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Financing of Livestock Production by Formal and Informal Financial Institutions in Imo State, Nigeria

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ABSTRACT

The growth of the livestock sector depends on access to financing from formal and informal financial institutions, which help farmers purchase essential inputs for better livestock health and higher yields. However, the strict requirements of formal institutions and the exploitative nature of informal ones, limit farmers' access to these funds. This study examined livestock financing in Imo State, Nigeria, revealing significant gender disparity, with more men accessing both formal (55%) and informal (56.7%) financial services. Livestock farmers financed by formal institutions had an average of 7 years of experience and earned a mean monthly income of N301,343, while those using informal financing had 8 years of experience and earned N87,815. Formal financing was more likely among cooperative members (66.7%), while most informal-financed farmers were not in cooperatives (80%). Formal institutions provided an average credit of N1,515,833 with interest rate of 7.025% per month, while informal institutions offered N244,167 at 0.729%. Regression analysis showed that income, years of experience, and credit duration were key factors for formal financing, while flock size, cooperative membership, and credit duration influenced informal financing. The study recommends financial inclusion programs for women and partnerships to reduce interest rates, promoting broader access to credit and sector growth.

1. Introduction

Livestock production in Sub-Saharan Africa, including Nigeria, is crucial for both food security and livelihoods. Common livestock species such as cattle, poultry, sheep, goats, and pigs provide essential commodities like meat, milk, eggs, wool, and leather, while also serving as a primary source of income for smallholder farmers. In Nigeria, the livestock sector is vital to the national economy, contributing approximately 6% to the country's GDP. Nearly 60% of the rural population relies on livestock farming for their income, with significant populations of cattle, goats, and sheep. However, the sector faces challenges, notably low productivity due to limited adoption of modern technologies. One key barrier to technological advancement is inadequate access to finance, with many farmers struggling to secure credit. A lack of access to affordable financing hinders their ability to invest in high-quality feed, veterinary care, and breeding stock, which are essential for improving productivity. Addressing these financing constraints is crucial for enhancing agricultural development and rural livelihoods.

Livestock financing plays a critical role in enabling farmers to improve their productivity and income. It allows them to adopt modern technologies, enhance sustainability, and contribute to overall socioeconomic development. Access to tailored financing options is essential for the growth of the sector. Research has shown that farmers often turn to both formal and informal credit sources to finance their activities. While formal credit from banks is often difficult to access due to stringent eligibility criteria, high interest rates, and collateral requirements, informal sources such as cooperatives and community savings groups are more accessible, though they come with their own limitations, such as group membership restrictions and lower loan amounts. Informal financing mechanisms, including cooperative societies, are often preferred by farmers in rural areas due to their flexibility and less stringent requirements compared to formal banks. These

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cooperatives operate through rotating savings schemes or by lending pooled funds to members at predetermined interest rates. However, informal credit systems also have challenges, such as the limited amount of funds available and the impact of factors like age, financial literacy, and gender on access to financing. Formal financial institutions, on the other hand, impose more rigid conditions, including high transaction fees, collateral requirements, and extensive documentation, which can deter farmers from accessing credit. Additionally, farmers with irregular incomes or low credit histories often struggle to meet the eligibility criteria for formal loans. Studies suggest that easing these criteria could encourage more farmers to utilize formal credit, which could offer longer repayment periods and better financial terms.

This study aims to evaluate the financing of livestock production in Imo State, Nigeria, by both formal and informal financial institutions. The specific objectives were to;

1. Examine The Socioeconomic Characteristics Of Livestock Farmers Financed By Both Formal And Informal Financial Institutions In The Study Area,

2. Determine And Compare The Amount Of Credit Demanded And Supplied, Interest Rate Charged, Credit Duration And Repayment Capacity Of Livestock Farmers Financed By Formal And Informal Financial Institutions In The Area, And

3. Determine The Socioeconomic And Institutional Factors That Influence Livestock Financing By Formal And Informal Financial Institutions In The Study Area.

2. Materials and methods

The study was carried out in Imo State, Nigeria. Imo State is located in the Southeastern zone of Nigeria. It is divided into three agricultural zones viz-a-viz Orlu, Okigwe and Owerri. These divisions are for administrative and extension services and not for any agro-ecological difference. It is delineated into 27 Local Government Areas. The state lies between latitudes 4° 45'N and 7° 15'N of the equator and longitudes 6° 50'E and 7° 25'E of the Greenwich Meridian (Chineke *et al*., 2011 and Microsoft Corporation, 2014). It occupies the area between the lower River Niger and the upper and middle Imo River. It is bounded on the East by Abia State, on the West by the River Niger and Delta State; and on the North by Anambra State, while Rivers State lies to the South, as shown in figure 1. Imo State covers an area of about 5,135km^2, with an estimated population of 5,459,300 and population density of about 1,063km^2 (National Population Commission and National Bureau of Statistics, 2022). The State has an average annual temperature of 24.1°C which can rise up to 32.6°C during the dry season, an average annual relative humidity of 64.2% which can rise to up to 77.9% during the rainy season, average annual rainfall of 1800mm to 2738mm and an altitude of about 100m above sea level (NBS, 2016). Agriculture is practiced by a good number of the population in the state. Crop farming is majorly regulated by the seasonal distribution of rainfall, although there are few farmers involved in dry season farming of some food crops and vegetables. Also, livestock like cattle, sheep, goats, pigs, poultry, rabbit, and snails are reared through subsistence and commercial farming in the state (Imo ADP, 2014).

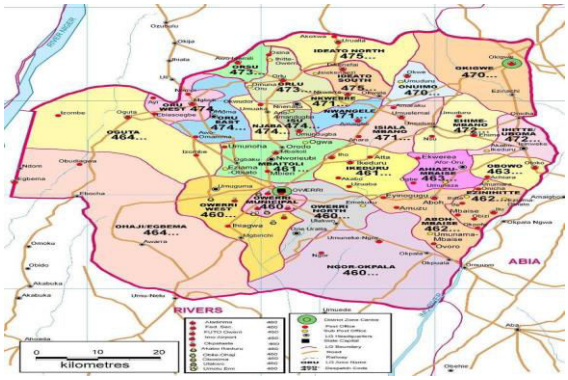

Fig 1: Map of Imo State showing the Local Government Areas: *Source: Imo State Archive, 2020.*

2.1 Procedure

Multistage sampling technique was used in the selection of respondents. Firstly, the three agricultural zones of the state were selected to enable the survey cover the entire state. Orlu, Okigwe and Owerri zones are made up of ten, six and eleven Local Government Areas respectively. Because of the difference in the number of LGAs in each agricultural zone, proportionate sampling was used to select four LGAs from Orlu zone, two LGAs from Okigwe zone and four LGAs from Owerri zone bringing it to a total of ten LGAs from the three Agricultural zones. The number of livestock farmers in each of the Local Government Area was obtained from the office of Agricultural Development Programme. A reconnaissance survey was carried out to determine the communities with sufficient distribution of livestock farmers who have obtained credit from formal and informal credit sources. Two (2) communities with sufficient distribution of livestock farmers were purposively selected from each of the LGAs. Six (6) livestock farmers were purposively selected from each of the communities, three of whom have obtained credit from formal financial institution (60 farmers) and the other who obtained from informal financial institutions (60 farmers) bringing the sample size to a total of one hundred and twenty (120) livestock farmers. A set of well-structured questionnaires was administered to the farmers. Data collected were analyzed using descriptive statistics, multiple regression technique, Chow and Z statistical tools. Objectives (i), and part of objective (ii) were analyzed using descriptive statistics. Part of Objective (ii) was compared using Z-statistical tool. Objective (iii) was analyzed using multiple regression technique and Chow-statistics. Hypotheses (i) to (iii) were realized using Z-statistics. Then hypothesis (iv) was realized from the results of objective (iii) using the Chow F-statistical tool. For comparison and test of significant difference, the Z-statistical model used is stated as:

$$Z = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \quad (1)$$

Where,
Z = Value of under consideration
$\overline{X_1}$ = Mean of the value of variable 1 under consideration
$\overline{X_2}$= Mean of the value of variable 2 under consideration
S_1^2 = Variance of the values of variable 1 under consideration
S_2^2 = Variance of the values of variable 2 under consideration
n_1 = Number of observation of variable 1 under consideration
n_2 = Number of observation of variable 2 under consideration

The socioeconomic and institutional factors influencing livestock financing by formal and informal financial sources were determined using OLS multiple regression model, implicitly represented as:

$$Y_i = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}) \quad (2)$$

Where:
Y_i = Value of credit obtained by farmers from the i^{th} institution, formal or informal sources (naira)
X_1 = Herd/flock size (number)
X_2 = Income (₦)
X_3 = Age of the farmer (years)
X_4 = Gender of the farmer (1= male; 0 = female)
X_5 = Marital status (1 = married; 0 = single)
X_6 = Household size (number)
X_7 = Farming experience (years)
X_8 = Educational attainment (years)
X_9 = Cooperative membership (member 1, otherwise 0)
X_{10} = Interest Rate (%)
X_{11} = Payback period (months)
Chow test was conducted to test the structural differences between the socioeconomic and institutional factors influencing livestock financing by the formal and informal financial institutions respectively. The chow test is given as:

$$F \approx chow = \frac{[(RSS_3 - (RSS_1 + RSS_2)/k}{(RSS_1 + RSS_2)/(n_1 + n_2 - 2k)} \quad (3)$$

Where:
RSS_1 = the residual sum of squared from the regression model of livestock farmers financed by formal financial institutions.
RSS_1 = the residual sum of squared from the regression model of livestock farmers financed by informal financial institutions.
RSS_3 = the residual sum of squared from the pooled regression of livestock farmers financed by both formal and informal financial institutions.
n_1 = the number of observations of livestock farmers financed by formal financial institutions.
n_2 = the number of observations of livestock farmers financed by informal financial institutions.
K = total number of regressors estimated in each model including the intercept

The decision rule: If Chow F-statistics is greater than that of F-tabulated at 5% level of probability, it then means that there is a structural difference between the outcomes of the formal and informal financing in the area.

3. Results and discussion

3.1 Socioeconomic characteristics of livestock farmers financed by formal and informal financial institutions

Table 1 shows the percentage distribution of livestock farmers by socioeconomic characteristics and financing sources. Results showed that majority of livestock farmers financed by both formal (55.0%) and informal (56.7%) financial institutions were males. This is an indication of male dominance in access to both formal and informal financial institutions in the study area. This could stem from the fact that male farmers have resources at their disposal and capable of meeting the credit requirement of the financial institutions than female farmers. The findings highlight the importance of considering gender dynamics in livestock financing among financial sources, ensuring equity in financing, regardless of gender. Results also showed that the mean age of livestock farmers financed by formal financial institutions was 47 years, while those financed by informal financial institutions was 44 years. This is in agreement with the findings of Nwosu (2014) who posited that people within this age range are knowledgeable enough to know the importance of using a credit

facility to invest in livestock production. According to Xiao *et al*. (2015), farmers' confidence in financial decision-making increases with age, as middle-aged adults within the age bracket of 41 to 60 years are more effective borrowers. The distribution of respondents based on marital status showed that majority of farmers financed by formal financial institutions (88.3%), and those financed by informal financial institutions (86.7%) were married. The dominance of married livestock farmers is an indication that the financial institutions (formal and informal) see married farmers as comparatively more secure and accountable individuals, capable of repaying borrowed funds. It also implies that livestock production in the study area is handled by matured and responsible people, the implication is that they are eager to be more committed to livestock production and efficiently utilize the borrowed funds than farmers who are not married. Single farmers acquired less agricultural credit compared to married farmers (Aladejebi *et al.,* 2018). Married farmers have easy access to productive resources, such as land which can be used as collateral to obtain credit (Onubuogu *et al.,* 2013).

Results showed that the majority of livestock farmers financed by formal financial institutions (46.7%) and those financed by informal financial institutions (58.3%) had secondary education. This is an indication that most livestock farmers have secondary education, understand the terms and conditions of these financial sources, and have high level of awareness of credit facilities and its importance to livestock production. Educated farmers allocate productive resources more efficiently than uneducated farmers (Ijioma & Osondu, 2015). The majority of livestock farmers financed by formal financial institutions (61.7%) and those financed by informal financial institutions (86.7%) had their household sizes ranging from 1 to 5 persons with a mean of 5 and 4 persons respectively. This is an indication that both formal and informal financial institutions in the State financed livestock farmers with small household members. This is an indication that smaller household sizes facilitate easier access to formal and informal credits, while larger household sizes pose challenges in accessing credit from both credit sources, possibly due to increased financial burdens. This is in agreement with the findings of Effiong (2005) who reported that very large household size may rob a farmer the opportunity of obtaining loans from lending institutions as it is believed that the loan may be diverted to some other family matters. Ugwu *et al.,* (2017) argued that small household size could result in increased expenses on hired labour as large household size tends to serve as a source of labour in the event of constraints to farm labour availability.

Table 1 also showed that the majority of livestock farmers financed by formal financial institutions (46.7%) had a mean of 7 years of experience in livestock production, while those financed by informal financial institutions (55%) had a mean of 8 years of experience in livestock production. The number of years of experience in livestock production determines how the farmer organizes his/her resources in order to achieve high level of productivity. This is an indication that both formal and informal financial institutions extend credit facilities to livestock farmers with moderate experience in livestock farming. Results also showed that the mean monthly farm income of livestock farmers financed by formal financial institutions was N301,343, while that of their counterparts who was financed by informal institutions was N87,815 This is an indication that formal financial institutions extend credit to livestock farmers with high level of monthly farm income. Farm income is an important determinant of utilization of formal financial services among smallholder farmers (Seluhinga, 2023, Wabwire, 2021). High farm income provides a security blanket for farmers, enabling them to access credit for expansion purposes (Ugbaja, 2011). Monthly deposits in form of income streams serves as a collateral, and often used as security to obtain formal credit from financial institutions.

Lack of such collateral limits access to formal credit facilities (Chen *et al*., 2020; Appiah-Twumasi *et al.,* 2022). Results showed that the majority of the livestock farmers who are financed by formal financial institutions (66.7%) were members of cooperatives while the majority of those financed by informal institutions (80%) did not belong to any cooperative society. This is an indication that cooperative membership facilitates access to formal credit in the area. Farmers who do not belong to a cooperative are constrained from accessing credit from formal sources, and lack the benefits enjoyed by members of cooperatives. This then pushes them to informal sources where they can easily meet credit requirements (Ukwuaba & Onwu, 2020). Farmers who belong to cooperative society gather more information on availability and type of financial services obtainable, exchange labour, acquire reasonable amount of credit especially from formal sources and knowledge on how to efficiently use productive resources to enhance their output.

Table 1 also showed that the majority of livestock farmers who are financed by formal financial institutions (61.7%) had contact with extension agents, while majority of those financed by informal financial institutions (73.3%) had no contact with extension agents. This implies that contact with extension agents facilitates access to formal credit, and more of the livestock farmers financed by formal financial institutions enjoy the services of extension agents who visit their farms and disseminate information on financial and/or resource management. Farmer's access to extension services, through visits by extension agents, enhances their productivity (Adesehinwa *et al.,* 2004). Results showed that the majority of farmers financed by formal financial institutions (61.7%) had a mean flock size of 102, while those financed by informal institutions (85%) had a mean of flock size of 36. This is an indication that the flock sizes facilitate access to formal credit, and the formal financial institutions extend credit to farmers with larger flock sizes (Silong & Gadanakis, 2020)

Table 1: Percentage distribution of livestock farmers by socioeconomic characteristics and financing sources

Variables	Farmer Financed by	Farmer Financed by

	Formal Financial Institutions		Informal Financial Institutions	
	Freq. Dist.	**%Dist.**	**Freq. Dist.**	**%Dist.**
Gender				
a. Male	33	55	34	56.7
b. Female	27	45	26	43.3
Age				
a. 21-30	0	0	4	6.7
b. 31-40	17	28.3	22	36.7
c. 41-50	20	33.3	16	26.7
d. 51-60	21	35	16	26.7
e. 61-70	2	3.3	2	3.3
Mean	**47**		**44**	
Marital Status				
a. Married	53	88.3	52	86.7
b. Single	7	11.7	8	13.3
Level of education				
a. Primary (1 – 6 years)	15	25	11	18.3
b. Secondary (7 – 12 years)	28	46.7	35	58.3
c. Tertiary (13 – 18 years)	17	28.3	14	23.3
Mean	**9.7**		**9.8**	
Household size				
a. 1-5	37	61.7	52	86.7
b. 6-10	22	36.7	7	11.7
c. 11-15	1	1.6	1	1.6
Mean	**5**		**4**	
Experience				
a. 1-5	6	10	8	13.3
b. 6-10	28	46.7	33	55
c. 11-15	7	11.7	6	10
d. 16-20	6	10	4	6.7
e. 21-25	0	0	1	1.7
Mean	**7.4**		**7.6**	
Income				
a. 1-100,000	8	13.3	28	47.7
b. 100,001-200,000	17	28.3	14	23.3
c. 200,001-300,000	8	13.3	7	11.7
d. 300,001-400,000	2	3.3	8	13.3
e. 400,001-500,000	7	11.7	0	0
f. 500,001-600,000	4	6.7	0	0
g. 600,001-700,000	4	6.7	0	0
h. 700,001-800,000	2	3.3	0	0
i. 800,001-900,000	3	5	0	0
j. 900,001-1,000,000	2	3.3	0	0
k. 1,000,001-1,100,000	1	1.7	0	0
l. 1,100,001-1,200,000	2	3.3	0	0
Mean	**301,343**		**87,815**	
Cooperative Membership				
a. Member	40	66.7	12	20
b. Non Member	20	33.3	48	80
Extension Contact				
a. Yes	37	61.7	16	26.7
b. No	23	38.3	44	73.3
Flock size				
a. 1-50	37	61.7	51	85
b. 51-100	6	10	7	11.7
c. 101-150	3	5	0	0
d. 151-200	8	13.3	2	3.3
e. 201-250	1	1.7	0	0
f. 251-300	0	0	0	0
g. 301-350	0	0	0	0
h. 351-400	0	0	0	0
i. 401-450	0	0	0	0
j. 451-500	2	3.3	0	0

k. 501-550	1	1.7	0	0
l. 551-600	1	1.7	0	0
m. 601-650	0	0	0	0
n. 651-700	1	1.7	0	0
Mean	**102**		**36**	

Source: Field Survey Data, 2023

3.2 Comparison of the amount of credit demanded and supplied, interest rate charged, credit duration and repayment capacity of livestock farmers financed by formal and informal financial institutions

Table 2 shows the livestock farmers' categorization and comparison by financing sources, average credit demanded and supplied, average interest rate and credit duration in the study area. Results showed that the average amount of credit demanded by livestock farmers from formal financial sources was three million five hundred and twenty thousand naira (₦3,520,000), while that demanded by farmers from informal financial sources was eight hundred and twenty-two thousand naira (₦822,000). The Z-test value (6.9650), which was significant at 5% level, showed that there is a significant difference between the amount of credit demanded by livestock farmers from formal financial sources and that from informal financial sources. Farmers who dwell more on livestock financing from formal financial institutions demand more credit (₦3,529,000) than their counterparts who dwell more on informal financial institutions, as evidenced by the percentage difference of 76.65%. Results also showed that the average amount of credit supplied to livestock farmers by formal financial institutions was one million five hundred and fifteen thousand eight hundred and thirty-three naira (₦1,515,833). While that supplied by informal financial institutions to farmers was two hundred and forty-four thousand one hundred and sixty-seven naira (₦244,167), with a percentage difference of 83.89%. The Z-test value (6.7646), which was significant at 5% level, further confirmed that there is a significant difference between the amount of credit supplied to livestock farmers by formal and informal financial institutions. Therefore, the null hypothesis that the amount of credit supplied to livestock farmers by formal financial institutions is not different from that supplied by informal financial institutions was rejected. The study accepted the alternative hypothesis and concluded that the amount of credit supplied to livestock farmers by formal financial institutions is different from that supplied by informal financial institutions. This could stem from the fact that formal financial institutions in the area supply more amount of credit to livestock farmers than their counterparts in the informal sector.

Results also showed that the average interest rate charged by formal financial institutions was 7.025%, while that of the informal credit institutions was 0.729%, with a percentage difference of 89.62%. The Z-test value (10.4319), which was also significant at 5% level, further confirmed that there is a significant difference in the interest rate charged by formal and informal credit institutions in the area. This implies that formal financial institutions charge higher interest rates than informal institutions. High interest rate is one of the factors limiting farmers from accessing credit from formal financial institutions (Seluhinga, 2023). High interest rate increases the production costs as farmers spend more servicing their borrowed loans. Appiah-Twumasi *et al*. (2022) reported that the interest rate is the key factor influencing high cost of financing in agriculture. Results also showed that the average duration of credits from formal financial institutions was 17.55, approximately eighteen (18) months, while that of the informal credit institutions was seven (7) months, with a percentage difference of 60.11%. The Z-test value (7.2729), which was significant at 5% level, further confirmed that there is a significant difference between the credit durations of formal and informal financial institutions in the area. Hence, the null hypothesis that there is no significant difference in the interest rate charged by formal and informal credit institutions in the area was rejected. This is an indication that informal financial institutions such as farmers' cooperatives or Associations charge less interest rate and less credit durations.

Results showed that the average amount of credit repaid monthly by livestock farmers financed by formal credit sources was eighty thousand nine hundred and nineteen naira (₦80,919), while that of the livestock farmers financed by informal credit sources was thirty-four thousand seven hundred and nine naira (₦34,709) with a percentage difference of 57.11%. This is an indication that farmers financed by formal institutions have higher repayment rates than their counterparts financed by informal institutions. This also suggests that the formal institutions tend extend more credit to farmers with strong repayment histories. Chen *et al.* (2020) asserted that farmers with low repayment capacity face credit constraints, as lenders are cautious about extending larger amounts to borrowers with a higher risk of default. Ajibade et al. (2018) argued that farmers more likely to use formal financial institutions if they relax their stringent rules, as this would provide a longer repayment period compared to the informal credit sector. The Z-test value (7.418687), which was significant at 5% level, further confirmed that there is a significant difference between the repayment capacity of farmers financed by formal and informal credit sources in the area. Therefore, the null hypothesis that there is no difference in the repayment capacity of livestock farmers financed through formal and informal credit institutions was rejected. The study accepted the alternative hypothesis and concluded that there is a significant difference in the repayment capacity of livestock farmers financed by formal and informal credit institutions in the area. The difference in repayment capacity could stem from the difference in the credit amount accessed by livestock farmers financed by formal and informal credit sources in the area.

Table 2: Categorization and comparison of livestock farmers by financing sources, average amount of credit demanded and supplied, average interest rate and credit duration

Items	**Formal**	**Informal**	**%**	**Z-values**

	Financial Sources	Financial Sources	Difference	
Average amount of credit demanded	3,520,000	822,000	76.65	6.9650*
Average amount of credit supplied	1,515,833	244,167	83.89	6.7646*
Average interest rate	7.025	0.729	89.62	10.4319*
Average credit duration	17.55	7.00	60.11	7.2729*
Repayment capacity (average amount repaid)	80,919	34,709	57.11	7.418687*

**significant at 5%; Source: Field Survey data, 2023*

3.3 Socioeconomic and institutional factors that influence livestock financing by formal and informal financial institutions

Table 3 shows the multiple regression results of the socioeconomic and institutional factors influencing livestock financing by formal and informal financial institutions in the study area. The four functional forms for linear, semi log exponential and double log were fitted and based on the values of R^2, F-values, number of significant parameters and the apriori expectation, the exponential function was chosen as the lead equation for the function for formal financial sources, while the double log was chosen as the lead equation for the function for informal financial sources. The coefficient of multiple determinations (R^2) for formal financial sources model was 0.8332, while that of the informal financial sources model was 0.8234. This implies that about 83.32% variability in livestock financing through formal financial sources and 82.34% variability in livestock financing through informal financial sources were explained by the independent variables specified in the respective models, while the remaining 16.68% for formal financing model and 17.66% for informal financing model were not accounted for by the variables. The F-values for formal (21.79204**)** and informal (20.3457) financial sources were significant at 5% levels. This is an indication that the explanatory variables specified have significant influence on livestock financing by formal and informal credit institutions in the area. The t-values significant at 1% and 5% levels further showed that income, years of experience and credit duration significantly influenced livestock financing by formal financial institutions, while flock size, cooperative membership and credit duration were the major factors that significantly influenced livestock financing by informal financial institutions in the area. For the formal financing model, results showed that the coefficients of income (1.12E-06), years of experience in livestock production (0.0318) and duration of credit (0.0567) were positive and statistically significant at 1% and 5% levels, respectively. The coefficient of income (1.12E-06) was positive and significant 1% level. This implies that an increase in income by one percent increases the amount accessed for livestock financing by 1.12E-04%. This is an indication that farmers with high level of income access more credit than those with less income level. Financial institutions' strict eligibility criteria pose a major challenge for farmers with irregular farm income streams (Khan *et al.,* 2024),

The coefficient of years of experience (0.0318) was positive and significant at 5% level. This implies that an increase in years of experience by one percent increases the amount accessed for livestock financing by 3.18%. This is an indication that years of experience in livestock production business increases the technical know-how of livestock farmers and instills confidence in the minds of risk managers of the formal financial institutions. The coefficient of credit duration (0.0567) was positive and significant at 1% level. This implies that an increase in the duration of the credit by one percent increases the amount accessed for livestock financing by 5.67%. This is an indication that an increase in credit duration increases the repayment capacity of farmers and hence more credit access ((Ajibade *et al.,* 2018).

On the other hand, the coefficients of flock size, cooperative membership and duration of credit were positive and significant at 1% and 5% levels, respectively, for informal financing model. The coefficient of livestock/flock size (0.1823) was positive and significant at 1% level. This implies that an increase in flock size by one percent increases the amount accessed for livestock financing by 18.23%. This is an indication that informal credit institutions consider the number of flocks in credit disbursement and distribute credits based on the number of livestock owned. The flock size influences the amount of credit demanded by livestock farmers as reported by Silong and Gadanakis (2020). The coefficient of cooperative membership (0.3033) was positive and statistically significant at 5% level. This implies that an increase in number of cooperative memberships by one percent increases the amount of credit accessed for livestock financing by 30.33%. This is an indication that members of cooperative societies accessed more credit from informal credit institutions for livestock financing than non-members. The coefficient of credit duration (0.8931) was positive and significant at 1% level. This implies that an increase in credit duration by one percent increases the amount accessed for livestock financing by 89.31%. This is an indication that an increase in credit duration increases the repayment capacity of livestock farmers and hence the amount of credit disbursed by informal credit institutions. Credit duration affects the repayment capacity of farmers (Ajibade *et al.,* 2018).

However, in order to test the presence of structural break in the two regression coefficients, a Chow test was employed using the individual regressions for formal and informal livestock financing and the pooled effects as shown in Table 3. Results showed that the Chow-F value was 2.534 and significant at 5% level (since F-critical was 1.854). Therefore, the null hypothesis that there is no structural break point and the explanatory variables specified are consistent across the models for formal and informal financing sources was rejected, and the alternative accepted. It was concluded that there is a structural break point and the explanatory variables specified are not consistent across the models for formal and informal financing sources. This could stem from differences in the policies and operational procedures of formal and

informal financial institutions, as informal sources have more lenient credit policies when compared to formal financial institutions.

Table 3: Estimated Results of the Socioeconomic and institutional factors influencing livestock financing through formal and informal financial sources

	Formal financial sources	**Informal financial sources**	**Pooled effects**
Variables	**Exponential**	**Double-log**	**Double log**
Constant	12.36469	9.915895	8.106637
	(33.62064)*	(8.428476)*	(7.554613)*
Flock size	-0.00033	0.182256	0.090714
	(-0.67026)	(4.231107)*	(2.358308)**
	1.12E-06	0.095929	0.35854
Income	(4.301971)*	(1.42858)	(6.878049)*
	-0.0149	-0.36431	-0.5085
Age	(-1.49938)	(-1.3603)	(-2.01083)**
	0.171029	-0.00844	0.107074
Gender	(1.187416)	(-0.08973)	(1.25138)
	-0.01184	-0.00659	-0.05414
Marital Status	(-0.05069)	(-0.03749)	(-0.34906)
	0.039677	0.166298	0.182817
Household size	(1.196729)	(1.472762)	(1.82325)***
	0.031797	0.102356	0.100336
Years of Experience	(2.063042)**	(1.07426)	(1.066801)
	0.006259	-0.01995	-0.0285
Education	(0.474235)	(-0.19022)	(-0.41805)
Cooperative	-0.1204	0.303344	0.005346
membership	(-0.8424)	(2.509936)**	(0.053562)
	0.029395	-0.01504	0.234809
Interest rate	(1.364294)	(-0.1755)	(3.819235)*
	0.056659	0.893092	0.740388
Duration of credit	(6.945366)*	(10.91286)*	(10.22726)*
R-square	**0.8332**	**0.8234**	**0.8829**
F-value	**21.79204***	**20.3456566***	**74.05741***
Observations	**60**	**60**	**120**
Sum of Square Residuals	**9.36442**	**4.692701**	**18.46867**
Chow F-value		**2.534****	

*Figures in parentheses are t-values; *significant at 1%, **significant at 5%, and ***significant at 10% levels. Chow test df, K = 12, $n_1+n_2-2k = 96$, F critical =1.854. Source: Computer analysis of the field survey data (2023) using E**XCEL***

4. Conclusion

Financing livestock production in Imo State through formal and informal institutions is essential for the livestock sector's development. The interaction between formal and informal financial institutions is vital for comprehensive financial inclusion of livestock farmers. While formal institutions offer larger and more structured financial products, informal institutions provide a cushion and immediate relief for farmers who require urgent funding and who may not have the collateral or documentation required by formal banks. Access to financial institutions exhibits a significant gender disparity, with males dominating both the formal and informal financial institutions. Male dominance in both institutions perpetuates gender inequality, limiting women's economic empowerment and financial inclusion. Therefore, targeted financial inclusion programs that specifically target women, providing them with access to both formal and informal financial services, financial literacy training and entrepreneurship support should be designed and implemented. The majority of the livestock farmers who are financed by formal financial institutions are members of cooperatives while the majority of those financed by informal institutions do not belong to any cooperative society. Therefore, there is need to encouraging the development of cooperatives that are inclusive and accessible to all livestock farmers. The Chow-test results confirmed that there is a structural break point and the explanatory variables specified are not consistent across the models for formal and informal financing sources. This could stem from the differences in policies and operation procedures in formal and informal financial institutions, as informal sources are exerting more lenient credit policies when compared to their counterparts in formal institutions. Finally, the high interest rate charged by formal financial institutions in the area deters livestock farmers from accessing formal credit. Therefore, fostering partnerships between formal financial institutions, government agencies, and livestock associations in the State, will promote access to formal credit and support the growth of livestock sector in the State.

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