

Profit efficiency assessment of goat marketers in Lagos state, Nigeria

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ABSTRACT

The study assessed profit efficiency of goat marketers in Lagos State, Nigeria. Data were collected from 120 goat marketers, selected through purposive and random sampling techniques with the aid of questionnaire and analysed using gross margin analysis and stochastic profit frontier technique. The results showed that 79.2% of the goat marketers were male, 51.7% had secondary education with a mean age of about 57 years and herd size of 24 goats. The gross margin analysis results indicated that goat marketing was lucrative with net profit of ₦22,066.17 in the study area. Costs of veterinary services, housing and transportation were the factors influencing gross margin of the goat marketers while profit inefficiency in goat marketing decreased with the sex of the marketers, education, herd size, primary occupation and membership of cooperative association in the study area. Therefore, the marketers should be sensitized to take advantage of the adult education program of the state government among other things, to improve their educational level, as this will help them to take wise economic decisions that will boost their efficiency levels in the study area.

Keywords: Assessment, goat marketers, profit efficiency, stochastic

1. INTRODUCTION

Goat, commonly called small ruminant, a member of the family *Bovidae*, plays significant roles in the economy of livestock production in developing countries (Yesufu et al., 2017; Wilcox, 2021). Domestic goats, *Capra aegagrus hircus*, are more evenly distributed in West Africa than other ruminant animals and commonly found in towns and villages all over the continent. Globally, there are about 300 species of goat while the population of goat was 1,050 million in 2014, Africa accounts for about 33.1% while Nigeria accounts for about 4.7% of the world output. In 2020, Africa had nearly 490 million heads of goat, Nigeria had the largest goat production of about 84 million heads in Africa, followed by Ethiopia and Chad, each with a goat stock of 53 million and 41 million respectively (FAOSTAT, 2014; Statista, 2022). Among the major breeds of domestic goat reared in Nigeria are the West African dwarf reared for its meat, Bornu red, Kano brown and Bauchi type reared for both milk and meat (Yesufu et al., 2017).

In Nigeria, goats are means of wealth accumulation security and insurance to the producers, the skin of the red Sokoto goat commands a high premium in the world market and well known for superior leather quality (Offar et al., 2016).

FAOSTAT, (2018) estimated that demand supply gap in chevon will increase by 159% in year 2050. Moreover, the imbalance in the current demand and supply of chevon is largely due to population growth, increasing income and change in consumer taste.

The role of marketing in any economic system is numerous, one of which is linking buyers and sellers. Druker, (1995) defined marketing as involving the movement of goods in the right form, place and time from the producer to the consumer. It also involves passing information about market demands from consumers to the producers. Goat marketing involves the movement of goats from the farmers to the consumers who are mostly found in urban areas. Recent studies (Bamigboye et al., 2017; Yesufu et al., 2017; Wilcox, 2021) reported net return on investment values of 19k, 45k and 34k for goat marketing in Rivers, Ekiti and Osun States respectively, indicating that goat marketing was a profitable venture in these states. Also, Okewu and Iheanacho, (2015) reported an average profit efficiency of 0.67 for goat marketers in Benue State. They further reported that an increase in variable prices of marketing activities such as purchase, transportation, commission, market charging, housing, feeding, medication and handling decreased profit efficiency, while primary occupation was found to reduce profit inefficiency in the state.

Gaining insights into goat marketing activities will involve an in-depth assessment of profit efficiency in terms of the benefits derived by the participants and consumers (Saleh et al., 2018). However, in order to close the demand supply gap of chevon requirement, it has become very necessary to examine the costs, returns and as well as profit efficiency. Hence, this study assessed the profit efficiency of goat marketers in Lagos State, Nigeria. Specifically, the study described the socio-economic characteristics of the goat marketers, estimate the costs and returns to goat marketing, analyse the profit efficiency as well as profit inefficiency of the goat marketers in the study area.

2. METHODOLOGY

The study area was Lagos State, Nigeria. A two stage sampling procedure was used for the study. The first stage involved the purposive selection of four markets in Lagos State due to the prominence of small ruminant marketers in the markets, while the second stage involved the random selection of 30 goat marketers each from the selected markets, making a total of 120 respondents for the study.

Information on personal characteristics, costs incurred and revenue realized from goat marketing were obtained from the marketers in the study area. Descriptive statistics, gross margin analysis and stochastic profit frontier technique were the analytical tools employed in the study.

Gross Margin and Net Profit Analysis

This was used to estimate the costs and returns to goat marketing in the study area. Gross margin is the difference between total revenue realised from the sales of goats and variable costs incurred (Wilcox, 2021). The gross margin was specified as:

$$GM = TR - TVC \quad (1)$$

Where:

GM = Gross Margin; TR = Total Revenue; TVC = Total Variable Cost

While, Net Returns (π) = GM – TFC (2)

Where: NR (π) = Net Profit; GM = as defined above and TFC = Total Fixed Cost.

$$\text{Rate of Return} = NP/TC \quad (3)$$

Where: NP = Net Profit and TC = Total Cost

Stochastic Profit Frontier Technique

This was used to analyse the profit efficiency and profit inefficiency of the goat marketers in the study area. This study adopts the Battese and Coelli, (1995) model which assumed that profit function behaves in a manner concordant with the stochastic frontier concept (Tijani et al., 2006; Ogundari et al., 2006; Adeleke, 2008; Tsue et al., 2012; Abiyong et al., 2019). The stochastic profit function is specified as:

$$\pi_i = f(P_{ij}, Z_{kj}) \text{Exp. } e_i \quad (4)$$

Where:

π = normalized profit of the jth market and it is computed as gross revenue less variable cost divided by the market specific output price, P_{ij} = price of jth variable input faced by the ith market divided by output price, Z_{ik} = level of the kth fixed factor on the ith market, e_i = an error term, $I = 1, \dots, n$, n, is the number of markets in the sample.

The stochastic profit frontier, using Cobb-Douglas functional form, was specified as follows:

$$\ln \pi = \ln\beta_0 + \beta_1\ln X_1 + \beta_2\ln X_2 + \beta_3\ln X_3 + \beta_4\ln X_4 + \beta_5\ln X_5 + \beta_6\ln X_6 + e_i \quad (5)$$

Where,

$\ln \pi$ = Gross margin (₦); X_1 = Cost of feed (₦), X_2 = Cost shed (₦), X_3 = Cost of purchase (₦), X_4 = Cost of labour (₦), X_5 = Cost of transportation (₦), X_6 = Cost of veterinary services (₦).

The profit inefficiency model was specified as:

$$U_i = \delta_0 + \delta_1 Q_1 + \delta_2 Q_2 + \delta_3 Q_3 + \delta_4 Q_4 + \delta_5 Q_5 + \delta_6 Q_6 + \delta_7 Q_7 + \delta_8 Q_8 \quad (6)$$

Where:

Q_1 = Sex (1 if male; 0 otherwise), Q_2 = Age (years), Q_3 = Marital status, Q_4 = Educational level (years), Q_5 = Household size (number), Q_6 = Experience (years), Q_7 = Main occupation (1 if goat marketing; 0 otherwise), Q_8 = Capital (₦), Q_9 = membership of cooperative association (1 if yes; 0 otherwise). δ_1 - δ_9 = parameters to be estimated. FRONTIER VERSION 4.1c program (Coelli, 1996), was used to estimate the parameters of the stochastic frontier profit function and the inefficiency model simultaneously.

3. RESULTS AND DISCUSSION

Socio-economic characteristics of the respondents

The results of the socio-economic characteristics of the goat marketers shown in Table 1 reveals that majority (79.2%) of the marketers were male. This implies that goat marketing in Lagos State was male dominated. This result is in tandem with Wilcox, (2021) who reported that male dominance in goat marketing could be due to the energetic nature of the enterprise. However, it is contrary to the reports of Yesufu et al., (2017) that goat marketing was female dominated in Osun State, Nigeria. Distribution by age indicates that a larger proportion (46.7%) of the goat marketers were between 51 and 60 years. The average age of about 57 years suggests that the goat marketers were growing old and this could influence their profit level negatively. This result supports the findings of Bamigbose et al., (2017) that the mean age of 58 years of goat marketers in Ekiti State implied that the marketers were far above their productive age.

Majority (51.7%) of the respondents had primary education, 19.2% had secondary education and 7.5% had adult/vocational education while 21.6% of the respondents had no formal education. This implies that the level of education of the goat marketers was low and this could hinder adoption of technology and better marketing practices. This result agrees with the findings of Yesufu et al., (2014) that uneducated marketers have low tendency of adopting new innovation in expanding their business enterprise. Majority (64.2%) of the marketers were married. This infers that the goat marketers would have lot of responsibilities which could spur their devotion to their business as married people have higher responsibilities of catering for the general well being of their family members in terms of provision of food, health, education and shelter than the unmarried ones. Majority (62.5%) of the goat marketers had family size ranging from 6 to 10 persons in their household. The mean household size of 7 persons implies that the marketers were medium sized which could signal the availability of family labour in the study area. Also, a mean herd size of 24 goats implies that the goat marketers operate on a small scale in the study area. The result further reveals that majority (77.5%) of the marketers had goat marketing experience of between 11 and 30 years with a mean experience of about 22 years in goat marketing. The long years of experience depicts that goat marketing is a stable, supportable and dependable enterprise in the study area.

Table 1 Socio-economic Characteristics of the Respondents ($n = 120$)

Variable	Frequency	Percentage (%)	Mean
Sex			
Female	25	20.8	
Male	95	79.2	
Age (years)			
≤40	8	6.7	56.67 (±9.297)
41-50	21	17.5	
51-60	56	46.7	
> 60	35	29.2	
Educational Qualification			
No Formal Education	26	21.6	

Primary Education	62	51.7	
Secondary Education	23	19.2	
Adult/Vocational	9	7.5	
Marital Status			
Single	24	20.0	
Married	77	64.2	
Divorced	8	6.7	
Widowed	11	9.2	
Household Size			
1-5	40	33.3	7 (± 3.805)
6-10	75	62.5	
>10	5	4.2	
Herd size			
≤ 20	48	40.0	24.44 (± 14.044)
21-30	46	38.3	
>30	26	21.7	
Goat marketing Experience			
≤ 10	14	11.7	21.88 (± 13.058)
11-30	93	77.5	
>30	13	10.8	
Major Occupation			
Goat marketing only	34	28.3	
Paid employment	29	24.2	
Self-employed	57	47.5	
Labour			
Family	80	66.7	
Hired	17	14.2	
Both	23	19.2	
Access to loan			
Yes	10	8.3	
Cooperative membership			
Yes	33	27.5	

Source: Field survey, 2022

Distribution by major occupation reveals that the goat marketers engaged in off-marketing activities probably to augment the income earned from goat marketing in the study area. Furthermore, family labour (66.7%) was the major type of labour employed in the study area. Only 8.3% had access to loan while 27.5% were members of cooperative association in the study area. This could have negative consequences on their profit level and possible expansion of their enterprise in the study area.

Average Costs and Returns to Goat Marketing in the Study Area

Summary of the costs and return analysis of goat marketing in Table 2 result reveals that the goat marketers on the average, incurred a total variable cost of ₦38,774.33 and total fixed cost of ₦12,927.83, and a total cost of ₦51,702.16 per production cycle. The total revenue, gross and net margins realized were ₦73,768.33, ₦34,994.00 and ₦22,066.17 respectively. The return on investment was 43k implying that, for every ₦1 invested in goat marketing, 43 kobo was realized as profit. This indicates that goat marketing is a

profitable enterprise in the study area. This result agrees with the findings of Bamigboye et al., (2017) and Wilcox, (2021) that goat marketing was a profitable enterprise in Ekiti and Rivers States respectively.

Table 2 Average Costs and Return to Goat Marketing in the Study Area

Cost items	Amount	Std. Deviation
Variable costs		
Cost of purchase	9554.17	5817.893
Feed cost	5708.33	4012.965
Labour cost	4701.67	3566.379
Cost drugs	3848.33	2561.001
Cost of veterinary services	3233.33	3734.821
Clipping and castration	3250.00	4566.789
Transportation cost	3312.50	3576.241
Cost of treatment	3595.83	2030.933
Market charges	1116.67	1236.954
Commission fee	570.83	306.750
Maintenance cost	454.17	621.800
Total Variable Cost (TVC)	38,774.33	
Fixed Costs (depreciated)		
Shed/Kara	7357.52	6259.818
Feeding trough	2297.61	1921.233
Water trough	2707.45	2217.011
Others	565.25	333.514
Total Fixed Cost (TFC)	12,927.83	
Total Cost	51,702.16	
Returns		
Total Revenue (TR)	73,768.33	48063.106
Gross Margin (TR - TVC)	34,994.00	
Net Profit (GM - TFC)	22,066.17	
Rate of Return (NP/TC)	0.43	

Source: Field survey data, 2022

Profit Efficiency of Goat Marketers in the Study Area

Results of the stochastic profit function for the goat marketers are presented in Table 3. The sigma-square value of 0.342 is significant at 5% alpha levels, implying that the model fits the data well. The gamma value of 0.678 implies that about 68% of the deviations in the total profit are largely as a result of the inefficiency in input use and other marketing practices, whilst the random factors which may be beyond the marketers control contribute 32% to the deviations of the actual profit from the frontier profit. The result shows that costs of housing (including cost of land/rent, rope, planks, etc.) and transportation were negative and statistically significant at 1% level of probability. This implies that gross margin decreases with these costs. A ₦1 increase in the costs of housing and transportation would decrease gross margin by ₦0.724 and ₦2.102 respectively. This result agrees with the findings of Okewu and Iheanacho, (2015). However, the cost of veterinary services was positive and significant at 1 alpha levels. This implies that gross margin increases with the cost of veterinary services in the study area. Services of professional veterinary personnel help reduce the incidence of diseases as well as the mortality rate, resulting in higher income and profit efficiency.

Profit inefficiency of the Goat Marketers in the Study Area

Result of the profit inefficiency of goat marketing in Table 3 reveals that the coefficients of sex and education of the marketers had significant inverse relationships with profit inefficiency at 5% alpha levels respectively. This implies that profit inefficiency decreases with these variables in the study area. The negative coefficient of sex implies that the female goat marketers were more profit inefficient than the male ones in the study area. This concurs with the findings of Musaba and Chibalani, (2021) that male

farmers were more profit efficient among smallholder broiler farmers in Zambia. The negative coefficient of education implies that profit inefficiency of the marketers reduces with education. Marketers who are well read tend to be more profit efficient. This agrees with Abiyong et al., (2019) that educated farmers were more profit efficient in Kaduna State, Nigeria. Saleh et al., (2019) posited that education enhances the competency of the marketers in decision making leading to increased efficiency. However, Bahta and Hikuepi, (2015)) found that educational level decreases technical efficiency of cattle production in Botswana. They explained further that, educated farmers were more likely to engage in off-farm activities, thereby decreasing their efficiency. In the same vein, the coefficients of herd size ($p<0.05$), main occupation being goat marketing ($p<0.05$) and cooperative membership ($p<0.01$) were negative and significant. This implies that profit inefficiency in goat marketing decreases with herd size, main occupation and membership of cooperative association in the study area.

Frequency Distribution of Profit Efficiency of Goat Marketers in the Study Area

Result in Table 4 indicates that profit efficiency of goat marketers ranges from 0.26 to 0.97 in the study area. Majority (54.2%) of the goat marketers were within 0.51 and 0.80 profit efficiency, with 23.3% percent of the goat marketers attaining between 0.31 and 0.50 profit efficiency, while 22.5% realized more than 0.8 profit efficiency level. The average profit efficiency of 0.710 implies that the goat marketers realized about 71% of the possible profit efficiency level, suggesting that goat marketing was about 29% below the frontier in the study area.

Table 3 Maximum Likelihood Estimate of Parameters of Cobb-Douglas Stochastic Frontier Profit Function Model for Goat Marketers

Variable	Parameters	Coefficient	T-ratio
Profit model			
Constant	β_0	2.167***	4.159
Cost of purchase (₦)	β_1	1.296	0.168
Cost of housing (₦)	β_2	-0.724***	-2.671
Feed cost (₦)	β_3	0.735	-1.214
Labour cost (₦)	β_4	0.977	-0.003
Cost of veterinary (₦)	β_5	2.037***	2.684
Transportation cost (₦)	β_6	-2.102***	-2.837
Inefficiency model			
Constant	δ_0	2.245	2.502
Sex	δ_1	-1.217**	-2.324
Age	δ_2	-0.542	1.368
Education status	δ_3	-0.055**	-2.477
Marital status	δ_4	-0.088	-0.976
Household size	δ_5	0.018	0.974
Experience	δ_6	0.106	1.028
Herd size	δ_7	-0.715**	2.158
Primary occupation	δ_8	-0.197**	2.068
Access to loan/credits	δ_9	0.222	1.305
wExtension	δ_{10}	-0.115	-1.184
Cooperative	δ_{11}	-2.307***	-3.078
Sigma square	σ^2	0.342	2.44**
Gamma	γ	0.678	
Log likelihood function	LLF	-102.714	

***Significant at 1 percent **Significant at 5 percent *Significant at 10 percent

Table 4 Frequency Distribution of profit Efficiency of the Goat Marketers

Efficiency range %	Frequency	Percentage
≤ 0.3	10	10.0
0.31-0.50	28	23.3

0.51-0.80	66	54.2
>0.80	17	22.5
Maximum	0.911	
Minimum	0.183	
Mean	0.710	

4. CONCLUSION AND RECOMMENDATIONS

Based on the costs and return analysis and the value of the rate of return to investment, it can be concluded that goat marketing is economically rewarding and profitable in the study area. The result of the mean profit efficiency suggests that the enterprise is efficient and has the potentials of ameliorating the living conditions of the marketers in the study area. Therefore, the marketers should take advantage of the adult education program of the state government to improve their educational level as this will help them to take wise economic decisions that will improve their profit efficiency in the study area. Also the marketers should be encouraged to pool their resources together to hire qualified veterinary personnel in each market as well as in the area of transportation so as to reduce the cost of veterinary services and transportation in the study area. In addition, governments and other stake holders should harmonise taxes paid along marketing channels by the goat marketers for increased revenue in the study area.

Authors Contributions

Folasade Aminu contributed to the paper's idea, questionnaire design and data analysis and wrote the manuscript.

Hassan Mohammed Assisted in discussion of the results of the paper

Stanley Onwughara collected and coded the data for the paper

Conflict of Interest

The authors have declared that there are no competing interests.

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Ethical approval

Not applicable.

Informed consent

Not applicable.

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The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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