



FACTORS INFLUENCING PROFITABILITY AMONG SMALL RUMINANT PRODUCERS IN BAUCHI STATE, NIGERIA

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ABSTRACT

This study examined the factors influencing profitability among small ruminant producers in Bauchi State, Nigeria. A multi-stage sampling technique was employed to select 312 respondents from 7 Local Government Areas across the three Agricultural Zones of the State. Primary data were collected using structured questionnaires and analyzed using farm budget analysis, multiple regression analysis, and descriptive statistics. The profitability analysis revealed total revenue of ₦39,209,452 against total costs of ₦29,949,905, yielding a gross margin of ₦9,259,547.00 and a Net Farm Income ratio of 0.6, indicating moderate profitability with every ₦1 invested generating ₦0.60 profit. Feed costs dominated variable expenses (over 47%), while goats contributed more to revenue (56.6%) than sheep (43.4%). Regression analysis showed that years of experience ($P < 0.01$) and type of animal raised ($P < 0.05$) positively and significantly influenced gross income, while association membership showed a negative significant effect ($P < 0.05$). Major constraints identified were disease outbreaks (68.5%), feed scarcity (65.2%), high cost of feed (60.8%), limited veterinary access (55.4%), poor market access (50.1%), theft/predation (45.7%), and inadequate credit (42.3%). The study concluded that small ruminant production is economically viable and contributes significantly to rural livelihoods in the study area. The study recommended that government should strengthen extension and veterinary service delivery, establish subsidized feed programmes and community feed banks, improve access to credit and improved breeds, enhance market infrastructures, address security challenges, and implement LGA-specific interventions tailored to local priorities.

Keywords: Profitability; Small ruminants; Producers; Sheep and goats; Bauchi State

INTRODUCTION

Agriculture remains a fundamental pillar of global economic growth, food security, and rural livelihoods, contributing significantly to employment, poverty reduction, and industrial development. Globally, the agricultural sector provides food for more than 8 billion people and employs over 27% of the world's labour force, making it one of the most economically and socially important sectors (FAO, 2021). Its contribution extends beyond food supply to include raw materials for agro-industries, foreign exchange earnings, and ecosystem services essential for sustainable development. Over the past decade, global agricultural systems have undergone substantial transformation driven by population growth, climate change, technological innovation, and shifting market demands (World Bank, 2022). Livestock production, which forms a critical component of global agriculture, contributes approximately 40% of agricultural GDP worldwide and remains a major source of protein, income, and rural employment (FAO, 2022).

In Nigeria, agriculture contributes about 23% of the national GDP and employs more than 36% of the labour force, making it a cornerstone of national development (National Bureau of Statistics, 2022). Livestock production contributes roughly 7–8% of the agricultural GDP, with small ruminants primarily sheep and goats forming a major component of rural agricultural systems (Oni and Adamu, 2021). Nigeria has an estimated 42 million goats and 22 million sheep, ranking among the largest small ruminant populations in Africa (FAOSTAT, 2023). Small ruminant farming supports household nutrition, provides an accessible form of savings and insurance for rural families, and serves as a significant income source, particularly for women and youth (Oluwatayo and Adefalu, 2022). Small ruminant production constitutes a key livelihood activity, especially in rural communities where sheep and goats are reared for meat, milk, manure, cultural ceremonies, and income generation. Women and



youth in the state rely heavily on small ruminant enterprises due to their relatively low investment requirements and quick turnover (Saidu and Yakubu, 2021).

Despite the significant role of small ruminants in enhancing household income, nutrition, and food security, their production potential remains grossly underexploited, particularly in Bauchi State and across northern Nigeria. Sheep and goats, due to their adaptive traits and low maintenance requirements, offer promising avenues for wealth creation among rural households. In Bauchi State, small ruminant enterprises are predominantly managed by smallholder farmers and serve as a vital economic activity due to their adaptability to the prevailing agro-ecological conditions and relatively low capital requirements. Despite their importance, the productivity and profitability of small ruminant enterprises in the State remain below potential, largely due to inefficiencies in resource use and numerous production constraints.

The broad objective of the study is to examine factors influencing profitability among small ruminant producers in Bauchi State. While the specific objectives were to;

- i. determine the profitability in sheep and goat production in the study area;
- ii. determine the factors influencing gross income in sheep and goat production; and
- iii. identify the constraints militating against sheep and goat production in the study area

METHODOLOGY

The Study Area

The study was conducted in Bauchi State lies in North-East Nigeria and occupies a strategic position in the country. The State extends between latitudes 9°03' and 12°30' N and longitudes 8°50' and 11°00' E, and is bordered by Kano and Jigawa to the North-West, Yobe and Gombe to the North-East, Taraba and Plateau to the south, and Kaduna to the west (Bauchi State Government, 2023; Saleh & Abdullahi, 2023). These coordinates place Bauchi on the Northern edge of the Jos Plateau, giving it a mix of plateau and savannah landscapes (Saleh & Abdullahi, 2023). The State covers an area of about 49,119 km², representing roughly 5.3% of Nigeria's land mass, and is administratively divided into Local Government Areas (LGAs) (Bauchi State Government, 2023; BASG, 2023–2024). Bauchi State most recent official population projection in 2026 places the State population at approximately 9,620,000-10,000,000 at 3.2% annual increase rate. Bauchi State falls across two main savannah agro-ecological zones (Northern Sudan/Sahel transition and Southern Guinea/Sudan savannah), producing a climatic gradient from drier North to more humid South (Saleh & Abdullahi, 2023). Recent climatological analyses for Bauchi State report a mean annual rainfall in the order of 966 mm (with substantial inter-annual variability and a concentration of rains in July–September) and note statistically detectable variability in rainfall and temperature in the 2000–2021 period (Saleh & Abdullahi, 2023). Spatial analyses also show that temperature and rainfall variability affect vegetation cover and therefore cropping potential across LGAs (Saleh & Abdullahi, 2023).

Bauchi State is ethnically diverse, with over 50 ethnic groups recorded in the State. The dominant and widely recognised groups include Hausa, Fulani, Gerawa, Sayawa, Jarawa, Bolewa, Karekare, Kanuri, Butawa, Warjawa, Zulawa, among many others (Bauchi State Government, 2023). This plurality influences language use, cropping systems, labour arrangements and social institutions (Bauchi State Government, 2023). Agriculture is the mainstay of Bauchi State economy: crop farming including rice, maize, sorghum, millet, groundnut and sesame, livestock rearing and fisheries form the backbone of rural livelihoods (Bauchi State Investment/Agribusiness report, 2025; Bauchi State Government, 2023). Mining (solid minerals), trading/commerce, and small-scale agro-processing are additional important economic activities contributing to employment and state GDP (Bauchi State Government, 2023; Federal Ministry of Environment, 2024). The state government has explicitly prioritized agriculture and agro-industrial development in its recent economic plans (Bauchi State Government, 2023–2024).

Sampling Technique and Sample Size

Multi-stage random sampling technique was employed in the selection of respondents for the study. In the first stage, the study purposively selected seven Local Government Areas (LGAs), two from each Southern and Central Agricultural Zones and three from Northern Agricultural Zone

respectively. Southern Agricultural Zone; Alkalari, Dass and Toro LGAs known for their predominant agrarian economy with growing interest in small ruminant fattening systems and Northern Agricultural Zone; Itas/Gadaw, Jama'are and Misau LGAs located near the rivers, offering limited irrigation but widely known for small-scale sheep and goat production with a vibrant livestock market and both nomadic and sedentary livestock farming systems. Central Agricultural Zone; Darazo and Ningi LGAs featuring a semi-arid climate and widespread pastoralism and a migration corridor for nomadic herders. In the second stage two communities were selected from each LGA making a total fourteen (14); In Toro (Magama and Tilde), Dass (Bagel and Bundot), Alkalari (Alkalari and Duguri), Misau (Misau and Hardawa), Jama'are (Jama'are and Dogon Jeji), Darazo (Darazo and Gabarin), Ningi (Ningi and Burra). In the final stage proportional and simple random sampling was employed in selecting 312 households for the study.

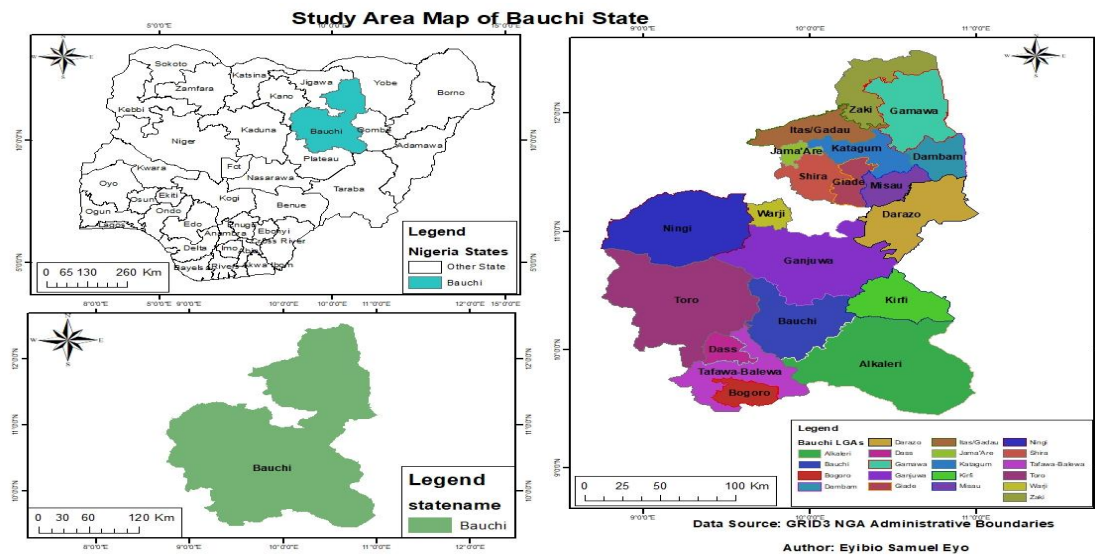


Figure 1: Map of the Study Area

Table 1: Sampling Technique and Sampling Size

LGA	Communities	Sampling Frame	Sample Size
Toro	Magama	700	45
	Tilde	600	38
Dass	Bagel	300	19
	Bundot	324	21
Alkalari	Alkalari	221	14
	Duguri	210	13
Misau	Misau	190	12
	Hardawa	260	17
Jama'are	Jama'are	406	26
	Dogon Jeji	634	40
Darazo	Darazo	183	12
	Gabarin	145	9
Ningi	Ningi	200	13
	Burra	524	33
Total		4,897	312

Source: Authors' computations (2025)

Methods Data Collection

The study utilized primary data. The data were collected through the administration of structured questionnaires to the respondents supplemented with interview using trained enumerators. The questionnaire was divided into sections.



Methods of Data Analysis

Data were analyzed using both farm budget analysis, descriptive and inferential statistics. The farm budget analysis was used to achieve objective i, linear regression was used for objective ii and descriptive statistics were used for objective iii.

The regression model used was expressed as:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + e \quad \dots (1)$$

Where;

Y= Gross income (Amount in Naira)

X₁= Age of farmers (years)

X₂ = Marital Status (single=1, married =2, divorced =3)

X₃ = Educational level of the farmers (Qur'anic=1, Primary=2, Secondary=3, Tertiary=4)

X₄= Occupation (crop farmers=1, civil servant=2, artisan=3, traders=4, livestock farmers=5,)

X₅= Years of herding experience (Number of Years)

X₆= Type of animal reared (Goat=1, Sheep=2)

X₇ = Membership association (Yes=1, No=2)

X₈ = Annual income (in naira)

a=Constant term of intercept

b₁(i=1...8) are regression coefficients.

e=Error term

RESULTS AND DISCUSSION

Profitability of Ruminants Production in the Study Area

The profitability analysis in Table 2 revealed total costs of ₦29,949,905 and total revenue of ₦39,209,452, resulting in a Gross Margin of ₦9,259,547 and a Net Farm Income Ratio (NFI) of 0.6. This indicates that ruminant production is moderately profitable among farmers. Variable costs dominated (₦22,102,313), with labor (21.6%) and feed (bran, haulm, husk accounting for over 47%) being the major cost components. This reflects the high feed dependency typical of semi-intensive systems (Ibrahim & Tanko, 2022). Fixed costs were notably high (26.2% for housing), indicating substantial investment in infrastructure.

Table 3: Cost and Returns on Ruminants Production

Variables	Amount (₦)	Percentage
Variable cost (₦)		
Cost of bran	4,745,809	15.8
Cost of haulm	4,491,152	15.0
Cost of groundnut husk	4,842,303	16.2
Cost of water	1,540,249	5.2
Cost of labour	6,482,800	21.6
TVC (₦)	22,102,313	
Fixed cost (₦)		
Housing	7,847,592	26.2
TFC (₦)	7,847,592	
TC (₦)	29,949,905	100
Revenue		
Sales of goats	22,182,129	
Sales of Sheep	17,027,323	
TR	39,209,452	
GM	9,259,547	
NFI	0.6	

Source: Field Survey (2025)

Sales of goats (₦22,182,129) contributed more than sheep (₦17,027,323), confirming goats' higher market turnover and quicker reproduction rates. Despite profitability, the margin is smaller



relative to rising feed costs and mortality, suggesting that profitability is highly sensitive to shocks. This aligns with Musa & Abubakar (2023), who found that feed cost inflation and disease outbreaks significantly reduce small ruminant profitability in northern Nigeria.

Factors Influencing Gross Income in Sheep and Goat Production

Table 3 presented the multiple regression estimates of factors influencing gross income in sheep and goat production. The model explains about 7.7% of the variation in gross income ($R^2 = 0.077$), while the adjusted R^2 of 0.049 suggests that although the explanatory variables jointly influence income, other unobserved factors such as market conditions, disease outbreaks, feed availability, and climatic variability may also play significant roles. The F-value (2.799) indicates that the model is statistically significant, confirming the joint relevance of the included variables in explaining variations in gross income.

Table 4: Factors Influencing Gross Income in Sheep and Goat Production

Variables	B	Std. Error	Beta	t	Sig.
Constant	5715281.155	2036046.664		2.807***	.005
Age	-7389.041	21872.239	-.021	-.338	.736
Marital status	115332.483	277264.826	.030	.416	.678
Educational level	-269834.849	168541.741	-.113	-1.601	.110
Occupation	6590.071	244136.814	.002	.027	.978
Years of experience	109909.416	32943.958	.191	3.336***	.001
Type of animal raised	530517.170	236161.341	.162	2.246**	.025
Access to extension	-772523.093	680430.534	-.095	-1.135	.257
Membership of association	-721820.567	348606.583	-.133	-2.071**	.039
Annual income	-2.151	1.978	-.100	-1.087	.278
R-squared	.077				
R adjusted	.049				
F-value	2.799				

Source: Field Survey (2025) ***,**Significant at 1% and 5%

The findings revealed that years of farming experience had a positive and highly significant ($P < 0.01$) effect on gross income. This indicated that experienced farmers earn significantly higher income from sheep and goat production. Experience enhances managerial ability, disease control, breeding decisions, and market timing, all of which contribute to improved income. This finding is consistent with Adekunle *et al.* (2022) and Olatunji *et al.* (2024), who found that farming experience is a critical determinant of livestock productivity and profitability. The type of animal raised also had a positive and statistically significant ($P < 0.05$) effect on gross income. This suggested that income differs significantly depending on whether farmers rear sheep, goats, or a combination of both. Farmers raising more commercially valuable breeds or species likely achieve higher income due to better market prices and adaptability. Similar findings were reported by Ibrahim *et al.* (2021) and Yusuf *et al.* (2023), who noted that breed type and species composition significantly influence livestock income in smallholder systems.

The result further showed membership of farmers' associations had a negative but statistically significant ($P < 0.05$) effect on gross income. This suggests that association membership does not necessarily guarantee higher income and may even impose costs such as dues, time commitments, or inefficiencies. This finding contradicts conventional expectations but aligns with Danjuma *et al.* (2021), who reported that poorly managed associations can reduce net income rather than enhance it.

Major Production Constraints in Sheep and Goat Production

Table 4 showed the major production constraints faced by sheep and goat farmers in Bauchi State, with the most severe challenge being disease outbreaks (68.5%). This high percentage highlights the vulnerability of small ruminants to transboundary and endemic diseases such as *PPR*, *helminthiasis* and ectoparasites. Several studies confirm that inadequate vaccination, poor hygiene, and limited veterinary access contribute significantly to disease prevalence among small ruminants in Nigeria



(Nwankpa *et al.*, 2020; Bala *et al.*, 2022). The implications are substantial: high disease burden suppresses productivity, reduces birth rates, increases mortality, and lowers profitability.

Table 4: Major Production Constraints in Ruminants Production

Constraint	Percentage	Rank
Disease Outbreaks	68.5	1 st
Feed Scarcity	65.2	2 nd
High Cost of Feed	60.8	3 rd
Limited Veterinary Access	55.4	4 th
Poor Market Access	50.1	5 th
Theft/Predation	45.7	6 th
Inadequate Credit	42.3	7 th

Source: Field Survey (2025)

The second and third major constraints were feed scarcity (65.2%) and high cost of feed (60.8%), reflecting the rising cost of supplementary feeds and the growing pressure on natural pastures due to climate change and land degradation. These findings agree with evidence that feed-related constraints are the most persistent challenges limiting livestock productivity in northern Nigeria (Oladimeji & Hassan, 2021; Yahaya *et al.*, 2023). Without reliable feed sources, farmers experience slow growth rates, poor reproductive performance, and financial losses. Limited veterinary access (55.4%), the fourth-ranked constraint, confirms earlier findings that respondents received no extension services. This institutional weakness limits farmers' ability to diagnose diseases early, access vaccination, or receive technical guidance. Studies showed that veterinary service deficits were among the strongest predictors of livestock mortality in northern Nigeria (Danbirni & Gadzama, 2021).

Poor market access (50.1%) also ranked highly, suggesting that many farmers were confined to local markets with low price margins. This aligns with recent research noting that rural livestock markets lack infrastructure, grading systems, and transport support, resulting in unfavorable price outcomes for producers (Maikasuwa & Farouk, 2022). Weak market access reduces profitability and discourages enterprise expansion. Other notable constraints include theft/predation (45.7%) and inadequate credit (42.3%). Theft and predation reflect increasing insecurity in northern Nigeria, which has forced many farmers to scale down production or relocate herds, a trend confirmed by Abdullahi & Tanko (2023). The inadequate credit access restricts investment in improved housing, feeds, veterinary care, and breeding stock, consistent with findings that credit constraints significantly undermine livestock enterprise growth (Ojo & Kuku-Shittu, 2020).

CONCLUSION AND RECOMMENDATION

The study concludes that small ruminant production in the study area demonstrates moderate profitability. However, this profitability is highly vulnerable to rising feed costs, which account for over 47% of variable expenses, and to disease outbreaks causing high mortality rates.

Based on the findings, the following recommendations were made:

- Government intervention through subsidized feed programmes, support for pasture development, and establishment of community feed banks across all LGAs is essential
- Training farmers on feed formulation using crop residues should be organized by NGOs and agricultural extension experts to reduce production costs and enhance enterprise profitability
- Financial institutions, particularly microfinance banks and agricultural credit agencies, should design farmer-friendly credit schemes with flexible terms to ease liquidity constraints
- Government and security agencies should collaborate with local communities to implement effective measures against theft and predation

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