7
<b>Perception level (60.09 ±6.04; Min = 45.00, Max =72.00)</b>	<b>F</b>	<b>%</b>			
Favourable (≥60.09)	79	51.6			
Unfavourable (< 60.09)	74	48.4			

Source: Field Survey, 2023

### Perception towards Non-agricultural Entrepreneurship

The results in Table 5 show that a slight majority of respondents (51.6%) held a favourable view of non-agricultural entrepreneurship, while 42.4% were unfavourable. This pattern is consistent with recent

evidence from Nigerian universities showing that campus entrepreneurship education and innovation activities are strengthening students' turn toward entrepreneurial careers, and that non-farm ventures often appeal because they promise autonomy, brand-building and perceived higher financial returns (Oyinlola et al., 2024).

**Table 5: Perceptions towards Non-agricultural entrepreneurship**

Perception statements	SA	A	U	D	SD
Non-agricultural entrepreneurship had potential for final success and independence	41.8	38.6	7.8	9.8	2.0
Non-agricultural entrepreneurship is a risky venture with potential for failure	30.1	50.3	0.7	5.2	13.7
Non-agricultural entrepreneurship is an opportunity to build a personal brand	47.1	39.2	8.5	2.6	2.6
Non-agricultural entrepreneurship can be competitive	41.2	44.4	6.5	5.2	2.6
There is Flexibility and freedom to set one's own schedule	37.3	43.8	11.8	4.6	2.6
Non-agricultural entrepreneurship is a way to provide societal needs	34.6	43.1	12.4	7.2	2.6
Non-agricultural entrepreneurship can be challenging but rewarding	43.8	40.5	9.8	3.9	2.0
It offers ability to pursue a passion or interest	49.0	36.6	9.8	2.0	2.6
There is possibility of working with a diverse group of people in Non-agricultural entrepreneurship	44.4	43.8	5.9	2.6	3.3
Non-agricultural entrepreneurship requires a strong work ethic and commitment	38.6	45.8	9.8	2.6	3.3
Provides access to resources and mentorship from experienced entrepreneurs	41.8	45.8	7.2	3.9	1.3
Non-agricultural entrepreneurship is an opportunity to be one's own boss	47.1	37.9	9.8	4.6	0.7
Requires networking and building relationships with potential customers and partners	49.7	33.3	7.2	7.8	2.0
Non-agricultural entrepreneurship requires creativity and problem-solving skills	43.1	28.1	22.2	3.9	2.6
Non-agricultural entrepreneurship offers a chance to learn new skills and gain experience	13.1	8.5	52.3	19.6	6.5
<b>Perception level (59.43 ±8.15; Min = 19.00, Max =72.00)</b>					
Favourable (≥ 59.43)	88	58.6			
Unfavourable (< 53.43)	65	42.4			

Source: Field Survey, 2023

### Motivations for considering agricultural entrepreneurship

The result in Table 6 shows that, interest in agricultural technology and innovation ( $\bar{x} = 1.66$ ), desire for independence and self-employment ( $\bar{x} = 1.65$ ), desire to improve rural livelihoods and communities ( $\bar{x} = 1.60$ ), opportunity to diversify income streams ( $\bar{x} =$

1.59), and potential for high profits and financial success ( $\bar{x} = 1.57$ ) are the significant motivations for considering agricultural entrepreneurship among the respondents. These results reflect the shift in how young people view agriculture, not just as a means of survival, but as a field full of possibilities. The desire for independence and self-employment indicates that

young people want control over their careers and are eager to build businesses they can manage on their own terms. This aligns with the findings of Amedu et al. (2023), who reported that flexible work and decision-making freedom were strong incentives for youth engagement in agribusiness. The motivation to improve rural livelihoods suggests that some youth are socially driven and want to use agriculture to create jobs, reduce hunger, and uplift their communities. In

addition, the idea of diversifying income streams shows a practical awareness of risk management, as many young people understand that farming can offer multiple channels of revenue from planting and processing to marketing and storage. The potential for high profits, though not the strongest factor, still mattered greatly, revealing that many see agriculture as a promising way to achieve financial success.

**Table 6: Motivations for considering agricultural entrepreneurship**

Motivational statements	Mean (x)	Rank
Interest in agricultural technology and innovation	1.66	1st
Desire for independence and self-employment	1.65	2nd
Desire to improve rural livelihoods and communities	1.60	3rd
Opportunity to diversify income streams	1.59	4th
Potential for high profits and financial success	1.57	5th
Passion for agriculture	1.56	6th
Love for nature and the outdoors	1.51	7th
Family tradition and cultural values	1.49	8th
Desire to contribute to food security and sustainable agriculture	1.48	9th
Availability of land and resources for farming	1.41	10th

Source: Field Survey, 2023

#### Motivations for considering non-agricultural entrepreneurship

As revealed in Table 7, desire for independence and self-employment ( $\bar{x} = 1.77$ ), need to solve a particular problem or challenge in society ( $\bar{x} = 1.69$ ), opportunity to pursue a passion or hobby ( $\bar{x} = 1.67$ ), desire to create jobs and provide employment opportunities ( $\bar{x} = 1.67$ ), and desire to be a leader or influencer in a particular field ( $\bar{x} = 1.67$ ) are the most significant motivations driving respondents toward non-agricultural entrepreneurship. The high mean score for independence and self-employment shows that many youths are motivated by the autonomy and personal

control that come with owning a business. This drive reflects a broader youth mindset that values flexibility, authority, and the ability to shape one's professional journey. The motivation to solve societal problems suggests that youths are not only driven by personal gain but also by a sense of purpose and responsibility toward their communities. Equally, the passion for hobbies and the opportunity to convert them into viable enterprises is a noteworthy motivation. Youths often seek avenues to express creativity and personal interests in ways that also generate income. This was emphasized by Adeyanju et al. (2020), who highlighted that young people with strongly passion-driven ideas had higher entrepreneurial persistence.

**Table 7: Motivations for considering non-agricultural entrepreneurship**

Motivational statements	Mean (x)	Rank
Desire for independence and self-employment	1.77	1st
Need to solve a particular problem or challenge in society	1.69	2nd
Opportunity to pursue a passion or hobby	1.67	3rd
Desire to create jobs and provide employment opportunities	1.67	3rd
Desire to be a leader or influencer in a particular field	1.67	3rd
Potential for financial success and higher earnings	1.64	6th
Opportunity to innovate and create something new	1.63	7th
Availability of support and resources for start-ups	1.62	8th
Desire to provide a unique product or service	1.61	9th
Opportunity to work remotely or from home	1.41	10th

Source: Field Survey, 2023

#### Proclivity to agricultural entrepreneurship

Table 8 indicates that 60.1% of respondents had high proclivity for agricultural entrepreneurship. This level of inclination aligns with the results of Idris-Adeniyi et al. (2019), who found that undergraduates in Southwestern Nigerian universities favoured

agripreneurship when institutional support and favourable policies were present. Support for value-added processing of agricultural products (81.0%) ranked highest, while taking risks (69.9%) ranked lowest, pointing to an opportunity for targeted risk management training.

**Table 8: Distribution of respondents based on proclivity to agricultural entrepreneurship**

Proclivity statement	Willing F (%)	Not willing F (%)	x	Rank		
To start own agricultural entrepreneurship after graduation	114(74.5)	39(25.5)	0.75	5th		
To invest time and resources in an agricultural enterprise	114(74.5)	39(25.5)	0.75	5th		
To take risks associated with agricultural entrepreneurship	107(69.9)	46(30.1)	0.70	8th		
To seek support from relevant stakeholders in agricultural entrepreneurship	115(75.2)	38(24.8)	0.75	5th		
To collaborate with other agricultural entrepreneurs to achieve common goals	118(77.1)	35(22.9)	0.77	4th		
To adopt innovative technologies and practices in agricultural entrepreneurship	121(79.1)	32(20.9)	0.79	2nd		
To support value-added processing of agricultural products	124(81.0)	29(19.0)	0.81	1st		
To promote agricultural entrepreneurship among other youth in my community	119(77.8)	34(22.2)	0.78	3rd		
<b>Agricultural entrepreneurship</b>	<b>F</b>	<b>%</b>	<b>Min</b>	<b>Max</b>	<b><math>\bar{X}</math></b>	<b>S.D.</b>
High proclivity ( $\geq 6.09$ )	92	60.1%	0.00	8.00	6.09	2.57
Low proclivity ( $< 6.09$ )	61	39.9%				

Source: Field Survey, 2023

**Proclivity to non-agricultural entrepreneurship**

The results in Table 9 reveal that 69.9% of the respondents exhibited high proclivity toward non-agricultural entrepreneurship, reflecting a growing

shift in youth preferences toward sectors outside primary agriculture. These findings are consistent with Oyinlola et al. (2024), who noted rising enthusiasm among Nigerian youths for non-farm entrepreneurship due to greater autonomy and income prospects.

**Table 9: Distribution of respondents based on proclivity to non-agricultural entrepreneurship**

Proclivity statement	Willing F (%)	Not willing F (%)	x	Rank		
To start own non-agricultural entrepreneurship after graduation	128(83.7)	25(16.3)	0.84	1st		
To invest time and resources in non-agricultural enterprise	124(81.0)	29(19.0)	0.81	6th		
To take risks associated with non-agricultural entrepreneurship	127(83.0)	26(17.0)	0.83	4th		
To seek support from relevant stakeholders in non-agricultural entrepreneurship	120(78.4)	33(21.6)	0.78	8th		
To collaborate with other non-agricultural entrepreneurs to achieve common goals	128(83.7)	25(16.3)	0.84	1st		
To adopt innovative technologies in non-agricultural entrepreneurship	127(83.0)	26(17.0)	0.83	4th		
To support value-added processing of non-agricultural products and services	129(84.3)	24(15.7)	0.84	1st		
To promote non-agricultural entrepreneurship among other youth in my community	123(80.4)	30(19.6)	0.80	7th		
<b>Non-agricultural entrepreneurship</b>	<b>F</b>	<b>%</b>	<b>Min</b>	<b>Max</b>	<b><math>\bar{X}</math></b>	<b>S.D.</b>
High proclivity ( $\geq 6.57$ )	102	69.9	0.00	8.00	6.57	2.37
Low proclivity ( $< 6.57$ )	46	30.1				

Source: Field Survey, 2023

**T-test analysis of differences in proclivity**

The paired sample t-test results in Table 10 ( $t = -1.68$ ,  $p = 0.095$ ) indicate that there is no significant difference between the proclivity to agricultural and non-agricultural entrepreneurship. This suggests that

the willingness of undergraduates to engage in entrepreneurship is broadly balanced between agricultural and non-agricultural ventures, consistent with findings by Ikuemonisan et al. (2022) and Oyinlola et al. (2024).

**Table 10: Paired sample t-test analysis for differences in proclivity to agricultural and non-agricultural entrepreneurship**

Variables	N	x	SD	Std. Err.	Mean Diff.	t	df	Sig.
Agricultural entrepreneurship	153	6.09	2.57	0.28	-0.48	-1.68	152	0.095
Non-agricultural entrepreneurship	153	6.57	2.37					

\*Significant at  $p \leq 0.05$ . Source: Field Survey, 2023

## CONCLUSION AND RECOMMENDATION

The study concludes that although undergraduates exhibited positive perceptions toward both agricultural and non-agricultural entrepreneurship, their proclivity toward non-agricultural ventures was relatively higher. This pattern implies that while awareness of agribusiness opportunities exists, perceived risks, limited access to capital, and inadequate institutional support continue to deter stronger engagement in agricultural entrepreneurship. It is recommended that universities and policymakers enhance experiential learning through agritech innovation hubs, mentorship schemes, and youth-friendly financing mechanisms. Additionally, targeted incentives such as start-up grants and structured agribusiness internships should be introduced to strengthen students' practical interest and confidence in pursuing agriculture as a viable entrepreneurial pathway.

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## Agricultural extension strategies for managing post-harvest gluts and commodity price declines in southern Kebbi state, Nigeria

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### ABSTRACT

This study investigated agricultural extension strategies for managing post-harvest gluts and commodity price drops in Southern Kebbi State, Nigeria, using data from 300 smallholder farmers collected through interview schedule. Descriptive statistics indicate that 78% of respondents had access to extension services, with 54% reporting easy accessibility. Exploratory Factor Analysis on 15 variables extracted five factors explaining 68% of total variance; the most significant factors were inadequate storage (factor loading = 0.82) and poor market information (0.79). Cross-tabulation and Chi-Square tests reveal significant associations between extension strategies and management of post-harvest gluts (chi-square = 32.45, df = 4,  $p < 0.001$ ). Multiple linear regression analysis shows that six extension strategies collectively explained 61.4% of variance in perceived effectiveness ( $R^2 = 0.614$ , Adjusted  $R^2 = 0.598$ ), with significant predictors including farmer training ( $\beta = 0.312$ ), storage support (beta = 0.278), market information ( $\beta = 0.235$ ), value addition training ( $\beta = 0.145$ ), cooperative linkage ( $\beta = 0.198$ ), and extension contact frequency ( $\beta = 0.167$ ), all significant at  $p < 0.05$ . The study recommends enhancing extension services, strengthening farmer training and cooperatives, and improving storage, market access, and information dissemination to empower smallholder farmers in Southern Kebbi for better post-harvest management and income stability.

**Keywords:** *Agricultural extension, post-harvest management, commodity price, Kebbi State, smallholder farmers.*

### INTRODUCTION

Agricultural extension strategies aimed at mitigating postharvest gluts and commodity price declines in Southern Kebbi State are both timely and necessary. Farmers in Kebbi produce staples such as maize, sorghum, cowpea, and vegetables, yet face sharp price drops during periods of oversupply owing to limited storage, poor handling, and weak market access (Ibrahim, Abdulrahman, & Ado, 2022; Bawa, Wade, & Auwal, 2024). Ibrahim et al. (2022) observed that major postharvest losses occur during drying and storage, driven primarily by insect pest infestations, spillage during handling, theft, and poor storage conditions. Bawa et al. (2024) reported that inadequate storage, poor handling, and lack of refrigeration contributed to both physical and economic losses, reducing incomes and destabilising livelihoods.

Extension services have been shown to play a crucial role in reducing postharvest losses and improving market outcomes. Nwafor, Nnadozie, and Chukwuezi (2019) found that marketing extension services had a statistically significant effect in controlling postharvest losses by improving market linkages, promoting value addition, and supporting efficient distribution channels. Mbah, Adikwu, and Agbo (2022) identified key extension-promoted practices such as proper harvesting time, adequate storage facilities, appropriate packaging, and efficient transportation as essential in reducing post-harvest losses. Adole, Peter, and Naswem (2024) demonstrated that variables such as education level, farming experience, age, and access to credit significantly affected farmers' willingness to implement post-harvest innovations.

Despite the significant contributions of agriculture to livelihoods and food security in Southern Kebbi State, farmers continue to face persistent challenges related to post-harvest losses and seasonal commodity price fluctuations. During peak harvest periods, the sudden influx of produce often exceeds the absorptive capacity of local markets, resulting in post-harvest gluts that trigger sharp declines in farm gate prices. Without a clear understanding of the reach, quality, and impact of extension interventions in this region, efforts to manage gluts and prevent price collapses may remain ineffective or misaligned with farmers' needs. The specific objectives are to:

- i. assess the availability and accessibility of agricultural extension services related to post-harvest management;
- ii. identify the major post-harvest challenges and factors contributing to commodity price drops;
- iii. examine the specific agricultural extension strategies employed to address post-harvest gluts and price instability; and
- iv. evaluate the effectiveness of these extension strategies.

### METHODOLOGY

Southern Kebbi, located in the southern zone of Kebbi State in northwestern Nigeria, lies between latitudes 10 degrees 05 minutes N and 11 degrees 55 minutes N and longitudes 3 degrees 05 minutes E and 5 degrees 05 minutes E. It comprises the local government areas of Zuru, Yauri, Shanga, Fakai, Sakaba, and Danko-Wasagu. The area, with an estimated population of about 1.3 million growing at 2.9% per annum, is predominantly rural and agrarian, supporting the

cultivation of maize, sorghum, millet, cowpea, rice, groundnuts, and vegetables.

A multi-stage sampling procedure was employed. In the first stage, three LGAs (Zuru, Sakaba, and Fakai) were purposively selected. In the second stage, two farming communities were randomly selected from

each LGA, giving six communities in total. In the third stage, a proportionate random sampling technique was employed to select individual respondents. A total sample size of 300 respondents was determined using the Yamane (1967) formula:  $n = N / (1 + Ne^2)$ , where  $N = 1,200$ ,  $e = 0.05$ , giving  $n = 300$ .

**Table 1: Summary of sampling procedure and sample size**

Local Government Area	Village/Community	Sampling Frame	Sample Size (n)
Zuru	Dabai	220	55
Zuru	Tadurga	180	45
Sakaba	Dirin Daji	210	53
Sakaba	Dankolo	190	48
Fakai	Mahuta	220	55
Fakai	Bajida	180	44
Total		1,200	300

Source: Author construct, 2025

**Method of data collection and analysis**

Data were collected using a structured interview schedule with closed-ended and Likert-scale questions, administered in person by trained enumerators. Descriptive statistics were used to analyse objective 1; Exploratory Factor Analysis (EFA) addressed objective 2; cross-tabulation and Chi-square tests addressed objective 3; and Multiple Linear Regression (MLR) addressed objective 4.

**Exploratory Factor Analysis (EFA) Model Specification:**

Factor Analysis Model:

$$Y = f(X_1, X_2, \dots, X_{15})$$

Where:

Y = Latent factors (e.g., storage issue, transport cost, market access)

X<sub>1</sub>...X<sub>15</sub> = Observed variables on post-harvest challenges

Assumptions: KMO > 0.6, Bartlett's test  $p < 0.05$

Extraction: Principal Component Analysis (PCA)

Rotation: Varimax

**Cross-tabulation and Chi-Square Test of Association Model Specification:**

Chi-Square Test:

Model:

$$\chi^2 = \sum [(O_{ij} - E_{ij})^2 / E_{ij}]$$

Where:

O<sub>ij</sub> = observed frequency

E<sub>ij</sub> = expected frequency

**Multiple Linear Regression Model Specification:**

Multiple Linear Regression Model:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \dots + \beta_7X_7 + \epsilon$$

Where:

Y = Effectiveness Score (or Post-harvest Loss Reduction / Price Stability Index)

X<sub>1</sub>...X<sub>7</sub> = Extension Strategies (e.g., training, market linkages, storage support)

β<sub>0</sub> = Intercept

β<sub>1</sub>...β<sub>7</sub> = Coefficients estimated

ε = Error term

**RESULTS AND DISCUSSION**

Table 2 shows that only 38.0% of the respondents reported the availability of extension services on postharvest management, while 62.0% indicated such services were unavailable. Furthermore, 44.0% had never been contacted by extension agents, and 67.3% found extension services inaccessible. Additionally, 74.0% of farmers believed that information provided by extension workers was not relevant to their actual postharvest needs. This mirrors results from Ogundele et al. (2024), who highlighted poor rural extension coverage in the Northwest geopolitical zone.

**Table 2: Availability and accessibility of agricultural extension services related to post-harvest management in Southern Kebbi (n = 300)**

Item	Response	Frequency (n)	Percentage (%)
Availability of extension services on postharvest issues	Available	114	38.0
	Not Available	186	62.0
Frequency of extension contact	Monthly	48	16.0
	Occasionally	84	28.0
	Never	132	44.0
	Accessible	98	32.7

Relevance of information provided	Not Accessible	202	67.3
	Relevant	78	26.0
	Not Relevant	222	74.0

Source: Field Survey, 2025

The EFA in Table 3 reveals revealed three major underlying factors that account for post-harvest challenges and commodity price drops among farmers in Southern Kebbi:

**1. Storage and Infrastructure Deficiencies (Factor 1)**

- This factor had strong loadings on poor storage, pest infestation, lack of cold chain, poor road infrastructure, and poor packaging. These findings align with, who highlighted that the absence of modern storage and transport systems results in high perishability and spoilage, reducing market value.

**2. Market Constraints (Factor 2)** - Variables like middlemen exploitation, market information gaps, seasonal gluts, price instability, and market space

limitations loaded heavily here. This supports the work of Ibrahim *et al.*, (2023), who found that market inefficiencies and overreliance on intermediaries lead to drastic price drops during harvest seasons.

**3. Financial and Organizational Barriers (Factor 3)**

- This factor groups issues like poor credit access, lack of cooperatives, and inadequate processing, indicating that financial exclusion and weak farmer organization limit value addition and bargaining power. As shown by Ibrahim *et al.* (2023), organized farmers with access to finance and cooperatives are more resilient to price fluctuations.

**Table 3: Factor analysis results of the major post-harvest factors contributing to commodity price drops (n = 300)**

Variables	Factor 1 (Storage & Infrastructure)	Factor 2 (Market Constraints)	Factor 3 (Financial Issues)
Poor storage facilities	0.802		
Pest infestation during storage	0.751		
Lack of cold chain facilities	0.709		
Poor road infrastructure	0.684		
Poor packaging	0.654		
Inadequate market space		0.779	
Middlemen exploitation		0.748	
Seasonal glut of produce		0.731	
Price fluctuations		0.715	
Limited access to market information		0.692	
Delayed market access		0.683	
High transport cost		0.650	
Poor credit access			0.795
Lack of cooperative marketing			0.761

Source: Field Survey, 2025

The Chi-square test in Table 4 reveals a statistically significant relationship between the type of extension strategy and the post-harvest issue being addressed (chi-square = 74.28,  $p < 0.001$ ). Farmer training and storage support were primarily targeted at reducing

post-harvest losses, consistent with Ibrahim *et al.* (2023), while cooperative linkages had the strongest association with price stabilisation, supporting Tanko and Lawal (2022).

**Table 4: Chi-square results of agricultural extension strategies employed to address post-harvest gluts and price instability (n = 300)**

Extension Strategies	Post-Harvest Loss Reduction	Market Glut Management	Price Stabilisation	Total
Farmer Training	72	21	15	108
Storage Support	68	24	18	110
Market Information	33	41	36	110
Value Addition Training	29	46	35	110
Cooperative Linkages	18	39	53	110
Test Statistic (chi-square)	74.28			

Degrees of Freedom (df)	8
p-value	$p < 0.05$

Source: Field Survey, 2025. \*Multiple responses allowed.

The multiple linear regression analysis in Table 5 shows an R<sup>2</sup> value of 0.614 and an adjusted R<sup>2</sup> of 0.598, indicating that approximately 61% of the variance in perceived effectiveness is explained by the included predictors. The F-statistic ( $F(7, 292) = 39.91$ ,  $p < 0.001$ ) confirmed that the model is statistically significant. Farmer training ( $\beta = 0.312$ ,  $p < 0.001$ ) had the highest positive and significant influence, followed

by storage support ( $\beta = 0.278$ ), market information ( $\beta = 0.235$ ), cooperative linkages ( $B = 0.198$ ), extension contact frequency ( $\beta = 0.167$ ), and value addition training ( $\beta = 0.145$ ). Access to credit via extension linkage ( $\beta = 0.122$ ) was not statistically significant ( $p = 0.061$ ), possibly reflecting structural constraints in rural financial services.

**Table 5: Multiple linear regression results on effectiveness of extension strategies in reducing post-harvest losses and improving price outcomes (n = 300)**

Predictor Variable	Coefficient (B)	Std. Error	t-value	p-value
Constant	1.213***	0.278	4.36	0.000
Farmer Training	0.312***	0.081	3.85	0.000
Storage Support	0.278**	0.090	3.09	0.002
Market Information	0.235**	0.074	3.18	0.001
Value Addition Training	0.145*	0.069	2.10	0.037
Cooperative Linkage	0.198*	0.077	2.57	0.011
Extension Contact Frequency	0.167*	0.080	2.09	0.038
Credit Access via Extension	0.122	0.065	1.88	0.061

R<sup>2</sup> = 0.614; Adjusted R<sup>2</sup> = 0.598;

$F(7, 292) = 39.91$ ;  $p < 0.001$

Source: Field Survey, 2025. \*\*\* $p < 0.01$ ; \*\* $p < 0.05$ ; \* $p < 0.10$

## CONCLUSION AND RECOMMENDATIONS

The findings confirm that well-targeted, multi-dimensional extension strategies are vital in enhancing post-harvest outcomes and empowering smallholder farmers to manage market-related risks. Accessible and targeted agricultural extension services are critical in reducing post-harvest losses and stabilising commodity prices.

The following recommendations are made:

- i. Government should improve the availability and accessibility of agricultural extension services by increasing the number of extension agents and enhancing outreach efforts in remote areas of Southern Kebbi.
- ii. NGOs should be encouraged to design targeted interventions to address the major post-harvest challenges identified, using insights from the exploratory factor analysis.
- iii. Extension agents should strengthen specific strategies including farmer training, storage support, and dissemination of market information that have been shown to effectively manage post-harvest gluts and mitigate price instability.
- iv. Government should promote integrated extension approaches that combine training, cooperative linkages, and frequent extension contacts, while also working to enhance farmers' access to credit through extension services.

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**Aged cattle rearers in northwest Nigeria and succession planning: Attitudinal analysis**<sup>1</sup>Ibrahim, S., <sup>2</sup>Torimiro, D. O., <sup>1</sup>Nasiru, S., <sup>3</sup>Aledare, M. E. and <sup>1</sup>Muhammad, H. A.<sup>1</sup>Department of Agricultural Economics and Extension, Faculty of Agriculture, Abdullahi Fodio University of Science and Technology, Aliero, Nigeria<sup>2</sup>Department of Agricultural Extension and Rural Development, Botswana University of Agriculture and Natural Resources, Gaborone<sup>3</sup>Department of Agricultural Education, Kogi State College of Education (Technical), Kabba, Nigeria

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**ABSTRACT**

The cattle rearing industry in Nigeria is highly traditional and dominated by aged farmers, which has made the sector less productive and limited the adoption of modern technologies. This study was conducted in Northwest Nigeria to assess the aged cattle rearers' attitude towards succession and their willingness to transfer the industry to the next generation. Specifically, the socio-economic characteristics were described, their attitudes toward farm succession were examined, their transfer of farm assets was determined, and the correlates of their attitudes towards succession were established. Two hundred and forty respondents were selected using a multistage sampling procedure. The data collected was analysed using descriptive statistics and Pearson Product Moment Correlation. The results show that most (45.74%) of the respondents were aged 65 and above, with a mean of 67.17 +/- 5.46 years, and most (95.4%) were males. Many (63.3%) respondents had a herd size of at least 100 with an average of 112.32 +/- 106.46 heads. The findings reveal that most (90.8%) respondents had a favourable attitude toward succession. Correlations existed between respondents' attitudes toward farm succession and their age ( $r = 0.204$ ), household size ( $r = 0.243$ ), and herd size ( $r = 0.378$ ). It is recommended, among others, that farm succession issues be legislated.

**Keywords:** Attitude, Cattle, Rearers, Farm, Succession.**INTRODUCTION**

Livestock production in Nigeria is a subsector of agriculture that contributes about 10% to the country's gross domestic product (GDP) apart from employment the sector generates (Angbulu, 2023). Many households rely on ruminants for their livelihoods, especially in rural areas. Nigeria has a cattle population of about 20,585,189 heads (NAERLS & FMARD, 2020). The cattle industry has become a security threat because of the over-dependence of its value chain on a network of nomadic herders, causing significant friction between herders and landowners (Federal Ministry of Agriculture and Rural Development, 2016).

The ageing farming population and the prevalence of traditional practices in Nigeria's cattle rearing industry limit productivity and make it difficult for modern livestock technologies to be effectively adopted. Farm succession has been defined as the process by which farms are passed on from one generation to the other. In northern Nigeria, a cattle farm is not passed down to a successor; instead, it is split between different successors of the business owner after his demise, which may negatively impact cattle farm business expansion (Ibrahim, 2018).

Attitude is an organised disposition to think, feel, perceive, and respond to a psychological object or idea (Kerlinger, 1967). Despite the critical role of livestock farming in the economy and culture of northwestern Nigeria, there is a significant research gap regarding older pastoralists' attitudes toward succession

planning. This study aims to provide valuable insights that can inform policy and educational initiatives and ultimately support the long-term sustainability of pastoral communities in Northwest Nigeria.

Therefore, the study was conducted in Northwest Nigeria to assess the aged cattle rearers' attitude towards succession and gauge their willingness to transfer the industry to the next generation. Specifically, it

- i. described the socioeconomic characteristics of respondents.
- ii. examine respondents' attitudes towards farm succession; and
- iii. determined respondents' transfers of farm assets to a successor.

The only hypothesis for this study tested significant relationship between respondents' socioeconomic characteristics and attitudes toward farm succession Planning.

**METHODOLOGY**

The study sample was drawn from rural communities in Kebbi State, Northwest Nigeria. The State is divided into five pastoral blocks: Argungu, Birnin Kebbi, Bagudo, Zuru, and Yauri. A multistage sampling procedure was used. In the first stage, two LGAs with a preponderance of aged cattle rearers were randomly selected in each pastoral block. In the second stage, 50% of all the rural communities were

purposely selected from each LGA, making a total of twenty-four rural communities. Slovin's formula was used to calculate the sample size of 240 respondents.

Attitude towards farm succession was measured on a five-point Likert scale ranging from strongly agree (5) to disagree (1) for positive statements, with negative statements scored in reverse. The total maximum and minimum scores of 20 and 4 were obtained for each respondent. Transfer of farm assets was measured on a scale of 0 (not transferred) to 3 (fully transferred).

## RESULTS AND DISCUSSION

Results in Table 1 show that nearly half (45.4%) of the cattle rearers were 65 years or older, with a mean age of  $67.17 \pm 5.47$  years. This indicates that most respondents are in their advanced years, reflecting the dominance of older adults in cattle production. This finding aligns with Fagorusi (2016), who reported that the mean age of Nigerian farmers was 55.5 years, signifying a decline in youth participation in livestock production. The finding also supports the United Nations (2022) projection that the global population of people aged 60 and above is expected to double by 2050, with developing countries Nigeria inclusive contributing the largest share. Similarly, Adeleke *et al.* (2017) noted that older persons constitute about 4.3% of Nigeria's population, equivalent to 9.4 million people. The implication is that most cattle rearers in the study area are elderly, and their physical strength and agility for intensive livestock management may have diminished, leading to reduced productivity. This reflects the law of diminishing returns, where increased age inversely affects labour efficiency and output (Ogunremi & Adedeji, 2023). Consequently, this demographic pattern limits the sector's capacity to adopt improved cattle-rearing technologies and sustain productivity, thereby posing challenges to the long-term sustainability of livestock production in Nigeria.

Table 1 further reveals that 95.4% of respondents were male, compared to 4.6% female, confirming that cattle rearing remains a male-dominated enterprise. This gender imbalance corroborates Torimiro (2019) and Adekunle, Agboola, and Ogunjimi (2015), who found that men dominate energy-demanding and capital-intensive farm enterprises. Similarly, Ibrahim *et al.* (2020) observed that the physical demands and long-

distance mobility involved in cattle rearing discourage female participation. Recent findings by Obayelu, Ogbe, and Edewor (2020) and Agada & Nwosu (2023) also indicate that gender disparity persists in Nigeria's agricultural sector, constraining inclusive development and equitable access to productive resources. The limited presence of aged female rearers may also be traced to traditional inheritance systems that prioritize male heirs, as observed by Torimiro (2019) and Ibrahim (2018), where livestock ownership is typically transferred to sons rather than daughters.

Furthermore, most (84.0%) respondents were married, indicating strong family structures that may facilitate intergenerational planning. According to Okpara (2010), married farmers often experience higher motivation to increase productivity for household sustenance and commercial benefits, making them more likely to engage in succession planning to secure family livelihoods. The results also show that 48.8% of respondents had household sizes between 11 and 20 members, with a mean household size of  $13 \pm 6.98$ . The large household size reflects sociocultural values attached to family and Labour in rural communities, where children are considered both social capital and a source of Labour. This finding is consistent with Ibrahim (2018) and contrasts with the National Bureau of Statistics (2016) report, which recorded an average rural household size of 5.9 persons. Large households in pastoral systems often provide abundant family labour for herding, which directly enhances livestock management and productivity (Gallagher & Waite, 2000; Mgbakor, Ochiaka, Okorie, & Ugwu, 2014; Musa *et al.*, 2022). Moreover, the majority (85.0%) of respondents had 20 years of education or less, with a mean of  $10.92 \pm 10.96$  years. This implies that most aged cattle rearers possess basic literacy, including the ability to read and perform arithmetic, which can enhance their capacity to plan for succession and manage farm resources efficiently. The finding supports recent studies such as Fasina and Inegbedion (2013), El-Osta, Johnson, and Mishra (2004), and Ibrahim *et al.* (2020), who noted that education significantly influences succession planning among farm households. Similarly, Nwabuatu (2024) found that literate livestock farmers in northern Nigeria are more likely to identify and mentor successors compared to their illiterate counterparts.

**Table 1: Distribution of respondents according to socioeconomic characteristics**

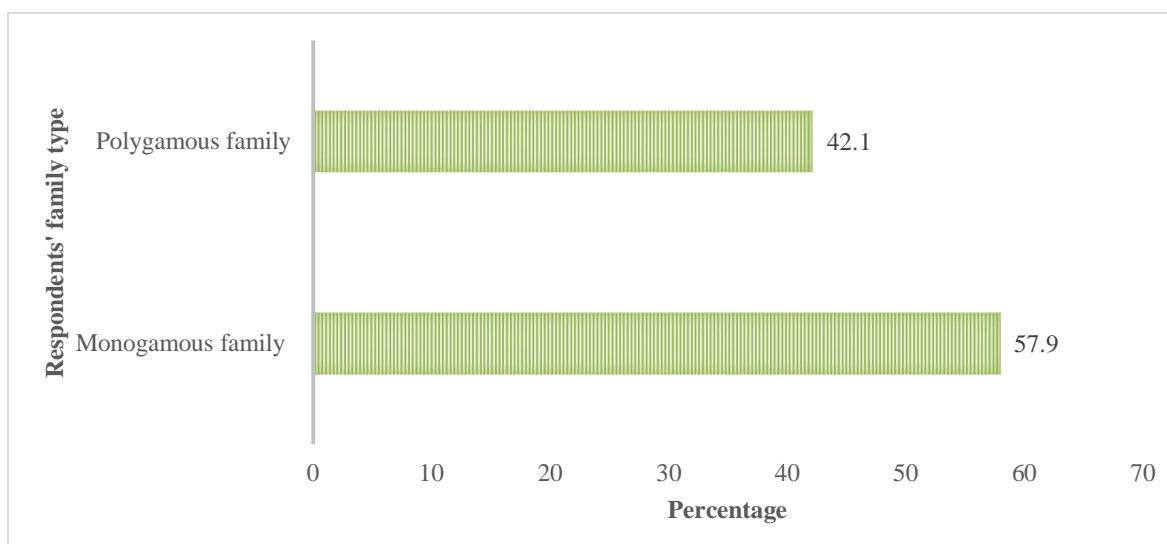
Variables	Frequency	Percentage (%)	Mean	Std. Dev.
Age			67.17	5.468
60-65	109	45.4		
66-70	74	30.8		
71-75	37	15.4		
> 75	20	9.3		
Sex				
Male		95.4		
Female		4.6		

Marital status				
Married	236	98.3		
Divorced	1	0.4		
Separated	2	0.8		
Widowed	1	0.4		
Household size				
< 11	93	38.8	13.04	6.989
11-20	117	48.8		
21-30	26	10.8		
31-40	2	0.8		
> 40	2	0.8		
Years of education				
< 21	209	85.0	10.92	1.096
21-40	32	13.3		
> 40	4	1.7		

Source: Field survey, 2018

Furthermore, results in Figure 1 indicate that more than half (57.9%) of the respondents practiced monogamous family structures, having only one wife. This finding suggests that monogamous households are more likely to have an identified and clearly designated successor. In contrast, in polygamous families, household heads often face challenges in identifying a single heir, making discussions about farm succession more complex and potentially conflict laden. This result supports the observation of Barclay, Foskey, and Reeve (2007), who reported that many farmers particularly those in polygamous or extended family systems—often avoid succession discussions because they raise emotionally sensitive issues related to fairness and the equitable treatment of children. Similarly, Baker, Ian, and Lobley (2010) noted that intergenerational transfer within family units remains the main entry pathway into farming in England, underscoring the significance of family structure in

shaping succession dynamics. Recent evidence from Ibrahim et al. (2020) and Nwabuatu (2024) reinforces this conclusion, showing that household composition strongly influences the succession process among livestock farmers in Northern Nigeria. Monogamous families tend to exhibit more coherent and cooperative succession arrangements, as decision-making is centralised and conflicts over inheritance are minimised. By contrast, polygamous arrangements introduce competing claims and power dynamics, often leading to delays or avoidance of formal succession planning (Okolocha & Anugwu, 2022; Gontur et al, 2025). Therefore, the predominance of monogamous family structures among respondents in this study may explain why most had identified successors. It also highlights the role of family cohesion and structure in shaping attitudes toward succession and ensuring the smooth transfer of farm assets to the next generation.



**Fig. 1: Distribution of respondents according to family types**

Source: Field survey, 2018

Results in Figure 2 show that the majority (85.7%) of the respondents were literate in both Arabic and Western education, meaning they possessed the ability to read, write, and perform basic numeracy in at least one language. This relatively high level of literacy implies that most aged cattle rearers have acquired some formal or informal education, which may have positively influenced their understanding and appreciation of the need for succession planning. Education, as an essential component of human capital, is known to shape decision-making, record-keeping, and the transmission of farm management knowledge to younger generations. The findings suggest that education attainment could be a major reason why most respondents had already identified successors for their farms. This aligns with earlier evidence by Fasina and Inegbedion (2014) and El-Osta, Johnson, and Mishra (2004), who posited that farmers with higher education levels are more likely to

plan and implement farm succession strategies due to improved awareness and planning capacity. Recent studies further support this relationship. Ibrahim et al. (2020) and Olubiyi (2022) reported that literacy and exposure to formal training enhance farmers' perception of the economic and social value of succession, encouraging them to prepare younger household members for management and ownership responsibilities. Likewise, Okoh et al. (2021) and Nwabuatu (2024) observed that educated farmers are more open to institutional advice and extension guidance on intergenerational transfer, resulting in smoother transition processes. Therefore, the high literacy recorded among the aged cattle rearers in this study could explain their generally favourable attitude towards farm succession planning, as education not only improves awareness but also facilitates communication and trust in the transfer process between generations.

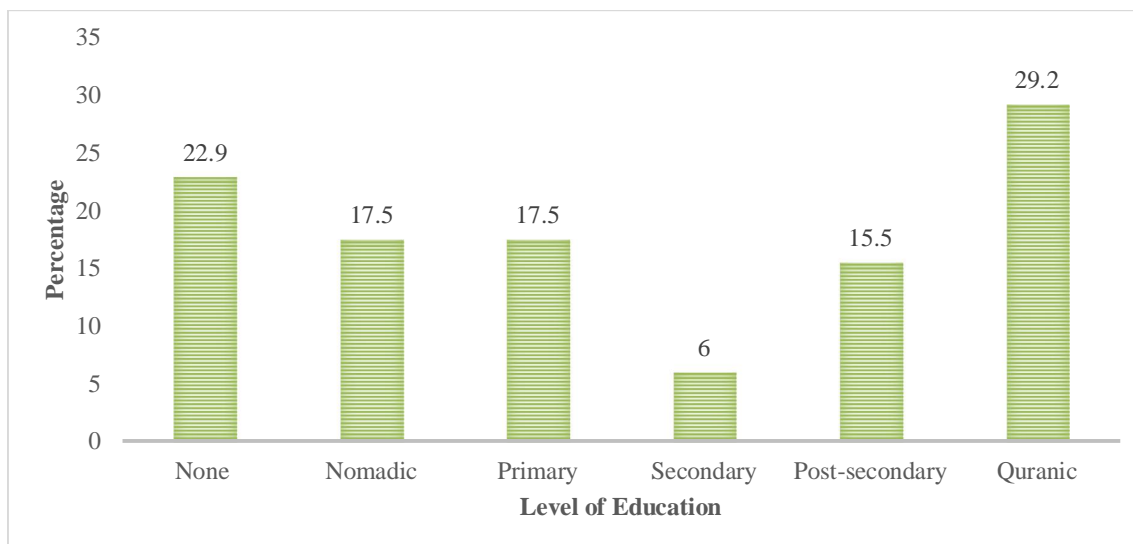


Figure 2: Distribution of respondents according to their level of education

Source: Field survey, 2018

#### Rank order of respondents' attitudinal statements towards succession planning

Table 2 presents respondents' attitudes toward farm succession planning. The statement "I am sure succession planning is important for the farm and farm owner" ranked 1st (Mean =  $5.00 \pm 0.00$ ), indicating a strongly positive perception of succession planning as essential to farm continuity and sustainability. This was followed by "I see succession-related issues as worrisome issues" ranked 2nd (Mean =  $3.33 \pm 1.59$ ), "Discussing succession is like wishing me early death" ranked 3rd (Mean =  $1.52 \pm 0.50$ ), and "Thinking about succession is like a waste of time" ranked 4th (Mean =  $1.12 \pm 0.34$ ). The overall result indicates that respondents generally exhibited a

favourable attitude toward succession planning. This finding implies that many aged cattle rearers in the study area recognise the relevance of succession planning to both the farm and its owner. Such awareness likely stems from increased access to extension and advisory services that emphasize the importance of intergenerational transfer of farm assets and knowledge. This is consistent with the findings of Ibrahim *et al.* (2020), who reported that cattle farmers in Kebbi State with greater awareness of succession planning were more prepared to designate successors despite prevailing socio-cultural and psychological barriers. Similarly, Okoh *et al.* (2021) and Olubiyi (2022) emphasized that a positive perception of succession planning enhances the continuity and

resilience of family owned agribusinesses in Nigeria. Conversely, Okolocha and Anugwu (2022) found that negative cultural connotation such as equating succession discussions with death or misfortune tend to delay or prevent proper planning. The lower mean scores associated with such negative attitudinal statements in this study suggest that while traditional beliefs persist, they may gradually weaken as more farmers become exposed to extension programmes promoting farm sustainability. Additionally,

Nwabuatu (2024) Gontur *et al.*, (2025) study both noted that effective succession planning is strengthened by exposure to training, education, and institutional support, all of which shape individuals' attitudes toward the process. Therefore, the findings from this study reinforce the growing recognition among older cattle rearers of the need for structured farm succession planning to ensure generational continuity and reduce the risk of farm fragmentation or abandonment.

**Table 2: Distribution of aged cattle rearers' attitude towards farm succession**

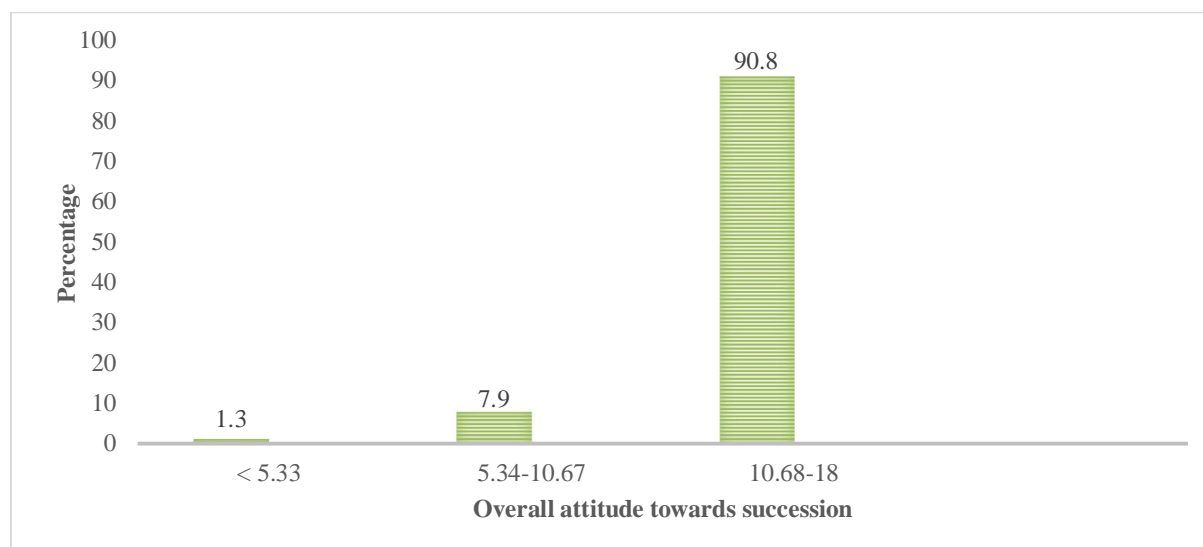
Attitudinal statements	Mean	Std. Deviation	Ranking	Decision
I am sure succession planning is important for the farm and the farm owner.	5.000	0.000	1st	Favourable
Discussing succession is like wishing the farm owner an early death.	1.520	0.500	3rd	Favourable
Thinking about succession planning is a waste of time.	1.120	0.339	4th	Unfavourable
I see succession planning-related issues as problematic to me.	3.325	1.586	2nd	Favourable

Source: Field survey, 2018

**Overall level of respondents' attitude towards succession**

Results presented in Figure 3 revealed that most respondents (90.8%) exhibited a favourable attitude toward farm succession planning. This finding suggests that many aged cattle rearers in the study area recognise the significance of planning for intergenerational farm transfer. The overall positive attitude implies that when farm succession is supported by appropriate legal frameworks and

extension guidance, older rearers may be more willing to entrust their farming operations to younger, energetic, and innovative successors. Such readiness enhances the prospects for continuity, modernisation, and sustainable growth within the cattle industry. These findings corroborate earlier reports by Ibrahim *et al.* (2020) and Okoh *et al.* (2021), who emphasized that positive attitudes and supportive institutional mechanisms are crucial determinants of effective farm succession among rural farming populations.



Mean=13.32, S. D=2.827, n = 240

Fig. 3: Distribution of respondents according to overall attitude towards succession

Source: Field survey, 2018

### Respondents' level of transfer of farm assets to a successor

Evidence in Table 3 shows that the grand mean of farm asset transfer among aged cattle rearers was 2.18, which served as the benchmark for assessing the extent of asset transfer. The results revealed that the respondents had transferred four out of six key farm assets to their identified successors. Specifically, management as a farm asset ranked 1<sup>st</sup> (Mean = 2.80 ± 0.60), followed by Labour (Mean = 2.77 ± 0.59) and cattle rearing skills (Mean = 2.77 ± 0.59), both ranking 2<sup>nd</sup>. *Knowledge of cattle rearing* ranked 3<sup>rd</sup> (Mean = 2.73 ± 0.63), control of the farm by a successor ranked 4<sup>th</sup> (Mean = 1.73 ± 1.07), while *ownership of the farm* ranked 5<sup>th</sup> (Mean = 0.30 ± 0.83). The findings indicate that most aged cattle rearers have begun transferring essential managerial, Labour, and skill-based assets to their successors but have largely withheld ownership

rights. This suggests that ownership is traditionally retained until the demise of the principal operator, reflecting a cultural norm of delayed inheritance within pastoral communities. The result thus aligns with Errington (1998), who observed that in many family farm systems, full financial and ownership responsibilities are rarely assumed by successors until the first generation has passed away. The partial transfer of farm assets observed in this study may also explain the respondents' generally favourable attitude toward succession planning, as they appear willing to prepare successors for future ownership while maintaining control during their lifetime. This gradual approach to transfer provides successors with experiential learning opportunities while preserving the elders' authority, a practice that enhances continuity and stability in traditional livestock production systems.

**Table 3: Rank order of respondents' transfer level of farm assets to a successor**

Assets	Mean	Std. Deviation	Rank	Decision
I have transferred the management of my farm to a successor.	2.80	0.60	1st	Fully transferred
I have transferred labour to an identified successor.	2.77	0.59	2nd	Fully transferred
I have transferred cattle-rearing skills to my successor.	2.77	0.59	2nd	Fully transferred
I have transferred knowledge of cattle rearing to a successor.	2.73	0.63	3rd	Fully transferred
I have transferred the control of my farm to a successor.	1.73	1.07	4th	Not transferred
I have transferred the ownership of my farm to a successor.	0.30	0.83	5th	Not transferred

Source: Field survey, 2018

### Overall level of respondents' transfer of farm assets to successors

Results presented in Figure 4 show that most respondents (86.3%) moderately transferred their farm assets to identified successors. This implies that aged cattle rearers have already initiated the process of succession planning. The finding suggests that, over time, these older farmers may become increasingly willing to hand over farm ownership to the younger generation. This pattern corroborates Fennell's (1981) classical assertion that family farm succession is a progressive and multistage process during which knowledge, Labour, management, and ownership of the farm business are gradually transferred from the retiring older generation to the younger one. Recent studies have reaffirmed that succession is typically a gradual and multi-phased process, often beginning with the delegation of Labour and managerial responsibilities before the eventual transfer of ownership (Ibrahim *et al.*, 2020; Okolocha & Anugwu, 2022; Nwabuatu, 2024). Similarly, Okoh *et al.* (2021) observed that aged farmers in Northern

Nigeria prefer to first engage potential successors in day-to-day operational tasks as a preparatory step toward eventual ownership transition. These observations align with Olubiyi (2022), who noted that successful farm continuity in sub-Saharan Africa depends on experiential learning and progressive asset handover to ensure sustainability. Furthermore, Daniele *et al.* (2024) reported that management and knowledge transfer precede legal ownership in most smallholder and livestock-oriented family farms, reflecting a cultural inclination toward maintaining control until late in life. More so, the moderate level of asset transfer recorded in this study indicates that the process of intergenerational succession has begun among aged cattle rearers. However, the deliberate retention of ownership until later in life highlights both cultural and risk-aversion factors influencing succession timing in pastoral systems. This aligns with general findings in rural succession studies accentuating that social norms, inheritance laws, and emotional attachment to the farm significantly shape the pace and completeness of the transfer process (Nwabuatu, 2024; Gontur *et al.*, 2025).

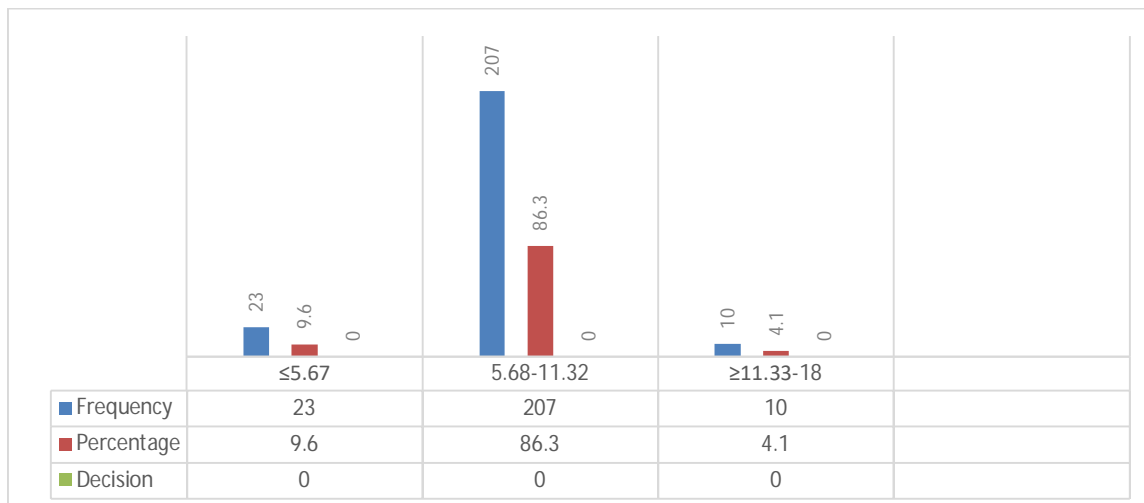


Figure 4: Distribution of respondents according to the rate of transfer of farm assets to successors  
Source: Field survey, 2018

**Some correlates of aged cattle rearers' attitudes towards succession**

Results in Table 4 indicate a positive and significant relationship between aged cattle rearers' attitudes toward succession planning and their age ( $r = 0.204$ ), household size ( $r = 0.234$ ), and herd size ( $r = 0.378$ ). This implies that as the age, household size, and herd

size of the respondents increase, their attitudes toward succession planning become more favourable. The positive relationship between herd size and attitude towards succession supports the argument that farmers with larger herds have stronger incentives to plan for continuity to prevent asset fragmentation and mismanagement (Stephen et al., 2024).

**Table 4: Correlates of respondents' attitudes towards farm succession**

Variables	R	r2	p-value	Decision
Age	0.204***	0.041	0.001	Significant
Household size	0.243***	0.059	0.000	Significant
Herd size	0.378***	0.142	0.000	Significant

\*\*\*Correlation is significant at the 0.01 level (2-tailed). Source: Field survey, 2018

**CONCLUSION AND RECOMMENDATIONS**

The study revealed that aged cattle rearers in Northwest Nigeria exhibited a generally favourable attitude toward farm succession planning. While most have begun transferring key managerial, labour, and skill-based assets to identified successors, ownership rights are typically retained until after the demise of the farm owner, reflecting deep-rooted cultural norms. Socioeconomic factors such as age, household size, and herd size significantly influenced attitudes toward succession. The following recommendations were made:

- i. Attitudinal change campaigns and succession mentorship programmes should be introduced to enhance farm succession planning.
- ii. Issues of farm succession planning should be legislated at the local, state and federal levels of government.
- iii. Youth involvement in livestock production should be actively promoted.
- iv. Livestock extension agents should be trained on farm succession planning.

- v. Gender inclusion and family dialogue in succession planning should be promoted.

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## Sustainable Agricultural Practices among arable crop farmers in Oyo state, Nigeria

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### ABSTRACT

The study investigated the utilisation of Sustainable Agricultural Practices (SAP) by arable crop farmers in Oyo State, Nigeria. A total of 152 respondents were sampled using a multi-stage sampling procedure. Descriptive statistics were used to summarise the data and inferential statistics were used to describe the relationship and differences that exist between the variables. Results reveal that majority were male (79.6%), married (82.9%), had secondary education (70.0%) with a mean age of 38.73 years. Also, majority (52.0%) of the respondents had a favourable attitude towards the use of SAPs. Mixed farming ( $x = 1.47$ ) was the SAP utilised most by the respondents. Level of utilisation of SAPs was low among majority (41.4%) of the respondents. A significant relationship existed between ownership of farmland (chi-square = 16.302,  $p = 0.000$ ), membership of organisation (chi-square = 121.754,  $p = 0.000$ ), years of farming experience ( $r = 0.215$ ,  $p = 0.008$ ), and the utilisation of SAPs by the respondents. The study concluded that the level of utilisation of SAPs is low and recommended the institutionalisation of digital extension services to enhance outreach to a broader spectrum of farmers on various uses of sustainable agricultural practices.

**Keywords:** *Sustainable agricultural practices, Mixed farming, Farming experience, Arable crop farmers.*

### INTRODUCTION

Sustainable agriculture is the comprehensive approach to the cultivation of plants and rearing of animals designed to meet human food and fibre needs over the long term, while enhancing environmental quality and the natural resource base essential to the agricultural economy (National Sustainable Agricultural Coalition, 2023). Addressing the global challenge of food security amidst constraints such as population growth, evolving food preferences, risks of natural resource degradation, and climate change impacts necessitates a fundamental reassessment of current agricultural production systems. The adoption of various SAPs such as mixed farming, zero/minimum tillage, irrigation, drainage, and bush fallowing can improve food security, increase farm productivity, protect ecosystems, and alleviate poverty.

Nigeria's agricultural system is faced with numerous constraints including a poor system of land ownership, limited irrigation agriculture, climate change, and soil degradation. The government has launched multiple projects to increase food production, including the Agriculture Promotion Policy (APP), the Presidential Economic Diversification Initiative (PEDI), the REDD+ programme, and the Nigeria Erosion and Watershed Management Project (NEWMAP) (FAO, 2023). Several studies have been conducted to investigate sustainable agricultural practices in Oyo State, including Gbadebo et al. (2022) who assessed climate-smart agriculture among cassava farmers, and Kehinde et al. (2022) who studied agricultural organisations and adoption of soil conservation practices. However, much consideration has not been

given to the utilisation of SAPs among arable crop farmers in Oyo State. The specific objectives of the study were to:

- i. describe the socio-economic characteristics of the respondents in the study area;
- ii. determine the enterprise characteristics of the respondents;
- iii. determine the attitude of the respondents towards the use of SAPs; and
- iv. determine the level of utilisation of SAPs among the respondents.

The study hypothesised that there is no significant relationship between the respondents' enterprise characteristics and utilisation of SAPs.

### METHODOLOGY

This research was conducted in Oyo State, located in the southwestern region of Nigeria, situated between latitudes 7 degrees 3 minutes and 9 degrees 12 minutes north of the equator and longitudes 2 degrees 47 minutes and 4 degrees 23 minutes east of the Meridian, with an average temperature of 27 degrees C. The state is divided into thirty-three Local Government Areas (NPC, 2009). A multi-stage sampling technique was employed. In the first stage, 50% of the zones in Oyo State were randomly selected (Oyo and Saki zones). The second stage involved the random sampling of 40% of the blocks in the sampled zones. The third stage involved the random selection of one cell each from the sampled blocks. Subsequently, 20% of the registered arable farmers in the cells were randomly sampled.

**Table 1: Summary of sampling procedure and sample size**

Sampled Zones	Number of Blocks	Sampled Blocks	Sampled Cells	Registered farmers	Sampled farmers (20%)
Oyo	6	Iseyin	Idiya	70	14
		Afijio	Iloro	200	40
		Atiba	Onire are-ago	54	11
Saki	9	Kajola	Elewure	156	31
		Atisbo	Corner-owo	78	16
		Iwajowa	Oguneleji	150	30
		Saki-West	Aroje	51	10
Total					152

Data were collected from respondents through a structured questionnaire. The dependent variable, level of utilisation of SAPs, was measured on a three-point scale: always (2), occasionally (1), and never (0). Data were analysed using descriptive and inferential (Chi-square, Pearson Product Moment Correlation) statistical tools.

## RESULTS AND DISCUSSION

### Socioeconomic characteristics of the respondents

The socio-economic characteristics of the respondents are presented in Table 2. The majority (79.6%) of the respondents were male, indicating that men were more engaged in arable farming than women. This finding aligned with previous studies such as Adeyemo *et al.* (2017), which reported male dominance in crop production in Ogun State, and Aworinde (2018), who also observed a higher proportion of male maize farmers in Oyo State. More than half (52.0%) of the respondents were between 41 and 50 years old, with a mean age of 38.73 years. This suggested that most farmers were in their economically active years and capable of sustaining productive agricultural activities. This result corroborated Taiwo *et al.* (2023), who reported a mean age of 45.36 and concluded that cassava farmers in Oyo State were young, experienced subsistence farmers.

The majority (82.9%) of the respondents were married, implying that farmers had family responsibilities requiring steady income. This finding was consistent with Eforuoku (2018), who reported high proportions of married farmers in rural areas, as well as Ademola and Olujide (2014), who noted similar patterns in Atisbo Local Government Area and suggested that household labour might support farm operations. Kehinde *et al.* (2022) also reported a predominance of married farmers in Oyo State. In terms of educational attainment, 46.1% of the respondents had completed secondary education,

indicating a relatively high level of formal schooling. This corroborated the report of Gbadebo *et al.* (2022), who found that most farmers in Oyo State had primary or secondary education, with only a minority attaining tertiary degrees.

Household size results showed that 62.5% of the farmers had between 5 and 8 members, with a mean household size of 5.66. This finding was consistent with Taiwo *et al.* (2023), who reported a mean household size of 5.76 among farmers in Ibarapa communities, and with Ademola and Olujide (2014), who noted that most households in Atisbo Local Government Area consisted of 4–6 members. The vast majority (88.8%) of the respondents were primarily engaged in farming, suggesting strong reliance on agriculture as the major source of livelihood. This observation supported the findings of Gbadebo *et al.* (2022), who similarly reported that most farmers in Oyo State practiced farming as their primary occupation. Furthermore, 71.8% of the farmers engaged in trading as a secondary occupation, indicating that many diversified their income sources to improve financial stability.

Income distribution showed that 44.1% of the respondents earned between ₦51,000 and ₦100,000 monthly, suggesting that cassava and maize farmers in Oyo State were earning above the national minimum wage of ₦30,000 and were therefore in relatively stable economic conditions. However, this contrasted with Eniolorunda (2016), who found that farmers in Bauchi and Gombe States earned between ₦11,000 and ₦20,000 from maize sales in the preceding year. Additionally, results showed that 96.1% of the respondents had no contact with extension workers during the 2022 farming year. This sharply contrasted with the findings of Kehinde *et al.* (2022), who reported that many farmers in Oyo State received extension visits that positively influenced their adoption of conservation practices.

**Table 2: Distribution of respondents by their socioeconomic characteristics (N = 152)**

Variables	Frequency	Percentage (%)	Mean
Age			45.36
< 40	66	43.4	
41-50	79	52.0	
> 50	7	4.6	

Variables	Frequency	Percentage (%)	Mean
Sex			
Male	121	79.6	
Female	31	20.4	
Marital status			
Married	126	82.9	
Single	10	6.6	
Divorced/Widowed	16	10.5	
Educational level			
No formal education	5	3.3	
Primary education	38	25.0	
Secondary education	70	46.1	
Tertiary education	39	25.7	
Primary occupation			
Farming	135	88.8	
Non-farming	17	11.2	
Monthly income (Naira)			
<= 50,000	60	39.5	
51,000-100,000	67	44.1	
101,000-150,000	63	41.4	
> 150,000	8	5.3	
Extension visits			
Yes	6	3.9	
No	146	96.1	

Source: Field survey, 2023

#### Enterprise characteristics of the respondents

The results in Table 3 show that majority (61.8%) of the respondents had between 11 and 20 years of farming experience, with a mean of 12.76 years. This finding corroborated with the report of Ademola and Olujide (2014), who stated that crop farmers in Atisbo Local Government Area had a mean farming experience of 16 years, suggesting that most farmers in the present study were experienced and capable of adapting to changing agricultural practices as well as managing production-related constraints.

More than half (52.6%) of the respondents operated farms measuring between 6 and 10 hectares, indicating that crop production in Oyo State was largely practiced on small- to medium-scale holdings. This aligned with Adeola and Adetunbi (2015), who reported a mean farm size of 4.4 hectares among farmers in southwestern Nigeria. The majority (86.6%) of the farmers owned their farmlands, supporting the findings of Aworinde (2018), who observed that most maize farmers in Oyo State were landowners.

In addition, most respondents (91.4%) operated 3–4 farm locations, implying fragmented landholdings that might increase production costs and limit the full utilization of Sustainable Agricultural Practices (SAPs) due to financial constraints.

The findings further revealed that hired labour (50.7%) constituted the predominant source of labour among the respondents. This contrasted with Oluwatayo and Adedeji (2019), who reported that farmers in Oyo State mainly relied on household labour for both farm and non-farm activities. The results also showed that a majority (62.7%) of respondents did not belong to any farming association, indicating low membership in such groups within the study area. This contradicted the findings of Oluwatayo and Adedeji (2019), who reported that most farmers in their study area were members of agricultural organisations. Among those who belonged to associations, 75.9% did not hold leadership positions. Similarly, 60.5% of the respondents reported that they were not members of any cooperative society, reflecting a generally low participation rate in cooperative structures.

Furthermore, 62.5% of the farmers lacked access to credit, a situation that may be linked to their low association membership, given that such groups often serve as channels for financial support. This finding differed from Oluwatayo and Adedeji (2019), who found that 64.4% of farmers had access to credit facilities in their study of Oyo State.

**Table 3: Enterprise characteristics of respondents (N = 152)**

Variables	Frequency	Percentage (%)	Mean
<b>Years of farming experience</b>			12.76
1-10	55	36.2	
11-20	94	61.8	
21-30	2	1.3	
41 and above	1	0.7	
<b>Farm ownership</b>			
Yes	132	86.8	
No	20	13.2	
<b>Farm size (ha)</b>			3.29
1-5	12	7.9	
6-10	66	43.4	
11-15	80	52.6	
> 15	5	3.3	
<b>Source of farm labour</b>			
Hired labour	77	50.7	
Family labour	63	41.4	
Self-labour	12	7.9	
<b>Membership of farmers association</b>			
Yes	55	36.7	
No	94	62.7	
<b>Membership of cooperative association</b>			
Yes	60	39.5	
No	92	60.5	
<b>Access to credit</b>			
Yes	57	37.5	
No	95	62.5	
<b>Number of farming locations</b>			
3-4	139	91.4	
5-6	10	6.6	
> 6	3	2.0	

Source: Field survey, 2023

#### Respondents' attitude towards the use of SAPs

Results in Table 4a indicate that respondents agreed that embracing SAPs can lead to improved soil health ( $x = 4.09$ ), SAPs have potential to address food security ( $x = 3.89$ ), adopting SAPs supports rural livelihoods ( $x = 3.88$ ), and they are open to adopting

SAPs to produce healthy foods ( $x = 3.84$ ). However, respondents disagreed that traditional farming methods do not affect the environment ( $x = 2.68$ ). The weighted mean was 3.53, indicating an overall moderately favourable attitude. Results in Table 4b show that a slight majority (52.0%) had a favourable attitude toward SAPs.

**Table 4a: Distribution of respondents based on attitude towards the use of SAPs (N = 152)**

Statements	SA	A	N	D	SD	Mean
	F (%)	F (%)	F (%)	F (%)	F (%)	
I believe that embracing SAPs can lead to improved soil health.	70(46.1)	48(31.6)	20(13.2)	6(3.9)	8(5.3)	4.09
I feel optimistic about the potential of SAPs to address food security.	42(27.6)	74(48.7)	16(10.5)	15(9.9)	5(3.3)	3.89
I think adopting SAPs supports rural livelihoods and well-being.	54(35.5)	55(36.2)	20(13.2)	17(11.2)	6(3.9)	3.88
I am open to adopting SAPs to produce healthy foods.	43(28.3)	63(41.4)	32(21.1)	7(4.6)	7(4.6)	3.84
Adopting SAPs will take too much time and effort.	12(7.9)	27(17.8)	2(1.3)	44(28.9)	67(44.1)	3.84
I am open to adopting SAPs to protect the environment.	46(30.3)	49(32.2)	42(27.6)	6(3.9)	9(5.9)	3.77

Statements	SA	A	N	D	SD	Mean
	F (%)	F (%)	F (%)	F (%)	F (%)	
I think adopting SAPs can enhance farming sustainability.	23(15.1)	71(46.7)	37(24.3)	6(3.9)	15(9.9)	3.53
I believe in conventional practices since I have enough knowledge.	8(5.3)	8(5.3)	71(46.7)	41(27.0)	24(15.8)	3.43
I do not think that traditional farming methods affect the environment.	24(15.8)	56(36.8)	38(25.0)	13(8.6)	21(13.8)	2.68
Weighted Mean						3.53

Source: Field survey, 2023

**Table 4b: Categorisation of respondents based on attitude towards the use of SAPs**

Attitude to SAPs	Frequency	Percentage (%)	Mean	SD
Unfavourable (range: 64-94.53)	73	48.0	94.53	5.98
Favourable (range: 95-109)	79	52.0		

Source: Field survey, 2023

#### Level of utilisation of SAPs among respondents

Results in Table 5a reveal that mixed farming ( $x = 1.47$ ) ranked highest among SAPs utilised by respondents. Bush fallowing (1.394) and crop rotation

(1.388) ranked 2nd and 3rd respectively. The respondents did not utilise irrigation systems, mulching, and water harvesting at all. Results in Table 5b reveal that most of the farmers (58.6%) had low utilisation of SAPs.

**Table 5a: Distribution of respondents by utilisation of SAPs (N = 152)**

SAPs	Always (%)	Occasionally (%)	Never (%)	Mean	Rank
Mixed farming	54.6	38.2	7.2	1.473	1st
Bush Fallowing	51.3	36.8	11.8	1.394	2nd
Crop Rotation	44.1	50.1	5.3	1.388	3rd
Use of Drainage systems	48.0	38.2	13.8	1.342	4th
Composting/use of crop residues	39.5	44.1	16.4	1.230	5th
Contour cropping	21.7	51.3	21.0	0.947	6th
Manual weeding/Reduced herbicides	9.9	68.4	21.7	0.881	7th
Use of improved planting materials	19.7	36.8	43.4	0.763	8th
Organic Manuring	2.0	57.2	40.8	0.611	9th
Ridging	3.9	41.4	54.6	0.493	10th
Integrated Pest Management (IPM)	11.2	25.7	63.2	0.480	11th
Agroforestry	8.6	13.2	78.3	0.302	12th
Avoiding fossil burning	2.6	24.3	73.0	0.296	13th
Afforestation/Reforestation	6.5	8.6	84.9	0.217	14th
Zero/Reduced tillage techniques	2.0	9.2	88.8	0.131	15th
Planting of cover crops	0.0	4.6	95.4	0.046	16th
Use of Irrigation systems	0.0	0.0	100	0.000	17th
Mulching	0.0	0.0	100	0.000	17th
Water Harvesting	0.0	0.0	100	0.000	17th

Source: Field survey, 2023

**Table 5b: Categorisation of respondents based on level of utilisation of SAPs (N = 152)**

Utilisation of SAPs	Frequency	Percentage (%)	Mean	SD
Low utilisation (range: 6-12)	89	58.6	12.0	2.65
High utilisation (range: 13-18)	63	41.4		

Source: Field survey, 2023

#### Relationship between enterprise characteristics and utilisation of SAPs

Results in Table 6a reveal that a significant relationship exists between ownership of farmland ( $x^2 = 16.302$ ,  $p = 0.000$ ), membership of organisation ( $\chi^2$

$= 121.754$ ,  $p = 0.000$ ), and utilization of Sustainable of Agricultural Practices. This implies that owning the land used for farming can increase the tendency of farmers to adopt SAPs. This can be related to the financial commitment that can come with adoption as farmers are more willing to invest in a land that is

completely theirs. Moreover, farming association (s) can aid the adoption of SAPs since it is an avenue for

farmers to share important farming knowledge and skills among themselves.

**Table 6a: Chi-square analysis of the relationship between enterprise characteristics and utilisation of SAPs**

Variables	Chi value	df	p-value	Remark
Ownership of farmland	16.302	1	0.000	Significant
Membership of farming association(s)	121.754	1	0.000	Significant
Leadership of association(s)	0.689	1	0.407	Not Significant
Access to credit facilities	0.219	1	0.640	Not Significant
Source of labour	0.097	2	0.953	Not Significant

Source: Field survey, 2023. Significant at  $p \leq 0.05$

Source: Field survey, 2023.

NOTE: df = Degree of Freedom, Significant at  $p \leq 0.05$

Results in Table 6b show that there was a significant relationship between years of farming experience ( $r = 0.215$ ,  $p = 0.008$ ) and utilization of Sustainable Agricultural Practices. This implies that, farmers with

more experience tend to adopt SAPs since they have practiced the occupation for a longer period and have tried several farming methods.

**Table 6b: Pearson Product Moment Correlation (PPMC) analysis between enterprise characteristics and utilisation of SAPs**

Variables	r-value	p-value	Remark
Years of farming experience	0.215	0.008	Significant
Farm size	-0.072	0.378	Not significant
Number of farming locations	0.050	0.543	Not significant

Source: Field survey, 2023. Significant at  $p \leq 0.05$

Source: Field survey, 2023.

NOTE: r-value = Correlation coefficient, Significant at  $p \leq 0.05$ .

## CONCLUSION AND RECOMMENDATION

The study concluded that the level of utilisation of Sustainable Agricultural Practices was low. Mixed farming, bush fallowing and crop rotation were the SAPs mostly utilised by the respondents, and majority of the respondents had a favourable attitude towards the use of SAPs. The study recommended that extension services be strengthened with adequate training opportunities and access to resources provided to enhance the utilisation of SAPs. In particular, the institutionalisation of digital extension services should be pursued to enhance outreach to a broader spectrum of farmers.

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## Bridging research commercialisation gaps in Nigerian universities: Problems and prospects

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### ABSTRACT

Research generates knowledge, fosters innovation, and offers evidence-based solutions to societal challenges. Unfortunately, in developing countries like Nigeria, research is largely confined to academic publications without real-world or industrial applications. The study explored the key problems hindering effective research commercialisation in Nigerian universities, the factors contributing to these gaps, and the prospects for addressing them. Data were collected using a structured questionnaire administered to 120 university researchers selected through a multistage sampling procedure. Data analysis was performed using frequency count, percentage, standard deviation and analysis of variance. The results indicated that 15% of the researchers had conducted up to 10 research projects within the last five years; however, none had succeeded in commercialising any of their outputs. The major factors contributing to this gap were lack of knowledge of commercialisation processes (40%), inadequate funding (13.3%), and limited institutional support (5%). A considerable commercialisation literacy deficit was also identified, as 45% of the researchers were unaware of whether their institution had an intellectual property (IP) policy, while 85% of those with access to such policies had never read them. Although the R4i training was described as impactful, only 1.7% of respondents reported initiating any commercialisation effort after the training. The study concludes that research commercialisation efforts in Nigerian universities remain low and recommends mainstreaming research commercialisation modules into research objectives.

**Keywords:** Research commercialisation, intellectual property, higher education, research for innovation (R4i).

### INTRODUCTION

In today's innovation-driven global economy, universities are increasingly recognized not only as centers of knowledge creation but also as critical drivers of national development. Ozor *et al.*, (2025) in their note on imperatives of research and innovation considered such pathway a critical step towards societal and economic advancement through research commercialisation. Hence, they referred to the process of translating academic research into marketable products, services, or technologies that deliver real-world impact as research commercialisation, and those who engage in it as innovators. In high-performing innovation systems, this process is supported by dedicated structures such as technology transfer offices (TTOs), university-industry partnerships, innovation incubators, and responsive intellectual property (IP) frameworks (Etzkowitz & Leydesdorff, 2000; Siegel, Waldman, & Link, 2003; Mian *et al.*, 2016). These mechanisms help ensure that research outputs do not remain confined to academic journals but instead extend into industry, policy, and community applications.

In Nigeria, research activities are conducted across a mix of higher education institutions, research institutes, and government agencies, each with specific mandates. Universities play a dual role in teaching and knowledge creation, producing academic research across disciplines, while federal and state research institutes focus on applied research in areas such as agriculture, health, energy, and technology. Key organizations include the National Universities Commission (NUC), which oversees academic

standards and research policy in universities; the Nigerian Institute of Science and Technology (NIST), which supports technological research; and sector-specific bodies such as the Nigerian Institute for Oil Palm Research and the National Agricultural Research Institutes. These institutions are expected to generate knowledge, develop innovations, and provide evidence-based solutions to societal challenges, although the translation of research outputs into commercial or industrial applications has historically been limited.

Many advanced economies have institutionalized commercialisation as a deliberate strategy to enhance competitiveness. Universities in countries such as the United States of America, Germany, China, and the United Kingdom have embedded broader innovation ecosystems that encourage co-creation between academia, industry, government, and civil society. This integrated approach is well captured by the Quadruple Helix Model, which expands on earlier frameworks by explicitly including the role of civil society, media, culture, and citizens in shaping innovation outcomes (Carayannis & Campbell, 2009; Carayannis, Barth & Campbell, 2012). The model emphasizes that successful research commercialisation depends not only on the technical quality of research but also on active collaboration among universities, industry, government, and civil society, ensuring that research outputs are effectively translated into marketable products, services, or policy solutions.

The Nigerian research ecosystem remains underdeveloped in terms of commercialisation. While

university research output has steadily increased, particularly under the pressure to “publish or perish,” most studies remain locked within academic publications, disconnected from industry or public need (Adegbola, 2023). The prospects of transforming academic research into viable innovations or actionable policy solutions remain limited by a number of structural challenges such as low awareness of IP rights, inadequate commercialisation training, poor funding, weak university-industry links, and limited incentive structures for applied innovation (Ugonna & Onwualu, 2016; Egbetokun et al., 2017; Ayandibu, 2023). Even where IP policies exist, their utilization is alarmingly low, with most researchers unaware of how to protect or commercialise their outputs (Cece et al., 2022; Dreer, 2022). These challenges are further reinforced by Nigeria’s academic promotion system, which continues to prioritise publication volume over innovation outputs, reducing researchers’ incentives to engage in commercialisation or applied impact.

Efforts to address the commercialisation gap in Nigerian universities have included initiatives such as the Research for Innovation (R4i) training program, which is designed to strengthen the entrepreneurial, innovation, and commercialisation capacity of academic staff. Launched to equip researchers with practical skills in translating research outputs into marketable products and services, the program targets early- and mid-career academics across multiple disciplines. While participants often report increased awareness, interest, and motivation to commercialise their research, systemic limitations, including lack of institutional follow-up, inadequate infrastructure, and limited incentives, have constrained the translation of training into practical outcomes (Chung, Chen & Olson, 2021; Abonyi & Nwadike, 2023).

This commercialisation gap poses a significant challenge to Nigeria’s ambition of transforming into a knowledge-based economy, as outlined in the National Science, Technology and Innovation Policy and Vision of 2050. Without systemic reforms, universities risk remaining isolated from national development priorities and the broader innovation ecosystem. Despite growing policy attention, there is a notable lack of empirical data on how commercialisation mechanisms function in real-world settings, how researchers perceive and engage in commercialisation, and the measurable outcomes of capacity-building efforts like the R4i training program. Hence, the study generates evidence-based insights and actionable strategies for strengthening research commercialisation capacity in Nigerian universities through the following objectives:

- i. To examine the extent of lecturers’ engagement in research and commercialisation activities.

- ii. To identify the institutional, financial, and knowledge-related barriers that hinder commercialisation.
- iii. To determine the key factors contributing to the commercialisation gap, including lack of
- iv. knowledge of commercialisation processes, inadequate funding, and limited institutional support.
- v. To assess lecturers’ awareness and use of institutional IP policy frameworks.
- vi. To evaluate the influence of R4i training on researchers’ attitudes and readiness for commercialisation

## THEORETICAL UNDERPINNING

### Systemic constraints on innovation in Nigerian universities

Recent academic discourse underscores the persistence of structural, behavioural, and policy-related barriers that hinder the effective translation of academic research into market-ready solutions (Ukwuoma, Amade & Moghalu, 2021). These challenges not only constrain innovation output but also limit the strategic contributions of universities to development. Unfortunately the challenging situation is not merely operational but deeply embedded in the institutional and systemic fabric of the research ecosystem. Studies point to a complex interplay of factors shaping commercialisation outcomes, beginning with the structural conditions of universities. These include chronic underfunding, under-resourced laboratories, outdated research facilities, and the absence of commercialisation infrastructure such as Technology Transfer Offices (TTOs), incubators, and innovation hubs, all of which create a weak foundation for translating research into practical outcomes (Ukwuoma et al., 2021; Omobhude & Chen, 2019). Even when research holds clear market potential, it often fails to move beyond publication due to the lack of institutional mechanisms that supports commercialisation. These gaps are compounded by limited access to innovation financing. Most research is still funded through public subventions and donor grants rather than strategic industry partnerships or competitive innovation funding (Abdulmalik, 2020).

Empirical evidence further validates these deficiencies. Fadeyi et al. (2019), in a cross-sectional study of Nigeria’s top ten universities, found that while resource endowments, such as the number of doctoral staff within the University’s TTO and the TTO’s membership in research consortia, are positively associated with commercialisation potential, actual outputs such as license execution and spin-offs remain low due to poor IP management, weak coordination, and limited institutional

incentives. These have shaped how academic researchers perceive and participate in research commercialisation. Many Nigerian academics lack commercialisation literacy and remain unfamiliar with processes such as intellectual property protection, licensing, and product development. Professional recognition remains closely tied to peer-reviewed publications and teaching, rather than innovation outputs, discouraging entrepreneurial engagement and reinforcing a culture of disengagement. Case studies have shown that weak researcher-industry communication, low entrepreneurial orientation, and limited awareness of commercialisation pathways continue to hinder progress, even where structural mechanisms exist (Ibeme, 2020).

Bridging these structural and cultural divides requires more than isolated interventions; it calls for a systemic recalibration of how research and innovation are governed and incentivised within universities. While studies such as Oboh & Okwilagwe (2017; Ibeme (2020); Okoroma *et al.* (2023); Okonji & Amuda (2023); Ozor *et al.* (2025) provide useful insight into university-industry linkages at the institutional level, their narrow focus leaves critical gaps in understanding the internal academic cultures and policy misalignments that sustain commercialisation inertia. Without a supportive policy environment that not only incentivizes innovation but also aligns university goals with national development priorities, efforts to strengthen commercialisation will remain fragmented. This underscores the need for coherent, cross-level policy frameworks that enable universities to evolve into dynamic hubs of innovation.

### **Research policy and implementation gaps: National realities and global lessons**

In an effort to address persistent structural and behavioral challenges, policy-level interventions in Nigeria have increasingly focused on research commercialisation, though results remain uneven. National measures such as the adoption of the National Intellectual Property (IP) Policy, alongside institutional initiatives like the University of Ilorin's 2025 IP guidelines, reflect growing awareness of the need for clear and structured commercialisation pathways. Many institutions still lack internal policies that define IP ownership, licensing frameworks, or revenue-sharing arrangements (Oboh & Okwilagwe, 2017), thereby creating uncertainty and limiting research uptake among academic staff. A national-level analysis by the Committee of Vice-Chancellors of Nigerian Universities (CVCNU, 2022) found that fewer than 20 percent of Nigerian universities had functioning IP offices or commercialisation protocols aligned with national standards. Even where some university and industry engagement exist, such as staff training, consultancy, or recruitment collaborations, these activities rarely mature into robust innovation

pipelines due to the absence of coherent commercialisation strategies and supportive institutional systems (Uzonwune & Kpee, 2023).

Building on these early efforts, recent initiatives by the National Universities Commission (NUC) have begun to advance a more ecosystem-driven approach to university innovation. As Tsauni (2024) notes, the NUC is working to position innovation as a central pillar in university development through reforms that promote industry partnerships, curriculum redesign, and multi-institutional research consortia. Similarly, TETFund has expanded its support to include patentable research and prototype development (Echono and FUND, 2023), signaling a gradual move toward a more application-oriented research culture. These are promising steps, but their long-term impact will hinge on their sustained implementation, better coordination among stakeholders, and the creation of institutional mechanisms that actively incentivize commercialisation efforts within universities.

Given the ongoing gaps in Nigeria's implementation landscape, valuable lessons can be drawn from other developing countries that have made notable progress in this area. India's Council of Scientific and Industrial Research (CSIR) and South Africa's National Intellectual Property Management Office (NIPMO) offer compelling models. Both demonstrate how government incentives, well-equipped TTOs, and performance-linked funding can significantly improve commercialisation outcomes in public universities. These examples highlight the importance of national coherence, institutional readiness, and functional innovation ecosystems in turning academic research into market-ready products and services. Compared to these contexts, Nigeria's institutional conditions remain less developed, limiting the country's capacity to replicate similar successes. This contrast becomes especially clear when one considers how other countries have operationalized frameworks like the Triple Helix and Quadruple Helix to integrate universities, industry, government, and civil society into dynamic innovation systems.

Notably, while existing literature on research commercialisation in Nigerian universities provides useful theoretical frameworks and policy suggestions, a notable proportion of it remains largely conceptual. There is a noticeable scarcity of empirical studies that examine how commercialisation mechanisms are implemented in practice or why they fail within specific institutional contexts. This lack of grounded evidence has resulted in a fragmented understanding of how factors such as institutional structures, researcher behavior, and policy execution interact to influence commercialisation outcomes. Many studies treat universities as a uniform system, overlooking significant variations in governance structures, research capacity, and policy uptake across

institutions. This homogenized view limits the practical relevance of existing insights and constrains the development of context-sensitive interventions.

As a result, there is growing recognition among scholars and practitioners of the need for more localized researches that go beyond identifying general challenges. Such research should explore how commercialisation strategies can be adapted, scaled, or redesigned to reflect the realities of diverse institutional environments. Addressing these gaps is essential for moving from broad recommendations to actionable strategies that support effective and sustainable research-to-market pathways in Nigerian universities.

### **Ecosystem approaches to research commercialisation**

In practice, efforts to adopt the Triple and Quadruple Helix models in Nigeria have resulted in mixed results. These frameworks, widely recognized for promoting innovation-led development, emphasize collaboration between universities, industry, government, and, in the case of the Quadruple Helix, civil society. However, their implementation in Nigeria has been hindered by persistent institutional weaknesses, fragmented policy environment, limited research funding, and low levels of trust among its key stakeholders (Momoh et al., 2021).

Despite these challenges, recent trends suggest growing alignment with global best practices. The emergence of university-based innovation hubs, science parks, and industry-funded research initiatives reflects a shift, although gradual, toward more collaborative models. In sectors such as agriculture, health, and ICT, joint university–industry projects are beginning to gain traction. For example, while the University of Lagos has institutionalized innovation through its Innovation and Technology Management Office, a recent case study revealed persistent operational barriers, including unstable funding, limited access to industry or angel investment, understaffing, slow patenting processes, and low trust from industry in local innovations (Okonji & Amuda, 2023). Similarly, Ofor-Douglas and Edu (2023) argue that these models can support broader development goals, including infrastructure growth, job creation, and strengthened university–industry linkages.

Nonetheless, key barriers persist. Misaligned stakeholder interests, weak governance structures, underfunding, and resistance to institutional reform continue to hinder the operationalization of Triple and Quadruple Helix frameworks. The Quadruple Helix model, which promotes the inclusion of civil society, cultural actors, and media, remains largely underdeveloped in the Nigerian context. Its practical integration into innovation ecosystems is yet to be meaningfully realized.

Overall, while the Triple and Quadruple Helix models offer valuable conceptual guidance for repositioning Nigerian universities as engines of innovation, their success depends on the development of enabling ecosystems. Deliberate policy support, sustained capacity building, and mechanisms for stakeholder alignment and trust-building are essential. Without these, the models will remain aspirational. Still, they serve as useful global benchmarks for the evolution of research commercialisation within Nigeria's innovation landscape.

### **Institutional enablers for effective research commercialisation**

While systemic approaches like the Triple and Quadruple Helix offer valuable frameworks for fostering innovation, their success ultimately depends on the presence of well-equipped institutions. For commercialisation to move beyond isolated successes and become a sustained pathway for innovation, it must be supported by robust institutional mechanisms. Even with modest progress in adopting global frameworks, the absence of critical infrastructure continues to hinder full-scale implementation across Nigerian universities.

Studies highlight the vast potential of commercialisation as a revenue stream when adequately supported. Licensing agreements, royalties, and the sale of intellectual property rights can contribute to financial sustainability while enhancing global visibility (Uzonwune & Kpee, 2023). Moreover, industry-sponsored training programs, contract research, and consultancy services offer additional opportunities to build researcher capacity and strengthen institutional reputation.

However, these prospects remain largely underexploited due to weak foundational support systems. The lack of dedicated intellectual property advisory units limited legal expertise in technology transfer, and underdeveloped incubation environments constrain universities' ability to capitalize on research outputs (Abdulmalik, 2020). Empirical evidence from Nigerian universities shows that many Technology Transfer Offices, where they exist, operate with minimal staff, inadequate funding, and no structured incentive mechanisms to encourage researcher participation in commercialisation activities (Fadeyi, et al., 2019; Soyinbola, et al., 2024). A recent survey of business educators in three public universities in Rivers State found only moderate awareness of core intellectual property rights such as copyright and trademark, highlighting persistent knowledge gaps that limit the translation of academic outputs into market-ready innovations (Koko, Benibo, & Bupo, 2023). Without coherent policies, strategic investment, and sustained capacity-building, commercialisation efforts are unlikely to scale or deliver transformative outcomes.

This underscores the need for Nigerian universities to not only adopt global models of collaboration but also invest in the institutional architecture necessary to support innovation, including clear IP policies, functioning TTOs, staff training, and partnerships with legal and industry actors. Strengthening these internal capacities is essential for translating research into real-world applications and economic value.

## METHODOLOGY

The study was carried out across selected institutions of higher learning in the six geopolitical zones of Nigeria. Descriptive survey research design was adopted to investigate the commercialisation practices, institutional support structures, and challenges encountered by academic researchers in Nigeria. This design was suitable for generating structured, quantifiable data across a diverse and geographically dispersed sample of higher education professionals. Respondents completed a structured questionnaire that elicited information on four key areas: research engagement levels, commercialisation activity, awareness and use of institutional intellectual property (IP) policies, and participation in commercialisation support programs such as the Research for Innovation (R4i) training initiative.

To ensure national representativeness and capture potential regional variation, data were collected from academic staff members selected from universities and polytechnics within Nigeria's six (6) geopolitical zones through multistage procedure. The study employed non-probability sampling due to the inaccessibility of population register of academic staff with over 20 research project supervision experience. In the absence of a sampling frame or known population, Creswell (2014) recommends that the study can conveniently adopt a sample size that is inclusive. Hence, the study adopts a sample size of 150, selected from all 6 geopolitical zones through a multistage procedure. In the first stage, two (2) Universities and two (2) Polytechnics were purposively selected from each of the six (6) zones

based on their high-ranking status. Secondly, from each of the selected institutions, academic staff members were stratified into senior lecturers and non-senior lecturers. The senior lecturers were further grouped into those who have supervised more than 20 research projects and those who have not. Finally, five (5) participants were randomly selected from the group of lecturers with more than 20 research supervision, which gives a total sample size of 120 participants. Frequency distribution and percentage scores were used to analyze data collected. Participants were acquainted with the objectives, focus, and potential benefits of the project.

## RESULTS AND DISCUSSION

### Lecturers' Research Engagement and Commercialisation Rates

Findings from the study reveal that a majority of the lecturers have conducted multiple research projects within the past five years. As presented in Table 1, 25 percent of respondents completed between 1–5 research projects, 20 percent conducted 11–15 projects, while 11.7 percent reported completing over 20 projects. However, 15 percent of the respondents had not undertaken any research projects during the period under review. The findings reveal a striking paradox; research activity is high yet result (Table 2) shows that over 80% are not privy to their institutions' intellectual property (IP) policies, indicating low engagement with research commercialisation frameworks. By implication, although many respondents had completed multiple research projects, some over twenty in the past five years, their unawareness of institutional IP policy potentially makes it difficult to successfully commercialise their work. This reflects a broader trend in Nigerian higher education where academic publishing, rather than innovation output, remains the dominant measure of researchers' productivity (Adegbola, 2023), signaling a misalignment between institutional priorities and national innovation goals.

**Table 1: Number of Research Projects Completed**

Number of Research Projects Completed	Frequency (n)	Percentage (%)
0 projects	18	15.0
1–5 projects	30	25.0
6–10 projects	18	15.0
11–15 projects	24	20.0
16–20 projects	16	13.3
Above 20 projects	14	11.7
<b>Total</b>	<b>120</b>	<b>100.0</b>

Source: Field survey data (2024)

### Key barriers to research commercialisation

The study identified multiple factors constraining the commercialisation of research outputs among

university lecturers. As presented in Table 2, the most frequently cited barrier was limited commercialisation knowledge (40%), far exceeding all other categories. This was followed by insufficient funding (13.3%),

perceived low innovativeness of research outputs (10%), and inadequate institutional support (5%). Notably, 30% of respondents selected “other” barriers, indicating the presence of broader systemic or context-specific constraints not fully captured by the survey categories, while only 1.7% cited time limitations.

The barriers identified in this study help explain the research gap. The most frequently cited constraint was lack of commercialisation knowledge (40%), a finding that points not only to individual skill deficits but also to structural shortcomings in academic and institutional frameworks. Similar gaps have been reported by Awodiji, Ogbudinkpa, and Agharanya (2020), who noted that most Nigerian institutions fail

to integrate innovation management or entrepreneurship into research training. This suggests that without foundational knowledge of intellectual property, patenting, licensing, or venture-building, even prolific researchers are ill-equipped to pursue commercialisation pathways. Funding constraints also emerged as a significant challenge, with respondents highlighting the absence of accessible financing mechanisms such as seed funding, industry investment, or affordable loans that are essential for moving innovations from prototype to market. This reinforces prior findings that commercialisation ecosystems require not only knowledge but also targeted financial support to thrive.

**Table 2: Distribution of respondents based on barriers to research commercialisation**

Identified barrier	Frequency	Percentage (%)
Lack of knowledge/awareness	48	40.0
Lack of funding	16	13.3
Limited institutional support	6	5.0
Perceived low innovativeness	12	10.0
Time constraints	2	1.7
Others	36	30.0
Total	<b>120</b>	<b>100</b>

Source: Field survey data (2024)

#### **Institutional intellectual property policies awareness**

The study assessed respondents’ awareness and engagement with their institutions’ intellectual property (IP) policies. As shown in Table 3, 45% of lecturers were unsure whether such a policy existed in their institution, while 35% believed no policy was in place. Only 20% confirmed the presence of an established IP framework. These results point to a significant gap in both awareness and institutional communication, suggesting that even where policies exist, they may not be effectively disseminated or integrated into academic practice. For instance, nearly half of respondents (45%) were unsure whether their university had an intellectual property (IP) policy, and only 20% confirmed its existence. In terms of IP readership, 85% of the respondents indicated they had never read it, regardless of whether such a policy existed within their institution. This points to a generally low level of awareness and interaction with commercialisation governance structures in Nigerian

universities. Similar patterns of low IP policy awareness have been documented elsewhere in developing-country, where poorly implemented IP frameworks leave researchers without clear commercialisation pathways (Dreer, 2022; Cece et al., 2022). In contrast, Germany’s innovation ecosystem illustrates how coordinated institutional, policy, and financial mechanisms can support commercialisation readiness. Universities and dedicated startup hubs, such as those operating within the *Silicon Allee* model, integrate entrepreneurship education, targeted funding streams, and industry-linked incubation into their structures. At the national level, strategies actively address financing gaps through business angel networks, early-stage venture capital, and corporate venturing partnerships, ensuring innovators can move from prototype to market (Elabidine-Madi & Madi, 2024). This approach underscores the value of aligning education quality, research infrastructure, and policy incentives to translate innovation into high-value job creation and long-term economic growth.

**Table 3: Distribution of respondents based on Institutional Intellectual Property Policies Awareness**

Institutional IP Policy Awareness	Frequency	Percentage (%)
Unsure if their institution has an IP policy	54	45.0
Institution does not have an IP policy	42	35.0
Their institution has an IP policy	24	20.0
IP Policy Readership		
I have not read it,	102	85.0

Source: Field survey data (2024)

### Implementation of Research for Impact (R4i) Training

Table 4 shows the extent respondents have stepped down the impact of R4i training programme they have received. From the result, majority (45.0%) of the respondents expressed improved awareness of IP policy and research commercialisation process only. This was followed by 23.7% who stated that they were yet to stepdown (“*Nothing yet but working on it*”) About 16.9% noted that the training had changed their teaching or supervisory approaches, while 8.5% stated they have further stepped down the training they received to colleagues. Others include 5.1% who indicated influencing the establishment of IP policies in their various institution, and 1.7% who initiated

commercialisation efforts. These findings indicate that while the R4i program has stimulated awareness and some behavioral shifts, most participants remain in the preliminary stages of applying the training outcomes.

The implication of a significant number reporting either no action or only preliminary steps, mirrors the findings by Chung et al. (2021) that training, such as the R4i training without sustained follow-up, mentorship, and incentives rarely produces lasting post training impact. Without such efforts followup, targeted reforms and leadership buy-in, Sule (2024) noted that even well-designed initiatives like R4i are likely to remain isolated successes rather than drivers of systemic transformation.

**Table 4: Distribution of respondents based on the Implementation of R4i Training Impact**

Outcome of Post-R4i Training	Frequency	Percentage (%)
Nothing yet but working on it	28	23.7
Altered teaching or supervisory approach	20	16.9
Conducted step-down training	10	8.5
Influenced establishment of IP policies	6	5.1
Started commercialisation activities	2	1.7
Expressed improved awareness of IP policy and research commercialisation process only	54	45.0
Total	120	100

Source: Field survey data (2024)

### CONCLUSION AND RECOMMENDATIONS

The study concludes that though the participants engage in high research activity, most of them are not privy to their institutions’ intellectual property (IP) policies, indicating low inclination to engage in research commercialisation. Limited knowledge of research commercialisation was identified as the most constraining barrier to research commercialisation, far exceeding all other categories. Majority of the participants believed no IP policy is in place in their institution. In terms of the impact of participating in R4i most of the participants expressed improved awareness of IP policy and research commercialisation process after their participation. Although interventions like the R4i training program have sparked increased awareness around innovation and commercialisation, their long-term impact appears limited. Without sustained follow-up, institutional alignment, and concrete pathways to implementation, such initiatives are unlikely to shift behavior at scale. The findings of this study therefore reinforce the urgent need for universities to rethink their approach to research, not just as a pursuit of knowledge but as a driver of innovation and national development.

Hence, the study recommends the following:

1. Integration of Commercialisation Training into Research Curricula: To close the persistent knowledge gap, universities should formally integrate commercialisation modules into postgraduate programs and faculty development

initiatives. These modules should cover core areas such as intellectual property rights, technology transfer, licensing, and entrepreneurship. More than technical exposure, the training should promote a mindset shift, positioning commercialisation as a natural extension of the research process.

2. Stronger Institutional IP Policies and Enforcement: While policy formulation is important, meaningful impact depends on implementation. Universities must not only establish clear and context-appropriate intellectual property frameworks but also ensure that researchers engage with them. This requires ongoing faculty training, transparent ownership structures, and incentive mechanisms that reward policy compliance and utilization.

3. Financial Incentives and Funding Accessibility: One of the most significant barriers identified was lack of funding. Addressing this will require the establishment of competitive commercialisation grants, innovation seed funds, and university-managed venture capital pools. Strategic partnerships with industry and government can also open co-financing channels. Just as importantly, academic incentive systems must evolve to reward innovation outputs, such as patents, spin-offs, and social impact, alongside publications.

4. **Monitoring and Evaluation of R4i Program Impact:** The R4i training program has created awareness but risks becoming a standalone intervention. For long-term impact, universities should embed structured follow-up systems, such as mentorship, peer learning communities, and periodic outcome evaluations. Integrating R4i benchmarks into institutional policy frameworks would also ensure that commercialisation becomes a visible and supported performance goal.

5. **Establish and Empower Technology Transfer Offices (TTOs):** Functional TTOs are critical to bridging the gap between academic research and commercialisation. These offices should serve as internal support hubs, guiding faculty through patenting processes, licensing negotiations, and startup incubation. Beyond administrative capacity, TTOs should also cultivate external partnerships and act as innovation liaisons between academia, industry, and government.

6. **Reform of Academic Reward Structures:** Institutional promotion criteria must evolve to reflect a broader definition of academic excellence. Recognizing innovation outputs such as product development, community impact, policy engagement, and entrepreneurial ventures would encourage researchers to pursue work with wider societal relevance. Without this shift, the incentive to engage in commercialisation will remain weak.

7. **Strengthening the National Innovation Ecosystem:** Finally, universities do not operate in isolation. National agencies, funding bodies, and policy actors must support these institutional reforms through coordinated policy, aligned funding, and capacity-building efforts. A collaborative innovation ecosystem anchored in the Quadruple Helix model can thrive only when universities, industries, government, and civil society share a unified vision for research-driven development.

By pursuing these reforms, Nigerian universities can shift from being knowledge producers to becoming engines of innovation and development translating ideas into impact.

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