Acta
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Effect of Cooperative Membership on Production of Plantain Farmers in Ijebu North Local Government Area, Ogun State, Nigeria

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Abstract: The study aimed to evaluate the impact of cooperative membership on the productivity of plantain farmers in Ijebu North Local Government Area, Ogun State, Nigeria. It specifically examines the socio-economic characteristics of these farmers, the influence of cooperative membership on their production, access to resources, and the cost-return structure of their farming activities. Primary data were collected for this study using Questionnaire. The study employs both descriptive and inferential statistical methods. Data collected were analyzed using Descriptive statistics, Multiple regression analysis, Logistic regression and Budgetary analysis. The results revealed that cooperative membership significantly influences plantain production, with an R-squared value of 0.441, indicating that 44.1% of the variation in plantain production is explained by the independent variables. Age ($\beta = 0.380$, $p < 0.001$), access to extension services ($\beta = 0.154$, $p = 0.276$), and farm size ($\beta = 0.063$, $p = 0.399$)

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positively impact production, while gender (β = -0.274, p = 0.002) and access to information (β = -0.258, p = 0.035) negatively influence production. Among the farmers (36.0%) are male, and 64.0% are female. In terms of access to resources, logistic regression results show that cooperative membership increases the probability of accessing land (β = 0.400, p < 0.05), inputs (β = 0.330, p < 0.05), and credit (β = 0.290, p < 0.05). The cost-return analysis indicates that the average return on investment (ROI) for plantain farmers is 1.45, meaning that for every Naira invested, farmers earn N1.45 in return. Based on these findings, it is recommended that agricultural cooperatives enhance their support systems, particularly in providing easier access to resources and addressing the capital needs of farmers. The study concludes that cooperative membership can be a valuable tool for improving the productivity and sustainability of plantain farming in the study area, provided that the identified challenges are adequately addressed.

1. Introduction

Cooperatives have long been recognized to play important roles in society that translate into the improvement of living conditions of their members, particularly the low-income earning cadres of the population; the rural people and the urban poor. Cooperatives aggregate people, resources and capital into economic units. Being voluntary, democratic and self-controlled business organizations, cooperatives offer the institutional framework through which local communities gain control over the productive activities from which they derive their livelihood (Ma et al., 2018). However, the agricultural sector, particularly in developing regions, relies significantly on cooperative memberships to enhance farmers' economic and social conditions. According to FAO (2016) Cooperative memberships among farmers play a crucial role in fostering collaboration, sharing resources, and accessing markets efficiently Understanding the impact of cooperative membership on farmers is essential for policy makers, agricultural organizations, and farmers themselves to develop strategies that promote sustainable agricultural practices and improve livelihoods.

As observed in Bijman and Hu (2018), cooperatives represent a fundamental aspect of agricultural development, providing farmers with collective bargaining power, access to credit facilities, technical assistance, and opportunities for value addition. In the context of plantain farming, cooperatives facilitate the pooling of resources such as land, labor, and inputs, thereby reducing production costs and increasing economies of scale. Ma et al., (2021) also noted that cooperatives often serve as platforms for knowledge exchange, training, and capacity building. Through cooperative initiatives, plantain farmers can acquire new farming techniques, adopt sustainable practices, and improve their overall productivity and resilience to environmental and economic shocks.

Beyond the economic advantages, participation in cooperatives enhances social cohesion and fosters community development among plantain farmers. Cooperatives

cultivate a feeling of belonging and collective responsibility, nurturing solidarity, trust, and mutual assistance among members. Consequently, they fortify the social structure of rural communities, promoting stronger bonds and shared values. Membership in cooperatives additionally aids smallholder farmers in enhancing production efficiency (Neupane et. al., 2022). Promotion of cooperatives therefore, can be considered as a strong pillar of national as well as international economic and social development.

Plantain holds a significant position as a staple food crop in both developed and developing nations, evident in its substantial production value. Its importance is most pronounced in regions such as East Africa, where per capita consumption exceeds 200 kg annually, and in West and Central Africa, where local trade sees over 10 million tons produced each year (Latham, 2001). Aina et al., (2012) note that plantain serves as a vital income source for smallholder farmers, cultivated in compound farms, mixed farms, and small-scale sole plantain farms. In Nigeria, processed plantain products like roasted plantain (boli), chips, and flour form thriving businesses, generating employment opportunities for numerous youths (Aina et al., 2012). However, due to its seasonal nature and short shelf life, post-harvest losses of plantain are considerable. Plantain serves as a primary food source in numerous regions worldwide and ranks as the second-largest fruit crop globally, with an annual production of 144 million metric tons (FAOSTAT, 2013). In the African sub-region alone, an estimated 70 million people derive over a quarter of their food energy from plantains, highlighting its crucial role in meeting basic carbohydrate needs. The majority (82%) of Africa's plantain production originates from the area stretching from the lowlands of Guinea and Liberia to the central basin of the Democratic Republic of Congo, with West and Central Africa contributing 61% and 21%, respectively. Nigeria stands among the world's leading plantain producers, generating an annual output of about 2.8 million metric tons, primarily sourced from its southern states (FAOSTAT, 2013). Despite its prominence, Nigeria focuses more on domestic consumption rather than export, and thus does not feature prominently among plantain-exporting nations.

Agriculture generally serves as the backbone of Nigeria's economy, contributing significantly to employment, food security, and economic growth, particularly in rural areas. Within the agricultural sector, plantain farming stands out as a key agricultural activity, with Nigeria being one of the largest producers of plantains globally. In the southwestern region of Nigeria, including Ogun State, plantain cultivation is widespread and plays a crucial role in the livelihoods of many rural households.

1.1. Objectives of the Study

The broad objective of this study is to appraise the effects of cooperative membership on productivity of plantain farmers in Ijebu North Local Government Area of Ogun State, Nigeria. Specifically, the objectives are to:

a. describe the socio-economic characteristics of plantain farmers participating in agricultural cooperatives in the study area;

b. examine the influence of cooperative membership on plantain farmers production;

c. determine the cost-return structure of plantain farmers productivity in the study area;

d. examine the constraints associated with cooperative memberships among plantain farmers.

2. Methodology

2.1. The Study Area

The study area is Ijebu North Local Government Area of Ogun State, Nigeria. Ijebu North is a Local Government Area in Ogun State, Nigeria. Its headquarters are in the town of Ijebu Igbo at 6°57'N 4°00'E. The Local Government was established in 1979 and has its headquarters at Ijebu Igbo. It is bounded by Oluyole Local Government of Oyo State in the North, in the west by Ijebu East Local Government Area, in the South by Ijebu North East, Odogbolu and Ijebu Ode Local Government Area, and in the East by Ikenne Local Government Area. The region is partitioned into local wards Atikori, Oke-Agbo, Ojowo/Japara, Oke-Sopen, Ome, Oru-awa-ilaporu, Osun and Ago-Iwoye urban I, Ago-Iwoye urban II, Ako-Onigbagbo Gelete, and Mamu/Ehin-Etiri (Wikipedia).
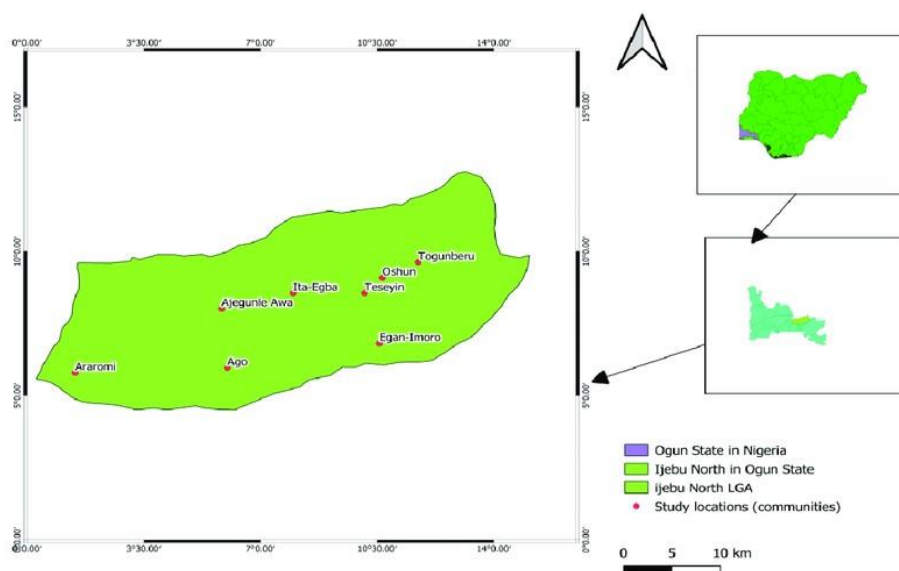
Figure 1. Map of the study area

2.2. Sources and Methods of Data Collection

Primary data is the major type of data used for this study. This was collected using a structured questionnaire which was administered through personal contact with the respondents. Secondary data were obtained from literature materials, bulletins, journals for this study.

2.3. Sampling Technique

The sampling technique that was employed for this study is purposive sampling technique. This will be used to select different respondents from Ijebu Igbo, Mamu, Awa and Ago Iwoye area of Ijebu North Local Government Area. Purposive sampling involves selecting participants based on specific criteria that align with the objectives of the study. The researcher will identify plantain farmers located within study Area. A specific section of the plantain farmer representing the sample size was critically examined. This will be used to select 150 respondents in the study area.

2.4. Methods of Data Analysis

The data collected were analyzed using descriptive and inferential statistics:

a. Socio-economic characteristics of plantain farmers participating in agricultural cooperatives in the study area

Descriptive statistics such as percentage, frequencies and mean were to describe the socio-economic characteristics of plantain farmers participating in agricultural cooperatives in the study area.

b. Examine the influence of cooperative membership on plantain farmers' production

In order to examine the influence of cooperative membership on production practices and efficiency among plantain farmers, a multiple regression analysis was conducted. The formula to be used is expressed below:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \varepsilon$$

Where:

Y represents the dependent variable, which denotes efficiency or adoption of production practices among plantain farmers.

$X_1, X_2 ... X_n$ represent the independent variables:

X_1:   Cooperative membership;

X_2:   Farm size (hectare);

X_3:   Access to extension services;

X_4:   Availability of agricultural inputs;

X_5:   Access to credit (Naira);

X_6:   Access to information;

X_7:   Land ownership.

β_0 represents the intercept or constant term of the regression model. β_1 to β_n represent the coefficients associated with each independent variable X_1 to X_n, respectively.

ε represents the error term, which captures the unexplained variation in the dependent variable.

c. Determine the cost-return structure of plantain farmers productivity in the study area

In order to determine the cost-return structure of plantain farmers productivity in the study area, budgetary analysis was used.

The budgetary analysis model can be represented as follows:

C: Total cost of production.

R: Total revenue from plantain sales.

P: Profit (difference between revenue and cost).

Total Cost of Production (*C*)

$$C = \sum_{i=1}^{n} C$$

Where *Ci* represents the cost of each input or activity involved in plantain production, such as land preparation, planting material, fertilizers, pesticides, labor, irrigation, maintenance, and harvesting.

Total Revenue from Plantain Sales (*R*):

R = Yield × Price

Where:

Yield: Total quantity of plantains harvested (in tons or kilograms).

Price: Price per unit of plantain (per ton or kilogram).

Profit (*P*):

P=Total Revenue – Total Cost

Profit is calculated as the difference between total revenue and total cost.

d. Constraints associated with cooperative memberships among plantain farmers

In order to examine the constraints associated with cooperative memberships among plantain farmers, descriptive statistics such as frequency, percentage and mean will be used.

3. Results and Discussion

Table 1. Socio-Economic Characteristics of Respondents

Items	Frequency	Percentage	Cumulative (%)
Age (years)			
Less or equal to 30	10	6.7	6.7
31 – 40	60	40.0	46.7
41 – 50	65	43.3	90.0
51 – 60	15	10.0	100.0
Sex			
Male	54	36.0	36.0
Female	96	64.0	100.0

Marital Status			
Single	12	8.0	8.0
Married	120	80.0	88.0
Divorced	13	8.7	96.7
Widowed	5	3.3	100.0
Religion			
Christianity	77	51.3	51.3
Islam	63	42.0	93.3
Traditional	10	6.7	100.0
Educational Level			
Primary Education	31	20.7	20.7
Secondary Education	77	51.3	72.0
Tertiary Education	23	15.3	87.3
No Formal Education	19	12.7	100.0
Farming Experience			
less than 1 year	25	16.7	16.7
1-3 years	104	69.3	86.0
3-5 years	21	14.0	100.0
Household Size			
1-3	92	61.3	61.3
4-6	58	38.7	100.0
Annual Income			
Less than 100,000	16	10.7	10.7
100,000 - 300,000	47	31.3	42.0
300,001 - 500,000	65	43.3	85.3
500,001 - 1,000,000	22	14.7	100.0
Source of Income			
Plantain farming	117	78.0	78.0
Trade/business	33	22.0	100.0
TOTAL	150	100	

Source: Field Survey, 2024

The socio-economic characteristics of the respondents are shown in Table 1. The age distribution of respondents revealed that the majority of respondents fall within the 41-50 years age bracket (43.3%). The age group (31-40 years) is also well-represented (40.0%). Fewer respondents are in the 51-60 years group (10.0%) or 30 years and younger (6.7%).

The predominant age groups (31-50 years) suggested a mature and experienced demographic, which may be beneficial for stability and productivity in community or economic activities. The small percentage of younger and older respondents implies limited representation of these age groups, which could affect the diversity of perspectives and needs within the community.

The role of gender is to provide information about the distribution of males and females of the respondents. The sex of the respondents shows that majority i.e.,

66.4% of the respondents are female while 36.0% are male. The higher proportion of female respondents could indicate a more active role of women in the community or in the survey's context. This sex distribution may influence the focus of programs or initiatives, emphasizing the need to address issues pertinent to women's involvement and representation.

Marital status is a major socio-economic characteristic when it comes to determine the effects of cooperative membership on plantain farmers in the study area. The marital status distribution of the respondents revealed that the largest segment of respondents, comprising 80.0% of the sample, is currently married. This indicates a significant majority within the surveyed population. Following married individuals, those who have never married (single) account for 8.0% of the sample, representing individuals who have not yet entered into marital unions. The category of divorced individuals makes up 8.7% of the respondents, reflecting those who have undergone legal separation from their spouses. Lastly, the smallest group consists of widowed individuals comprising 3.3% of the sample, representing those who have lost their spouses due to death. The high percentage of married respondents suggests a focus on family-oriented issues and needs within the community. This could influence the types of support or resources needed, emphasizing family and household stability as key areas of concern.

This table shows the distribution of respondents by their religious affiliation. The findings revealed a diverse distribution across different faiths. Christianity emerges as the most prevalent religion among the respondents, with 77 individuals identifying as Christians, representing 51.3% of the total sample. Following closely, Islam is the second most prominent religion, with 63 respondents accounting for 42.0% of the sample. A smaller but notable group of 10 respondents, representing 6.7% of the sample, adhere to traditional religious beliefs. The predominance of Christianity and Islam indicates that community initiatives should be sensitive to the practices and values of these major religions. Inclusion of diverse religious perspectives may enhance community engagement and support.

Educational level is a major socio-economic characteristic that can determine the literacy level of the respondents. The degree to which innovation and new technology are adopted affects the importance of formal education in business. The table presents the educational backgrounds of 150 respondents, offering insights into their varying levels of formal education. Primary education emerges as the most common educational attainment among the respondents, with 20.7% of the sample having completed this level. A significant portion of the sample, comprising 77 respondents (51.3%), has completed secondary education, indicating a strong presence of individuals with education beyond the primary level. Tertiary education is represented by 15.3%, reflecting a smaller yet notable proportion with higher academic qualifications. Additionally, 12.7% have no formal education.

The distribution highlights a range of educational achievements among the surveyed population, from basic primary education to advanced tertiary degrees, as well as a segment with no formal schooling. Overall, the data underscores the diversity in educational attainment among the respondents, providing valuable insights into their educational profiles and potential implications for socioeconomic factors.

The findings show the duration respondents have been involved in farming. It indicates that the majority of the respondents, 69.3%, have been involved in farming for 1-3 years. This group significantly outweighs the others, indicating that most farmers are relatively new to the profession. Those with less than one year of experience constitute 16.7% of the respondents, while those with 3-5 years of experience make up 14.0%. The cumulative percentage shows that 86.0% of the respondents have 1-3 years of farming experience, and by including those with less than one year of experience, 100% of the respondents have five or fewer years in farming. This suggests that the farming community surveyed is predominantly composed of individuals with limited years of experience.

The predominant experience of 1-3 years suggests that many respondents are relatively new to farming. This could imply a need for additional support and training to build expertise and improve productivity in the farming sector.

The finding presents the distribution of respondents based on the size of their households. The data revealed that the majority of respondents, 61.3%, live in smaller households consisting of 1-3 members. In contrast, 38.7% of the respondents have larger households with 4-6 members. This distribution suggests that most respondents are part of smaller households, with a significant portion also living in moderately larger households.

The smaller household sizes could reflect a lower dependency ratio, which may affect the financial and resource needs of respondents. This distribution might impact the types of support and services required by families in the community.

This table details the annual income ranges of respondents. The figure on annual income from plantain farming revealed that 43.3% of the respondents earn between 300,001 and 500,000 units of currency annually from plantain farming. This income bracket represents the largest group. Following this, 31.3% of respondents earn between ₦100,000 and ₦300,000 annually. Those earning less than ₦100,000 constitute 10.7% of the respondents, while 14.7% have an annual income between ₦500,001 and ₦1,000,000. The cumulative percentages show that 85.3% of respondents earn up to ₦500,000 annually, and all respondents earn up to ₦1,000,000. This distribution suggests that while a majority of the farmers earn a moderate income from plantain farming, there is a smaller group that earns higher annual incomes. The income distribution indicates a predominantly lower-middle-income population. Programs aimed at increasing income or providing financial support could be crucial in improving the economic conditions of these respondents.

3.1. Influence of Cooperative Membership on Plantain Farmers Production

Data in Table 2 provides a summary of the model's performance. The correlation coefficient (R) is 0.664, indicating a moderate to strong positive relationship between the independent variables and the dependent variable. The R Square value is 0.441, meaning that approximately 44.1% of the variability in the dependent variable can be explained by the model. The Adjusted R Square, which adjusts for the number of predictors in the model is 0.383, indicating 38.3% measures the goodness of fit of the model. While other unexplained variables which are not included in the model are captured by the error terms.

The standard error of the estimate is .43587, which measures the average distance that the observed values fall from the regression line. The Change Statistics revealed that the R Square Change is .441, and the F Change is 7.612 with 14 and 135 degrees of freedom, respectively. The significant F Change value (0.000) indicates that the model is statistically significant and that the predictors, as a whole, reliably forecast the dependent variable. Overall, the model demonstrates a moderate level of explanatory power and is statistically significant.

The findings in the results indicate a significant relationship between the predictors and the dependent variable in the regression model. The Regression component shows that the model explains a significant portion of the variability, with an F-statistic of 7.612 and a p-value of .000, highlighting its statistical significance. The Residual component accounts for unexplained variability. Overall, these findings suggest that the model effectively predicts the dependent variable, providing valuable insights into the relationships among the variables studied.

The finding displays the coefficients from a regression analysis assessing various predictors' impact on the dependent variable. Age emerges as a significant predictor, with each unit increase correlating with a 0.380 unit increase in the dependent variable. Gender also shows significance, with males exhibiting a negative influence compared to females. Other variables such as marital status, educational background, and several socio-economic factors do not demonstrate significant associations with the dependent variable based on this analysis. These findings suggest that age and gender are key factors influencing the outcome, while other variables may have minimal predictive power in this particular regression model.

Table 2. Regression Estimates on Effect of Cooperative Membership on Plantain Production

Model	Unstandardized coefficients		Standardized coefficients	T-valu	Sig
	β	Std. Error	Beta		
(Constant)	1.450	0.394		3.684	0.000
Age	0.380	0.082	0.522	4.634	0.000
Gender	-0.274	0.089	-0.238	-3.089	0.002
Marital status	-0.030	0.088	-0.029	-.339	0.735
Religious status	-0.130	0.073	-0.145	-1.789	0.076
Educational background	0.034	0.045	0.072	0.758	0.450
Household size	0.050	0.094	0.044	0.537	0.592
Annual income from plantain farming	0.057	0.049	0.088	1.168	0.245
Primary source of income	-0.008	0.045	-0.017	-0.171	0.864
Cooperative membership	-0.079	0.131	-0.054	-0.601	0.549
Farm Size	0.063	0.074	0.057	0.846	0.399
Access to extension services	0.154	0.141	0.103	1.093	0.276
Availability of agricultural input	0.048	0.124	0.038	0.386	0.700
Access to information	-0.258	0.121	-0.193	-2.125	0.035
Land ownership	0.026	0.058	0.032	0.443	0.658
Farm Size	1.450	0.394		3.684	0.000
Access to extension services	0.380	0.082	0.522	4.634	0.000
Availability of agricultural input	-0.274	0.089	-0.238	-3.089	0.002
Access to information	-0.030	0.088	-0.029	-.339	0.735
Land ownership	-0.130	0.073	-0.145	-1.789	0.076

R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
				R square change	F change	df1	df2	Sig. F change
.664a	.441	.383	.43587	.441	7.612	14	135	.000

Source: Field Survey, 2024

3.2. Cost-Return Structure of Plantain Farmers Production

The cost-return structure and profitability of plantain were determined Table 3. The result revealed that total income was N298,286.67. The analysis also shows that total cost of production was ₦148,053.33 with the total variable cost items (₦91,513.33) as the major components while the total fixed cost was (N56,540). Using the profitability technique following Ogbonna and Ezedinma (2005) as adopted form Jiriga and Baba (2001), the result shows the gross margin of N206,773.44 and the

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result also shows that the net farm (NFI = TR –TC) income was N150,233.34. The benefit cost ratio (TR/TC) was 2.01. Since BCR is greater than 1, this implies that plantain production is very profitable in the study area.

Table 3. Description of Budgetary Analysis of Plantain Farmers

ITEMS	MEAN AMOUNT (₦)	PERCENTAGE (%)
Variable input		
Cost of transportation	5,277.33	3.56
Fertilizer	10,394	7.02
Pesticides	2,116.67	1.43
Farm tools	8,472	5.72
Mulching	2,226	1.50
Cost of labour	65,253.33	44.07
Total Variable Cost	**91,513.23**	**61.81**
Fixed Input		
Cost of Land	46,306.67	31.28
Irrigation	10,233.33	6.91
Total Fixed Cost	**56,540**	**38.18**
Total Cost(TFC+TVC)	**148,053.33**	
Revenue/Farm Output		
Plantain bunch	298,286.67	
Gross Margin (TR-TVC)	**206,773.44**	
Net Farm Income(TR-TC)	**150,233.34**	
BCR(TR/TC)	**2.01**	

Source: Field Survey, 2024

3.3. Challenges Associated with Cooperative Membership among Plantain Farmers

The result in Table 4 details the challenges respondents face with cooperative membership. The data revealed that bureaucracy is not a significant issue for most, with 72.7% indicating "Not all" and 27.3% indicating it "Rarely" poses a problem. Inadequate capital is a serious concern for 74.7% of respondents, while 19.3% often face this issue, and only 6.0% do not consider it a problem. Lack of storage facilities is not an issue for 88.0% of respondents, with 12.0% experiencing it rarely. Limited access to resources or inputs is not a challenge for 73.3% of respondents, while 26.7% encounter it rarely. Finally, strict conditions imposed by lenders are not a problem for 40.7% of respondents, rarely an issue for 54.0%, and often a challenge for 5.3%. Overall, inadequate capital and lenders' conditions are more frequently cited challenges, while bureaucracy, lack of storage facilities, and limited access to resources/inputs are less commonly reported issues among cooperative members.

The data suggests that while bureaucracy, lack of storage facilities, and limited access to resources are not major challenges for most cooperative members,

inadequate capital and lenders' strict conditions pose significant obstacles. The high percentage of respondents who identify inadequate capital as a serious issue underscores the need for cooperatives to find ways to improve access to financial resources.

Table 4. Distribution of respondents according to challenges with cooperative membership

Variables	Descriptive	Frequency	Percentage (%)
Bureaucracy	Not all	109	72.7
	Rarely	41	27.3
	Total	**150**	**100.0**
Inadequate Capital	Serious	112	74.7
	Not all	9	6.0
	Often	29	19.3
	Total	**150**	**100.0**
Lack of storage facility	Not all	132	88.0
	Rarely	18	12.0
	Total	**150**	**100.0**
Limited access to resources/inputs	Not all	110	73.3
	Rarely	40	26.7
	Total	**150**	**100.0**
Lenders' strict conditions	Not all	61	40.7
	Rarely	81	54.0
	Often	8	5.3
	Total	**150**	**100.0**

Source: Field Survey, 2024

4. Conclusion

The findings underscore the critical need for targeted interventions to address the disparities faced by older and female farmers within agricultural cooperatives. While cooperatives have the potential to significantly improve agricultural productivity and livelihoods, their effectiveness is contingent on ensuring that all members, regardless of age or gender, have equitable access to resources, training, and support. To achieve this, it is essential to implement policies and programs that specifically cater to the needs of these vulnerable groups. Enhancing access to credit, providing tailored training, and promoting inclusive policies within cooperatives are key steps toward ensuring that the benefits of cooperative membership are shared equitably.

5. Recommendations

Based on the findings, it is recommended that agricultural cooperatives in Ijebu North Local Government Area, Ogun State, Nigeria implement targeted strategies to address the disparities in access and benefits experienced by older and female farmers. These strategies should include the development of inclusive policies that prioritize equitable access to resources, such as credit, land, and training, specifically tailored to meet the unique needs of these groups. Additionally, cooperatives should focus on providing gender-sensitive training programs that empower female farmers and promote their active participation in decision-making processes. For older farmers, there should be initiatives aimed at reducing the physical demands of farming, such as the introduction of labor-saving technologies and support for the adoption of modern farming practices. By implementing these recommendations, cooperatives can ensure that all members, regardless of age or gender, have the opportunity to fully benefit from their participation, thereby enhancing the overall effectiveness and sustainability of cooperative initiatives in the region.

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