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RISK DIFFERENTIALS IN LIVESTOCK FINANCING: A COMPARATIVE STUDY OF FORMAL AND INFORMAL CREDIT MARKETS IN IMO STATE, NIGERIA

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Abstract

This study investigated the risk differentials in livestock financing between formal and informal credit markets in Imo State, Nigeria. A total of 120 livestock farmers were sampled, and data were analyzed using both descriptive and inferential statistics. Findings revealed that access to financial institutions revealed a significant gender disparity, with males dominating both formal (55.0%) and informal (56.7%) financial institutions. Most livestock farmers financed by formal financial institutions (46.7%) had a mean of 7 years of experience in livestock production, whereas those financed by informal financial institutions (55%) had a mean of 8 years of experience. Most livestock farmers financed by formal financial institutions (46.7%) and those financed by informal financial institutions (58.3%) had secondary education. Formal credit sources provided significantly higher loan amounts (₦1,515,833), charged higher interest rates (7.03%), and offered longer repayment periods (18 months) compared to informal sources, which provided an average of ₦244,167, with lower interest rates (0.73%) and shorter durations (7 months). Formal credit also exhibited higher financial risk, evidenced by greater variance (₦92.83 billion) and standard deviation (₦304,681.07) in earnings, relative to informal credit (variance: ₦16.58 billion; SD: ₦128,743.93). The major factors militating against accessing formal credit included savings deposit requirements (95.0%), insufficient collateral (85.0%), lack of guarantors (83.3%), and years of account holding (75.0%). In contrast, informal credit access was limited primarily by insufficient loan amounts (90.0%), years of group membership (80.0%), and collateral (76.7%). These results underscore the trade-off between loan size and financial risk in credit market choice. To enhance livestock financing, policymakers should promote reforms that reduce entry barriers to formal credit, regulate interest rates, and strengthen risk management frameworks within formal financial institutions.

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Keywords: Risk assessment, livestock financing, formal credit markets, informal credit markets, agricultural credit

INTRODUCTION

Livestock financing plays a critical role in promoting agricultural development and improving rural livelihoods, enabling disadvantaged farmers to maintain their standard of living, adopt cutting-edge technologies, increase their incomes (Mariam *et al.,* 2020), achieve socioeconomic development (Reddy *et al.,* 2020), and address key constraints in the rural economy (Teye & Quarshie, 2022). Access to affordable and tailored financing options is essential for boosting productivity and profitability (Kumari & Garg, 2023). Agricultural financing has two major sources, formal and informal credit markets (Pandley 2022; Masinde, 2021; Moahid & Maharjan, 2020). Formal credit markets are institutionalized lending channels, such as commercial banks, microfinance institutions, and state-owned credit institutions. While informal credit markets are non-institutionalized lending channels, including money lenders, traders, cooperatives, "esusu", friends, and relatives (Okojie *et al.,* 2010).

Formal credit markets provide several benefits, including standardized lending procedures, collateral requirements, and interest rates regulated by central banks. Informal credit markets offer easy access to credit, flexible repayment terms, lower transaction costs, and quick disbursement of loans. In rural areas, farmers tend to prefer informal credit from families, friends, and trusted business partners to formal bank credits (Banerjee *et al.,* 2021). The limitations of formal credit sources in supporting farmers often drive them to seek informal financing options, particularly in times of income shocks (Moahid and Maharjan, 2020). Informal credit sourcing, particularly, through cooperatives, is often less challenging than formal credit sources, which typically require stringent conditions for credit access (Ajibade *et al.,* 2018). The challenges of accessing formal credit are multifaceted, stemming from both systemic limitations and farmer-specific constraints. Farmers often lack collateral, guarantee, and credit history, making it difficult for them to access formal credit. This leads to high loan risks (Guo *et al.,* 2024).

Formal credit markets typically offer lower default risk due to collateral requirements and credit scoring. In some rural areas, banks cannot usually reduce lending risks by taking an asset as collateral, as few rural farmers possess collateral-worthy assets (Meyer, 2015). High interest risk is predominant, as interest rates fluctuate and affect repayment costs. As a result, lenders charge higher interest rates to compensate for the perceived higher risk (Chiu *et al.,* 2014). Additionally, formal credit markets have standardized repayment terms, which do not usually align with the unique agricultural production cycles. In contrast, informal credit markets present a different risk profile. Informal credit markets often have higher default risk due to the lack of collateral and credit history. The institutions offer more flexible interest rates and repayment terms, which are

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beneficial for farmers with unpredictable cash flows. Ultimately, the choice between formal and informal credit sources depends on the farmer's specific needs and risk tolerance. Risk averse farmers tend to be more cautious and reluctant to source funds from formal credit markets due to concerns about repayment pressure in the events of potential losses or uncertainties associated with agricultural production (Gebeyehu, 2019), and would rather go for the financing option that has longer repayment periods or flexible terms (Khan *et al.,* 2024). As a result of the foregoing, the paper examines the risk differentials in livestock financing through formal and informal credit markets in Imo State, Nigeria. The specific objectives were to:

i. determine the socioeconomic characteristics of the livestock farmers financed by formal and informal financial institutions in the study area;
ii. determine and compare the formal and informal credit accessed, interest rate charged, credit duration and repayment capacity of livestock farmers in the area;
iii. ascertain the risk differentials in formal and informal livestock financing in the area;
iv. examine the factors militating against livestock financing through formal and informal credit markets in the area.

The null hypotheses tested were:

i. H_0: There is no significant difference in the interest rate charged by formal and informal credit sources in the area;
ii. H_0: There is no significant difference in the risk levels associated with formal and informal livestock financing in the area.

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 4º 45'N and 7º 15'N of the equator and longitudes 6º 50'E and 7º 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. 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

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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).

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 livestock farmers with formal credit arrangements (60 farmers) and the other three with informal credit arrangements (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, Standard deviation as an analytical tool, and Z-statistics. Objective (i) was analyzed using descriptive statistics and the Z-test. Objective (ii) was analyzed using the standard deviation and coefficient of variation as analytical tools. Objective (iii) was analyzed using descriptive statistics. Hypotheses (i) and (ii) were realized using Z-statistics. The risk differentials in formal and informal livestock financing were analyzed using the standard deviation and coefficient of variation models specified as:

$$\boldsymbol{\sigma_1 = S^2 = S_i^2 = \sum_{i=1}^{n} (X_i - \varepsilon v)^2 P_i} \qquad (1)$$

Where,

σ_1= Standard Deviation of Earnings.

S^2 =Variance of the Earnings.

X_i = Earnings of livestock farmers

$\varepsilon \nu$ = Expected Value of Earnings

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P_i = Probability Distribution of Expected Earnings

The coefficient of variation model is specified as (Pandey, 2005):

$$\boldsymbol{CV} = \frac{\sigma_i}{\varepsilon\, \nu} \qquad (\mathbf{2})$$

Where,

CV = Coefficient of Variation of Expected Earnings.

σ_i = Standard Deviation of Expected Earnings.

$\varepsilon\, \nu$ = Expected Earnings.

The coefficient of variation of expected earnings was compared using the Z-test stated as:

$$\boldsymbol{Z} = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \qquad \mathbf{(3)}$$

Where

Z = Value of under consideration

$\overline{X_1}$ = Mean value of coefficient of variation of expected earnings of farmers with formal credit

$\overline{X_2}$= Mean value of coefficient of variation of expected earnings of farmers with informal credit

S_1^2 = Variance of coefficient of variation of expected earnings of farmers with formal credit

S_2^2 = Variance of coefficient of variation of expected earnings of farmers with informal credit

n_1 = Number of farmers with formal credit

n_2 = Number of farmers with informal credit

RESULTS AND DISCUSSION

Socioeconomic characteristics of livestock farmers

Table 1 showed the socioeconomic characteristics of livestock farmers who accessed credit through formal and informal financial institutions. The results showed that gender distribution pointed to male dominance in livestock financing, as 55.0% of formal-sector borrowers and 56.7% of informal-sector borrowers were males. This suggests that men in the study area are better positioned to meet credit requirements, possibly due to greater control over productive assets and

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financial resources. The findings underscore the pressing need to address gender disparities in agricultural finance to promote equitable access across both formal and informal channels.

The mean age of farmers financed by formal institutions was 47 years, while that of their informal counterparts was 44 years. This aligns with Nwosu (2014) and Xiao et al. (2015), who observed that middle-aged farmers tend to be more confident and strategic in financial decisions, leveraging credit effectively for investment in livestock enterprises. The age profile reflects a productive, economically active segment that financial institutions may perceive as lower-risk borrowers.

Educational attainment showed that the majority of farmers financed by both formal (46.7%) and informal (58.3%) sources had secondary education. This indicates that most farmers possess the literacy and comprehension necessary to engage meaningfully with credit terms and conditions, and to utilize loans productively. The result corroborates Ijioma and Osondu (2015), emphasizing the role of education in resource allocation and technology adoption in farming.

Household size, formal-sector borrowers had an average of 5 members, while informal-sector borrowers had an average of 4 members, with most respondents in both categories (61.7% formal, 86.7% informal) having 1–5 household members. This pattern suggests that smaller household sizes may ease access to credit, as financial institutions could perceive them as having fewer competing demands for loan funds. Larger households may raise concerns about potential diversion of credit to non-farm uses, as noted by Effiong (2005). Furthermore, a small household size could mean higher dependence on hired labour, increasing production costs, as highlighted by Ugwu *et al*. (2017).

Finally, the study found that farmers financed by formal institutions had an average of 7 years of livestock farming experience, while those financed informally averaged 8 years. This suggests that both formal and informal financial sources prefer clients with a reasonable degree of farming experience, likely as a measure of creditworthiness and management capability. Experienced farmers are often seen as better equipped to deploy borrowed funds effectively for productive outcomes.

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Table 1: Distribution of livestock farmers according to socioeconomic characteristics

	Farmer Financed by Formal Financial Institutions		Farmer Financed by Informal Financial Institutions	
Variables	**Freq. Dist.**	**%Dist.**	**Freq. Dist.**	**%Dist.**
Gender				
Male	33	55	34	56.7
Female	27	45	26	43.3
Age				
21-30	0	0	4	6.7
31-40	17	28.3	22	36.7
41-50	20	33.3	16	26.7
51-60	21	35	16	26.7
61-70	2	3.3	2	3.3
Mean	**47**		**44**	
Level of education				
Primary (1 – 6 years)	15	25	11	18.3
Secondary (7 – 12 years)	28	46.7	35	58.3
Tertiary (13 – 18 years)	17	28.3	14	23.3
Mean	**9.7**		**9.8**	
Household size				
1-5	37	61.7	52	86.7
6-10	22	36.7	7	11.7
11-15	1	1.6	1	1.6
Mean	**5**		**4**	
Experience				
1-5	6	10	8	13.3
6-10	28	46.7	33	55
11-15	7	11.7	6	10
16-20	6	10	4	6.7
21-25	0	0	1	1.7
Mean	**7.4**		**7.6**	

Source: Field Survey Data, 2023

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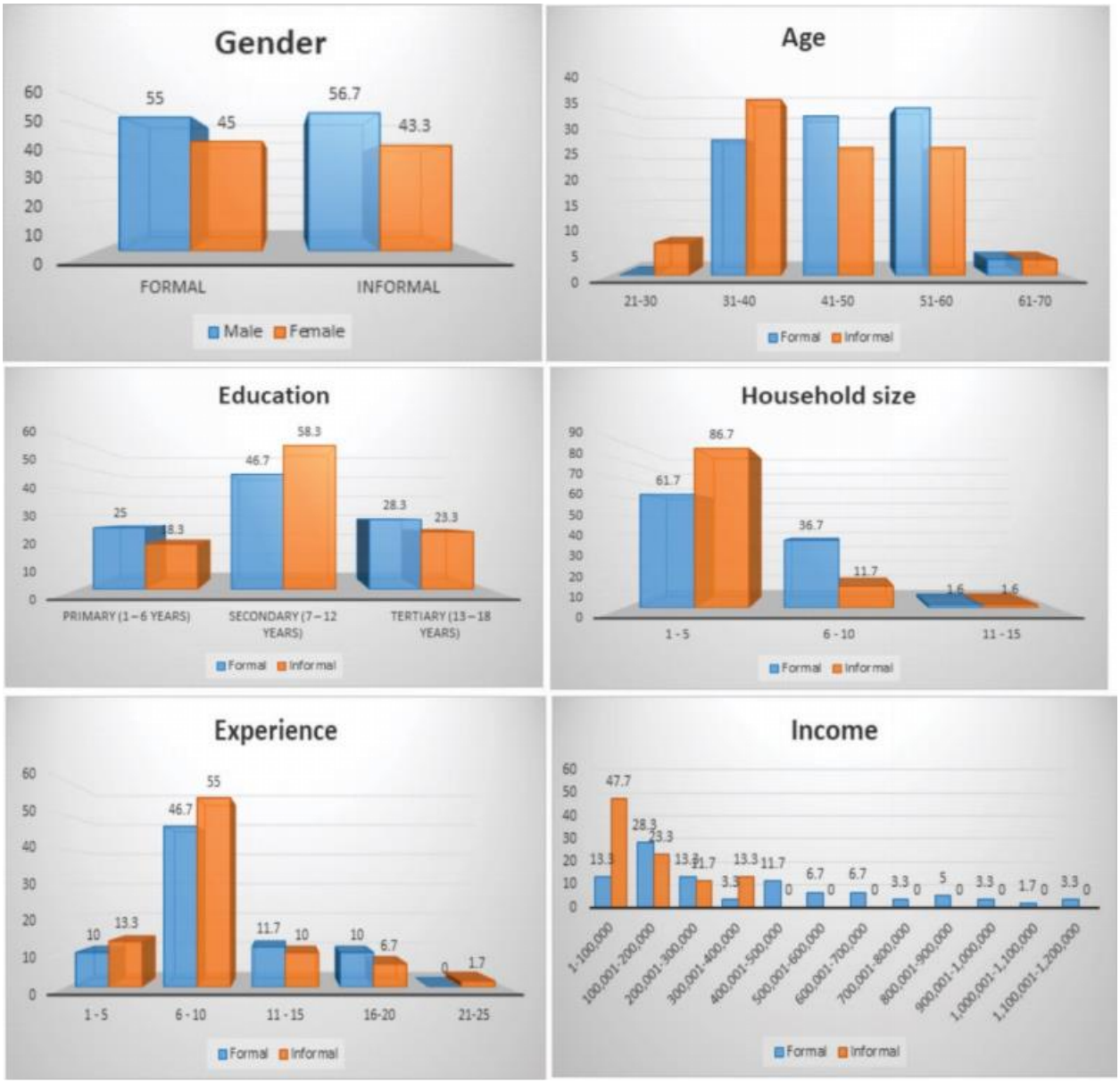

Comparison of formal and informal credit accessed, interest charged, credit duration and the repayment capacity of livestock farmers

Table 1 shows the estimated amount of formal and informal credit accessed, interest charged, credit duration and repayment capacity of livestock farmers in the study area. Results showed that the average amount of credit accessed by livestock farmers from formal credit markets was one million five hundred and fifteen thousand eight hundred and thirty-three naira (₦1,515,833), while average of two hundred and forty-four thousand one hundred and sixty-seven naira (₦244,167) was accessed from informal credit markets, with a percentage difference of 83.89%. The Z-test value

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(6.7646), which was significant at 5% level, confirmed that there is a significant difference between the amount of formal and informal credit accessed in the area. This could be linked to the fact that formal credit markets 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 credit sources was 7.025%, while that of the informal credit sources was 0.729%, with a percentage difference of 89.62%. This implies that the formal credit markets charge higher interest rates than informal sources such as cooperatives. High interest rate is one of the factors limiting farmers from accessing credit from formal credit markets (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. 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 sources in the area. Results also showed that the average duration of formal credit was 17.55, approximately eighteen (18) months, while that of the informal credit 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 credit sources in the area. This is an indication that informal credit sources such as farmers' cooperatives or associations charge less interest rate and credit durations.

Results showed that the average amount of formal credit repaid monthly by livestock farmers was eighty thousand nine hundred and nineteen naira (₦80,919), while that of informal credit was thirty-four thousand seven hundred and nine naira (₦34,709) with a percentage difference of 57.11%. This is an indication that farmers financing their livestock businesses through formal credit sources have higher repayment capacity than their counterparts financing through informal credit sources in the area. This also suggests that the formal credit sources extend more credit to farmers with strong repayment histories. Farmers with low repayment capacity face credit constraints, as lenders are cautious about extending larger amounts to borrowers with a higher risk of default (Chen *et al.,* 2020). The Z-test value (7.418687), which was significant at 5% level, further confirmed that there is a significant difference between the repayment capacities of farmers financing their livestock businesses through formal credit markets and those financing their livestock businesses through informal credit markets in the area.

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Table 1: Estimated formal and informal credit accessed, interest charged, credit duration and repayment capacity of livestock farmers

Items	Formal Credit Sources	Informal Credit Sources	% Difference	Z-values
Average amount of credit accessed	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

Risk differentials in formal and informal livestock financing

Table 2 shows the estimated risk differentials in formal and informal livestock financing in the area. Results showed that the expected net cash inflow of livestock farmers financed through formal credit markets was three hundred and eight-one thousand six hundred and sixty-seven naira seventeen kobo (₦381,667.17) with a standard deviation of three hundred and four thousand six hundred and eighty one naira seven kobo (₦304,681.07), while the expected net cash inflow of livestock farmers financed through informal credit markets was one hundred and eighty eight thousand three hundred and thirty-three naira eight three kobo (₦188,333.83) with a standard deviation of one hundred and twenty eight thousand seven hundred and forty three naira ninety three kobo (₦128,743.93). The higher value of the standard deviation for livestock farmers financed through formal credit markets is an indication that there is a higher level of risk associated with financing livestock businesses through formal credit markets when matched with their counterparts who financed their livestock businesses through informal credit markets.

Results also showed that the coefficient of variation for livestock businesses financed through formal credit markets was 0.798 while those financed through informal credit markets was 0.684. The coefficient variation of livestock businesses financed through formal credit sources was higher than those financed through informal credit sources. This implies that there is a slightly high level of risk involved in financing livestock business through formal credit markets than informal credit markets in the study area. This could stem from the higher interest rate and other administrative fees charged by formal credit sources that affect the repayment capacity of farmers especially in the event of disease outbreak that increases the mortality rate of these livestock and reduces the returns upon which the farmers repay these formal credit sources. The limitations of formal credit sources in supporting farmers often drive them to seek informal financing options, particularly in times of income shocks (Moahid & Maharjan, 2020). While formal credit sources charge higher interest rates to compensate for perceived higher risk (Chiu *et al.,* 2014), resulting from the uncertainties in agricultural production or lack of collateral. On the other hand, farmers prefer

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financing options that match their production cycles with flexible terms (Khan *et al.,* 2024), in order to reduce the risks of defaulting. Results showed that the Z-value (2.800794) was statistically significant at 5% level. Therefore, the null hypothesis that there is no significant difference in the risk levels associated with formal and informal livestock financing in the area was rejected. The alternative was accepted and the study concluded that there is significant difference in the risk levels associated with formal and informal livestock financing in the area.

Table 2: Estimated risk differentials in formal and informal livestock financing in the area

	Farmers financed through Formal Credit Sources			**Farmers financed through Informal Credit Sources**		
Net Cash Inflow (Naira)	**Freq**	**Probability**	**Expected Values**	**Freq**	**Probability**	**Expected Values**
1-100,000	8	0.13	6666.73	14	0.47	11666.78
100,001-200,000	17	0.28	42500.14	28	0.23	70000.23
200,001-300,000	8	0.13	33333.40	7	0.12	29166.73
300,001-400,000	2	0.03	11666.68	3	0.05	17500.03
400,001-500,000	7	0.12	52500.06	8	0.13	60000.07
500,001-600,000	4	0.07	36666.70	-	-	-
600,001-700,000	4	0.07	43333.37	-	-	-
700,001-800,000	2	0.03	25000.02	-	-	-
800,001-900,000	3	0.05	42500.03	-	-	-
900,001-1,000,000	2	0.03	31666.68	-	-	-
1,000,001-1,100,000	1	0.02	17500.01	-	-	-
1,100,001-1,200,000	2	0.03	38333.35	-	-	-
Expected Value (εv)	**381,667.17**			**188,333.83**		
Variance	**92830555556**			**16575000000**		
Standard deviation (σ)	**304,681.07**			**128,743.93**		
Sample size	**60**			**60**		
CV	**0.798**			**0.684**		
Mean value of coefficient of variation	0.20451			1.73351		
Variance of coefficient of variation	0.012306411			1.484995221		
Z-Statistics	2.800794*					

*significant@5% levels

Source: Field survey data (2023) computed using EXCEL

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Identify the factors militating against livestock financing through formal and informal credit sources in the area.

Table 3 shows the multiple responses of the factors militating against livestock financing through formal and informal credit markets in the study area. Results showed that the major factors militating against livestock financing through formal credit markets were years of account holding (75.00%), savings deposits (95.00%), insufficient collateral (85.00%) and lack of personal guarantors (83.33%), while that of livestock financing through informal credit markets were insufficient credit (90.00%), years of membership (80.00%), insufficient collateral (76.67%) and lack of personal guarantor (53.33%). This implies that years of account holding, savings deposits, insufficient collateral and lack of personal guarantor are the major factors militating against livestock financing through formal credit markets while insufficient credit, years of membership, insufficient collateral and lack of personal guarantor are the major factors militating against livestock financing through informal credit markets in the area.

Table 3: Multiple response of the factors militating against livestock financing through formal and informal credit sources in the study area

	Farmers financed through Formal Credit Markets		Farmers financed through Informal Credit Markets	
Factors	**Frequency**	**% Distribution**	**Frequency**	**% Distribution**
Lack of credit facilities/insufficient credit	4	6.67	54	90.00*
Years of membership/account holding	45	75.00*	48	80.00*
Monthly Savings deposits	57	95.00*	7	11.67
Insufficient collateral	51	85.00*	46	76.67*
Ineligibility resulting from improper documentation	21	35.00	12	20.00
Lack of consistent cash flow	1	1.67	3	5.00
Lack of personal guarantor	50	83.33*	32	53.33*

***Major factors ≥ 50%**

Source: Field survey data (2023)

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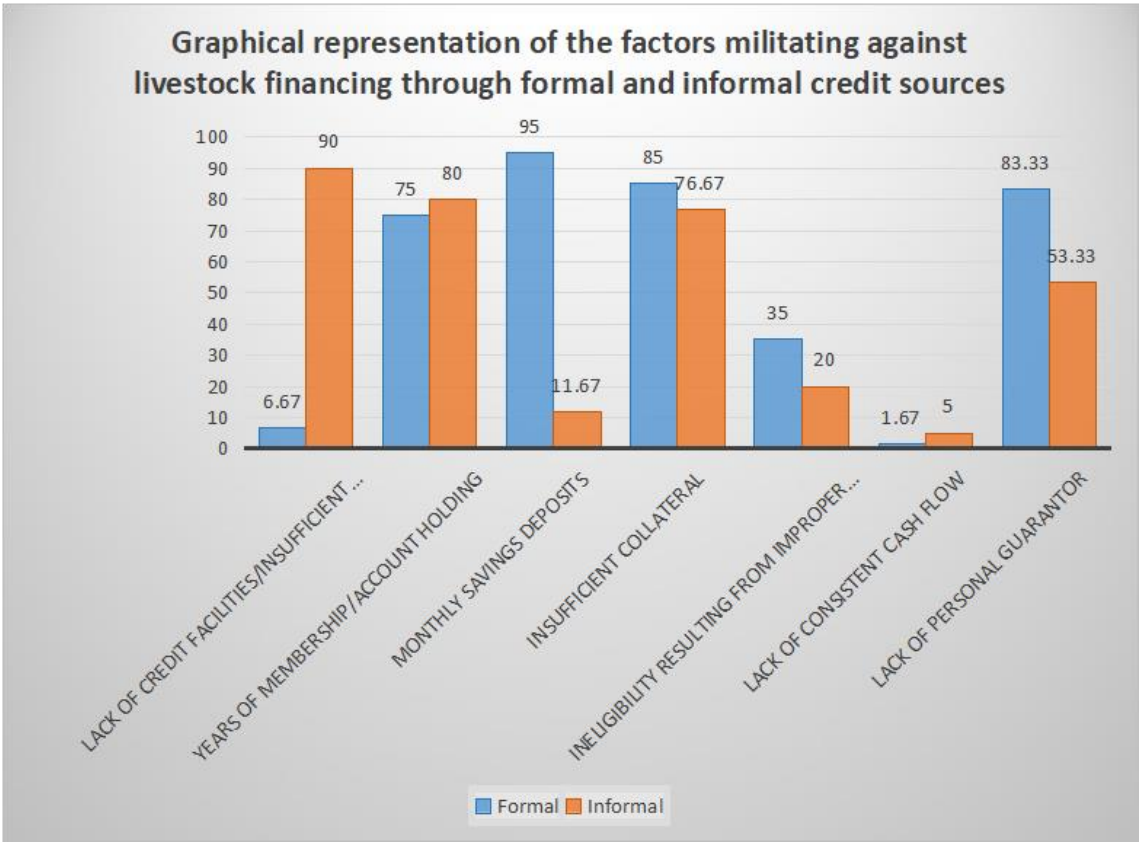

CONCLUSION AND RECOMMENDATIONS

This study's findings underscore the complexities of livestock financing in Imo State, Nigeria. The analysis reveals that formal credit sources offer higher credit amounts, longer credit durations, and greater repayment capacities compared to informal credit sources. However, this increased access to credit comes with higher risk, as evidenced by the greater variance and standard deviation associated with formal credit sources. Moreover, the study highlights the numerous constraints that hinder livestock financing, including insufficient collateral, lack of credit facilities, and stringent account holding and membership requirements. The findings have implications for policymakers, financial institutions, and livestock farmers, highlighting the need for improved access to formal credit sources for livestock farmers, as they provide higher credit amounts and longer credit durations. Regulatory bodies should consider implementing policies to regulate interest rates charged by formal credit sources, making them more competitive with informal credit sources. Finally, formal credit sources should implement effective risk management strategies to mitigate the higher risk associated with livestock financing in Imo State, Nigeria

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