Economic Analysis of Small Ruminant (Sheep and Goat) Production among Rural Households in Iwo Agricultural Zone, Osun State, Nigeria

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Abstract

This study examined the economic aspects of small ruminant production among rural households in Iwo Agricultural Zone, Osun State, Nigeria. Using a multistage sampling technique, data were collected from 120 respondents through structured interviews. The majority of participants were middle-aged, married males with an average household size of five, and 63% had between one and thirteen years of formal education. Small ruminant farming was the most common livelihood activity (30.83%), with 90% of respondents earning ₦10,000–₦100,000 monthly from secondary occupations. On average, respondents had 15.2 years of experience in small ruminant production, generating ₦49,555.25 in revenue, ₦109,806.32 in total costs, and a gross margin of ₦26,524.79, with half of them achieving a medium gross margin. Regression analysis showed that gross margin was positively influenced by factors such as education level, flock size, production experience, and start-up cost. Conversely, feeding costs negatively impacted profitability. The study concluded that small-scale ruminant farming is a viable and profitable enterprise that contributes to income generation, poverty reduction, and food security in the area. It recommends the promotion and support of small ruminant farming as a sustainable income source for rural communities.

Keywords: Small ruminant, rural households, economic performance, gross margin, cost-benefit analysis.

Introduction

Over half of people living in developing nations are farmers, with farming being their primary source of income, according to Food and Agriculture Organization (FAO)

reports from 2015 and 2018. In developing nations like Nigeria, agriculture is the main economic activity in rural households. However, the productivity and profitability of this operation are limited because rural households are frequently small-holder farmers with dispersed agricultural holdings and primitive technologies [1,2,3]. This exacerbates rural family poverty. Over 800 million rural smallholder households around the world rely on the livestock industry for their daily needs in the form of natural capital, meat, milk, wool, hide, rangeland, and pasture, financial capital; cash, savings, credit, insurance, gifts, and remittances, social capital, traditions, wealth, prestige, identity, respect, friendship, marriage dowry, and celebrations, and human capital [3].

In addition, it is a significant source of protein for low-income rural households, particularly for expectant mothers, and it helps children's cognitive development and mental maturation. It serves as a valuable resource for local, cultural, and socioeconomic systems in rural households that are impoverished and enables the efficient use of resources that would otherwise be unusable [7, 3]. Production of goats and sheep has not only contributed to economic and financial security, particularly in low-potential areas, but it has also facilitated other biological benefits. Due to a few intrinsic benefits, including a quick market maturity phase and a relatively short gestation period, it offers a consistent and immediate source of income [5, 3]. Nigeria's livestock sub-sector faces productivity constraints due to pest and disease issues, which can ultimately result in animal death. Additionally, low reproductive ability or deformity in animals can lead to high production costs and persistently low economic returns, which in turn significantly reduce rural household income [1, 14].

Statement of research problem

Previously was stated [6, 14] that poverty is a problem in Africa, particularly in sub-Saharan Africa, where Nigeria is one of the world's poorest nations. These issues are made worse by declining farm productivity, shifting climatic conditions, and issues with production and livelihood that force rural households to diversify their sources of income. Rural households can diversify their income sources to supplement the decreasing revenue from farming by engaging in a variety of non-farm businesses. One of the sustainable enterprises among rural households is the production of livestock, particularly small ruminants (sheep and goats), which are known for their low input requirements, quick production cycles, and consistent returns on investment. This industry significantly contributes to the food, financial, and economic security of rural households [15].

However, animal debility, low reproductive success, stunted growth, and death hindered the enterprise's degree of economic returns [2]. Diseases caused by parasite infestation that affect carcass quality and weight loss, as well as higher production costs due to veterinary expenses, further exacerbate the problem [11, 2].

In order to give important financial and economic information about the enterprise, it is necessary to investigate the financial performance of small ruminant enterprises among rural households and identify key elements influencing the enterprise's profitability. Therefore, in Iwo Agricultural Zone, Osun State, Nigeria, the study looked at the financial performance of small ruminant enterprises among rural households. The

specific goals are to: characterize the socioeconomic characteristics of the study area's respondents; assess the costs and benefits of small-scale small ruminant production among rural households in the study area; ascertain the extent of the gross margin of small-scale small ruminant production among these households; and identify key variables affecting the gross margin of small-scale small ruminant production among these households.

Materials and Methods

Study area

The Iwo Agricultural Development Programme (ADP) zone in Osun State served as the research area. There are seven (7) local government areas (LGAs) that comprise the zone. It is situated in a warm, tropical area of South Western Nigeria's rainforest. Between May and July, the zone receives 25 mm of rain on average every month, whereas between December and January, it receives 2.5 mm. Although there are significant variations from the mean amount of 52.35 inches (1,330 mm) of rainfall annually, this figure is the average. The rainy season spans between April and October. Due to the zone's dual rainforest and derived savannah vegetative cover, which supports a high volume of small ruminant production, particularly in the zone's rural parts, there are many grazing pastures.

The population of the study are rural dwellers who are involved in small ruminant production in the study area. A multistage sampling technique was adopted to select 120 respondents as the sample size for the study. In the first stage, three local government areas (LGAs) with highest rural communities were purposively selected from the seven (7) LGAS in the agricultural zone. In the second stage, ten (10) rural communities where small ruminant production is predominant were selected from each LGAs to make thirty (30) communities. Finally, using snowball technique, five (5) rural households' heads engaged in small ruminant production were selected from each community to make 150 respondents for the study.

Primary data for the study were collected through structured interview schedule to elicit responses from the respondents. The structured interview was pretested to ensure its accuracy and validity for the study. Socio-economic characteristics of the respondents such as age, education level and small ruminant production experience were measured in years, household size measured as number of people eating from the same pot, flock size measured as number of animals kept, labour was measured in man days, while costs of inputs, and revenue from animal sales were measured in Naira.

The independent variables of the study are age, cost of feeding, years of formal education, cost of medication, household size, extension contact, flock size, small ruminant production experience, and costs of starting flock. The dependent variable of the study is the level of gross margin from small ruminant production per rural household.

Data analysis

This study used a variety of analytical tools, including multiple regression analysis, gross margin analysis, and descriptive statistics like frequency tables, percentages, and

means. A budgetary study was used to look into the small ruminant business's profitability. The gross margin was estimated as the difference between the total revenue and total variable costs.
Mathematically,
Total Revenue = Output x Unit price
Gross margin = Total Revenue – Total Variable Cost
Benefit cost Ratio = Total Revenue/ Total Cost

The benefit cost ratio (BCR) is a metric used to quantify profitability. Investment requirements stipulate that an enterprise cannot be considered profitable until the BCR is larger than one (Jatto *et al*.. (2020).
The association between the revenue from small ruminant production and the selected determinants was established using multiple regression analysis, an inferential analytical technique..
The equation is given as:
$Y = f(X_1, X_2, X_3, X_4, ----------, X_n, ei)$
Where, Y is the gross margin from small ruminant production
X_1 is the age of respondents (years),
X_2 is the cost of feeding
X_3 is years of formal education,
X_4 is cost of medication
X_5 is household size (number),
X_6 is extension contact (yes = 1, no = 0),
X_7 is flock size (number),
X_8 is experience in small ruminant husbandry (years),
X_9 is cost of starting flock.

Results and Discussion

Results of descriptive statistical analysis

Socioeconomic characteristics of the respondents

The socioeconomic characteristics of the respondents in the study area are shown in Table 1. The data in the Table suggests that small ruminant production is a venture that is dominated by men in the study area, with the majority of respondents (60.00%) being male and the remaining respondents (40.00%) being female. The age distribution of the respondents is also shown in the Table; the majority (54.17)fall within the 49–58 age range (mean of 52.33 years), suggesting that they are still in their peak financial years. Most (84.17%) of the respondents are married.

The majority of rural households' heads (63.34%) had between one (1) and thirteen (13) years of formal education, with a mean of 9.60 years, according to the distribution of respondents' years of formal education in the Table, suggesting that the respondents were literate. Additionally, the Table's representation of the respondents' household size distribution shows that, with a mean of five (5) people per family, almost all of the respondents (97.50%) had 1-10 persons as members of their households. The primary occupation distribution of the respondents, as indicated in the Table, indicates that

small ruminant production (30.83%) is the most common livelihood activity among the respondents in the study area.

Table (1): Socioeconomic characteristics of the respondents (n=120)

Gender	**Frequency**	**Percentage**
Male	72	60.00
Female	48	40.00
Age (Years)		
29-38	7	5.83
39-48	24	20.00
49-58	65	54.17
59-68	20	16.67
69-78	4	3.33
Mean	52.33 years	
Marital status		
Single	3	2.50
Married	101	84.17
Separated	3	2.50
Divorced	2	1.67
Widowed	11	9.17
Years of formal education		
0	21	17.50
1-6	41	34.17
7-13	35	29.17
14-20	23	19.17
Mean	9.60 years	
Household size	**Frequency**	**Percentage**
1-5	82	68.33
6-10	35	29.17
11-15	3	2.50
Mean	5 persons	
Primary occupation	**Frequency**	**Percentage**
Small ruminant	37	30.83
Crop production	16	13.33
Civil servant	21	17.50
Trading	26	21.67
Artisan	30	16.66
Primary income (₦)	**Frequency**	**Percentage**
10000-100000	108	90.00
101000-200000	8	6.67
201000-300000	3	2.50
301000-400000	0	0.00
401000-500000	1	0.83
Mean	₦58088.33	
Flock size	**Frequency**	**Percentage**
1-10	59	49.17

11-20	34	28.33
21-30	17	14.17
31-40	6	5.00
41-50	1	0.83
51-60	3	2.50
Mean	15 animals	

Source: Field Survey, 2024.

The primary income distribution of the respondents indicates a low level of primary income among the respondents, with nearly all (90.00 %) earning between ₦10,000 and ₦100,000 monthly from their major occupation, with a mean monthly income of ₦58,088.33. With a mean of 15.20 years of experience, the respondents' distribution of ruminant-keeping experience, as shown in the Table, indicates that they had a great deal of experience raising small ruminants. The distribution of small ruminant flock sizes among the respondents shows that almost all of them (77.50%) are smallholders of small ruminants, with a mean flock size of 15 animals and a range of 1 to 20 animals.

Budgetary analysis

The results of budgetary analysis to determine costs and returns to small ruminant production enterprises are presented in Table 2. From the Table, the cost of pen construction, land purchase, and starting flock constituted 43.82%, 26,91%, and 21.09% respectively of the fixed cost (₦ 86,775.86). The initial capital investment required to start a small ruminant enterprise in the study area is ₦86,775.86. The major variable costs are the cost of feeding and medication constituting 49.23% and 39.71% of the total variable cost of ₦23,030.46. The gross margin per small ruminant production cycle in the study area is ₦26,524.79. The value of the benefit-cost ratio is 1.15, implying that ₦0.15 is returned for every Naira invested in the enterprise, indicating that the venture is profitable in the study area.

Table (2): Costs and returns analysis per small ruminant production cycle

s/n	Items	Amount (₦)	Scale
A	**Fixed costs**		% of TFC
	Land purchase	23,350.00	26.91
	Land rent	1,958.34	2.26
	Pen construction	38,022.50	43.82
	Starting flock	18,298.35	21.09
	Production materials (bowls, plastic buckets)	5,146.67	5.93
B	**Cost of fixed assets (TFC)**	86,775.86	
C	**Total Revenue (TR)**	49,555.25	
D	**Variable costs**		% of TVC
	Cost of feeding	11,338.36	49.23
	Cost of medication	9,146.25	39.71
	Cost of transport	1,655.00	7.19
	Cost of animal shed	656.67	2.85
	Market levies	224.18	0.97
E	**Total variable cost (TVC)**	23,030.46	
F	**Gross margin (TR-TVC)**	26,524.79	

G	**Benefit/Cost ratio**	1.15	

Respondents' gross margin levels in the study area

Table 3 presents the respondents' gross margin levels from small ruminant production in the study area. The gross margin was classified as low (difference between the mean and standard deviation of the gross margin), medium (mean of the gross margin), and high (sum of the mean and standard deviation of the gross margin). Results in the Table show that the majority (50.00%) of the respondents earn a medium gross margin. While very few (33.33%) earn low gross margins from their small ruminant enterprise. These results can be attributed to the respondents' small ruminant flock size and production practices.

Table (3): Respondents' gross margin levels in the study area

Levels of gross margin	Mean (₦)	Frequency	Percentage
Low	8,841.59	40	33.33
Medium	13,262.39	60	50.00
High	4,420.79	20	16.67
Total	26,524.79	120	100

Field Survey, 2024.

Multiple regression analysis results

The result of regression analysis used to determine the factors influencing the market margin of small ruminant production in the study area is presented in Table 4. The adjusted R-squared is 0.486 and the F-value (12.46) is significant at the 1% level, showing that the model has a good fit. The coefficient of cost of feeding (X_2) is negative and significant at a 1% level implying that this variable is negatively related to the level of gross margin in the study area.

The coefficients of years of formal education (X_3), flock size (X_7), experience in small ruminants (X_8), and cost of starting flock (X_9) are positive and significant at 1% levels respectively. This implies that these variables are positively related to the level of gross margin from small ruminant production in the study area.

Table (4): Results of multiple regression analysis

Variables	Coefficient	Standard error	t-value	Probability
Age (X_1)	0.786	0.981	0.801	1.763
Cost of feeding (X_2)	-0.790	0.208	-3.80	0.000*
Years of formal education (X_3)	39.116	16.538	2.37	0.000*
Cost of medication (X_4)	0.866	0.950	0.91	0.943
Household size (X_5)	0.756	0.803	0.94	0.954
Extension contact (X_6)	66.149	94.275	0.71	0.476
Flock size (X_7)	22.423	10.234	2.30	0.000*
Experience in small ruminants (X_8)	23.456	12.023	1.95	0.001*
Cost of starting flock (X_9)	243.789	106.150	2.30	0.000*
Constant	-116418.401	239311	-0.49	0.630

R^2= 0.507, Adjusted R^2= 0.486, F value= 12.46 *Significant at 1% level,
Source: Data Analysis, 2024.

The study finds that small ruminant production can be a sustainable source of income for rural households in the Iwo Agricultural Zone. However, the profitability of this venture is influenced by various factors such as cost of feeding years of formal education, flock size, experience in small ruminant production, and cost of starting flock. Consequently, policies and programs designed to enhance the economic viability of small ruminant production should prioritize these elements.

Several important recommendations are drawn from the study: First, increase rural households engaged in small-scale ruminant production's access to loans. Secondly, to assist rural households with small-scale ruminant production, provide extension services. Thirdly, Raise rural households engaged in small-scale ruminant production's educational attainment. Finaly, Encourage rural households to increase the number of flocks they own.

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References

1) Adu, I. F. (1997). The problems of sheep and goat production in Savannah region of Nigeria. **Small Ruminant Research, 15**, 203–208.
2) Alabi, B. O., Busari, A. O., & Ogunleti, E. (2019). Assessment of housing, nutrition and health management practices among smallholder sheep farmers in Ejigbo Government Local Area, Osun State, Nigeria. **Applied Tropical Agriculture, 24**(2), 7–16.
3) Aldosari, O. F. (2018). Gender participation in sheep and goat farming in Najran, Southern Saudi Arabia. **Saudi Journal of Biological Sciences, 25**(1), 144–148.
4) Davis, J. (2006). Rural non-farm livelihoods in transition economies: Emerging issues and policies. **Electronic Journal of Agricultural and Development Economics, 3**(2), 180–224.
5) Fitzhugh, A., Onim, J. F. M., Semenye, P. P., & Sidahmed, A. E. (1987). Integration of goats with crop production and other livestock production systems. In O. P. Santana, A. G. da Silva, & W. C. Foote (Eds.), **Proceedings of the Fourth International Conference on Goats** (Vol. II, pp. 945). Brasilia, Brazil.
6) Halidu, D., Mieso, G., Nigatu, A., Fufa, D., & Gemeda, D. (2006). The effect of environmental factors on pre-weaning survival rate of Borana and Arsi-Bale kids. **Small Ruminant Research, 66**, 291–294.
7) International Fund for Agricultural Development. (2016). **IFAD annual report 2016**. https://www.ifad.org/documents/10180/bcb2e5dd-ad6b-4a5d-a23b-6031d5f99303

8) Jatto, K. A., Adeoye, A. S., & Oke, O. O. (2020). Economic analysis of cassava (**Manihot esculenta** Crantz) production in Akinyele Local Government Area of Oyo State, Nigeria. **Journal of Sustainable Agriculture and Environment, 18**(1), 87–100.

9) Kassie, G. W., Kim, S., & Fellizar, F. P., Jr. (2017). Determinant factors of livelihood diversification: Evidence from Ethiopia. **Cogent Social Sciences, 3**(1), 1369490.

10) Kebede, M., Haileselassie, A. G., Haile, M. L. T., & Luchia, T. (2014). Livelihood diversification strategies among men and women rural households: Evidence from two watersheds of Northern Ethiopia. **Journal of Agriculture and Economic Development, 3**(2), 17–25

11) Lamorde, A. G. (1996). The role of veterinarians in a developing economy. *Nigerian Veterinary Journal (Special Edition), 1*, 106–111.

12) Moyo, S. (2016). *Family farming in sub-Saharan Africa: Its contribution to agriculture, food security and rural development* (Working Paper No. 150, pp. 1–30). International Policy Centre for Inclusive Growth.

13) Obi-Egbedi, O., Omotoso, S. O., & Ajayi, O. I. (2021). Livelihood diversification, gender and poverty among rural households in Osun State, Nigeria. *Rural Economics and Development, 23*(1), 34–48.

14) Oluwatayo, I. B. (2014). Gender dimensions of poverty and coping options among smallholder farmers in Eastern Nigeria. *Mediterranean Journal of Social Sciences, 5*(27), 49–61.

15) Umunna, M. O., Ibrahim, A. O., Sodiya, O. M., Adedeji, E. O., & Oyediran, O. B. (2021). Livestock production contributions to rural households' livelihood and its constraints in Niger State, Nigeria. *Scientific Papers Series: Management, Economic Engineering in Agriculture and Rural Development, 1*(3), 783–788.

16) Wodajo, H. D., Gemeda, B. A., Kinat, W., Mulem, A. A., van E., A., & Wieland, B. (2020). Contribution of small ruminants to food security for Ethiopian smallholder farmers. *Small Ruminant Research, 184*, 106064.