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Technical Efficiency Sheep Fattening in Gombi Local Government Area of Adamawa State

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Abstract:

The study examined the technical efficiency of sheep fattening in the Gombi Local Area of Adamawa State. Data were collected from a random sample of 90 sheep fatteners by means of snow ball sampling technique to which questionnaires were administered. The regression model was used to determine the relationship between variable inputs and output and also efficiency of resources used. The Cobb-Douglas production function gave the best fit equation with an R^2 of 0.607 which means that about 61% of the variability of output is being explained by the variables included in the model. The analysis showed that medication and labour are highly significant at 1% while feed, salt-lick; water and length of fattening are significant at 10% respectively. Resource productivity analysis revealed that medication and salt-lick were under-utilized while feeds were over-utilized and labour were efficiently utilize. The major problems facing the farmers include high cost of feeds, inadequate credit facilities, and high cost of medication. A policy and research emphasis should be geared toward feeds production at affordable price to the fatteners and fatteners should be educated on how to formulate local feeds to reduce cost and access to feeds for better efficiency

Key words: Technical efficiency, regression, fattening, Gombi local government area

1. Introduction

Nigeria ranks the 10th sheep head with over 8million in 1972 and increased to 22 million sheep in 2009 (Umar, 2007 in Umar *et al.*, 2008). The sheep are entirely of the hairy thin tailed, West African long legged type, kept primarily for their meat and skin. These include the Uda, Balami, Yankasa and West African Dwarf sheep. Sheep are unimportant in West Africa as a whole, compared with Arab countries to the North and East.

Sheep (*Ovine aries*) plays an indispensable role in the traditional agriculture and largely subsistence economy, the sub-sector contributes about 15.3% of the total agricultural sector (Mbanasor, 2000). The sector is undergoing a massive transformation fuelled by high demand for meat, which is likely to double in the near future, the major forces behind this, is the combination of population growth, urbanization and income growth (FAO/IAEA, 2006). In the recent past, there is a greater emphasis on sustainable mutton production through backyard sheep fattening which has its focus on the long-term health of the environment while maintaining the economic viability of the farm and addressing consumers' concern about mutton they eat (Fanaticoet *al.*, 1999).

Sheep fattening simply refers to the preparation of the sheep for marketing (Jean, 1993; Uza *et al.*, 1999). It is particularly attractive to poor farmers including women because of the low initial investment, rapid rate of turnover and social acceptance. The main strategy is to fatten young, lean male sheep obtained either from the farmer's own flock or, more often, purchased on the open market, over a two- to three-month period, with each farmer fattening between one and five animals. The sheep are usually tethered or kept in a small sheltered enclosure at the homestead, and often fed and watered individually. Basal feeds used for sheep fattening, such as bush hay and millet straw, are commonly supplemented with cowpea hay, groundnut haulms, and millet bran which is derived from the household processing of millet grains. The rapid growth and good condition required within a short time make feeding the appropriate quantity and quality critical for the profitability of the activity. In traditional sheep fattening, feeds are always provided ad hoc and in

an unregulated fashion. In other words, farmers often give the animals whatever is available, leading to waste when feed availability is high, and underfeeding when feed availability is low. The result of such practice is that the growth rates in traditional sheep fattening remain below the genetic potential of the animals. This combination of low growth rates and long fattening period makes traditional sheep fattening largely unprofitable. Alternative feeding strategies are pertinent to make sheep fattening profitable (Ayantunde *et al.*, 2008)

The growing demands for ruminants' meats from city dwellers also present opportunities for fattening as well as improved markets for the animals. Fattening of animals is a highly profitable venture with return of premium to the farmer. Uza (1998) reported that in Nigeria, small ruminants (sheep), fattening have been carried out mainly by small holder farmers while medium or big time farmers can handle on a commercial basis feedlot operations. Sheep fattening has been an established practice in Nigeria, but largely carried out by butchers and sheep traders being the only category of people with the resources to buy both sheep and feeds (Ayoola and Ayoade, 2006). People fatten sheep for the same reason that other men operate factories, mainly to make a profit by converting raw materials which are of low value in their natural form into a product for which there is a good demand and sell for better prices (Neumann, 1977) also, the production technology. Despite of all the contributions the livestock sub-sector is a relatively neglected part of agriculture with its supporting services collapsing well ahead of others (Oni, 2006). In Adamawa State, though fattening is a profitable venture, its sustainability is not certain. Most of the fatteners are not knowledgeable as far as modern techniques in animal production are concerned. Their operations are on small scale due to inadequate of capital; feeds offered are of low quality. In view of the above therefore, it is important to carry out a research on economic analysis of sheep fattening as a means of ascertaining the profitability and efficiency of scarce resources used by the farmers to maximize their profit at the long run. This research will also identify fattening problems and suggest possible solutions.

2. Methodology

2.1. The Study Area

The study was conducted in Gombi Local Government Area (GLGA) of Adamawa state. The local government area is located in the north-eastern part of Adamawa state lying between latitude 10-11^o, 40' North and longitude 12-20^o, east (Adebayo *et al.*, 1999). The local government shares common boundaries with Hong Local Government to the east, Song Local Government Area to the South, Shani and Hawul Local Government area of Borno State (Adebayo *et al.*, 1999).

Gombi Local Government is the fourth largest in Adamawa State. The total land area is approximately 2,093.3 square kilometers Population constitutes an essentials segment of the resources based and development potential of any society. With an estimated population of 101,100 people according to 2006 population census in Nigeria (CBN 2007), This population is made up of several ethnic groups, among which are Bura, Ngwaba, Hwona, Fulani, Ga'ada, Lala, Kilba, Chibok, Margi, and Yungur. These heterogeneous ethnic groups have been coexisting peacefully and they play greater attention to agriculture and trade.

Farming is the major occupation of the people of the area with cowpea and maize as the most cultivated crops. Other crops cultivated include soybeans, rice, and sorghum. However, the people also engage in some activities like rearing of animals, fishing, hunting, and trading. The vegetation is guinea savannah with tall grasses and short scattered grasses and tress. It has a hilly and mountainous terrain. The hill has a general height of about 750-800 meters above sea level. Some of the physical features found around the area include, Garkida Fwuhar escarpment, Virgwi escarpment, Ga'ada escarpment and Girgithlang hills which form part of the undulating landscape.

2.2. Sources of Data

Primary data were used, for this study, which involved the use of questionnaires and scheduled interviews. The information gathered includes those on socio-economic variables of the sampled fatteners, cost of input used in sheep fattening, cost of sheep fattening, values of feed, drugs and labour. Other costs were computed on depreciation on fixed assets such as feeders, drinkers, rakes, wheel barrow, buckets and financial parameters have been calculated.

2.3. Sample Size and Sampling Procedure

Gombi Local Government Area is divided into ten (10) political wards. Five (5) of the wards were purposively selected (Garkida, Gombi South, Gombi North, Guyaku and Tuffa) because of their involvement in the sheep fattening business. Two villages have also been purposively selected from each ward to make up to ten. By this, a total of 100 sheep fatteners have been selected from the ten villages by means of snow ball sampling technique to which questionnaires were administered.

3. Multiple Regression Analysis

This has been used to study the relationship between inputs and output (Mshelia *et al.*, 1991 in Daniel *et al.*, 2009).

Four functional forms would be used to determine the input-out relationship and the best fit equation will be selected. These include:

3.1. Linear Function

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + \dots + b_7X_7 + U_i$$

3.1.1. Exponential Function

$$\text{Ln}Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + \dots + b_7X_7 + U_i$$

3.1.2. Semi-Logarithm Function

$$Y = \text{ln}b_0 + b_1\text{ln}X_1 + b_2\text{ln}X_2 + b_3\text{ln}X_3 + b_4\text{ln}X_4 + \dots + b_7\text{ln}X_7 + U_i$$

3.1.3. Double Logarithm Function

$$\text{Ln}Y = \text{ln}b_0 + b_1\text{ln}X_1 + b_2\text{ln}X_2 + b_3\text{ln}X_3 + b_4\text{ln}X_4 + \dots + b_7\text{ln}X_7 + U_i$$

The general equation is given as;

$$Y = f(x_1, x_2, \dots, x_n)$$

Where:

- Y = Weight Gain
- X₁ = Feeds (kg)
- X₂ = Medication (vials/mils)
- X₃ = Labor (in man-day)
- X₄ = Salt lick (kg)
- X₅ = Water (liters)
- X₆ = Length of fattening (month)
- b₁ – b₆ = Coefficients of the variable inputs
- U_i = Error term

4. Input-Output Relation

The economic data collected at the study area were subjected to multiple regression analysis, using four functional forms (linear, Exponential, Semi-log and Cobb-Douglass) to determine the influence of independent variables on the weight gained by the sheep within the period under consideration.

Based on economic and statistical reasons Cobb-Douglass equation was selected as the best fit;

$$\text{Thus } \text{Ln}Y = 5.263*** + 0.068*X_1 + 0.771***X_2 + 0.540***X_3 + 0.015*X_4 + 0.034*X_5 + 0.54*X_6 .$$

The importance of production function analysis is that, it measures the contribution of each input in the production cycle when input interacts with one another to produce output. The analysis of the results in Table 1 shows that R² to be 0.607 which simply implies that about 61% of the weight gained of sheep fattening is accounted for by the independent variables (feeds, medication, labor, salt-lick, water and duration of fattening) in the analysis, while the remaining 39% is as a results of other factors outside the research, as well as error in estimation. The F-ratio is highly significant at 1% which indicates that the explanatory variables moderately explained the dependent variable (Y) which is weight gained.

Looking at the coefficients for the sheep fattening in Table 1 all had a positive relationship with weight gained (Y) and significant at different levels. This implies an increase in the levels of variable inputs had a positive effect on the farmer's income (weight gain). In other words, regression analysis of sheep fattening revealed that medication and labour as the most significant (1%) factors influencing farmer's income in fattening. While feed, water, salt-lick and duration of fattening were significant at 10%. All coefficients of the variables had favourable effects on live weight gain of the sheep. That is as the farmers increase the use of variables(x₁, x₂, x₃, x₄, x₅ and x₆), the more is the output. Christopher (2004) in Gambia had earlier reported that ruminant fattening is found to be relatively easy and more profitable than other agricultural enterprise because, it require minimal inputs and low maintenance cost couple with the ability to maximize the use of available resources. Similarly, Sumberg and Cassaday (2010) reported that small ruminant fattening is highly profitable because investment in them show much quicker pay even more than large ruminants.

VARIABLE	LINEAR	EXPONENTIAL	DOUBLE-LOG	SEMI-LOG
Feed	0.037 (1.576)*	5.94E-005 (1.219)	0.068 (1.494)*	42.258 (291.7)*
Medication	52.169 (6.268)***	0.100 (5.840)***	0.771 (10.052)***	362.005 (8.850)***
Labour	157.833 (2.841)***	0.317 (2.782)**	0.540 (4.320)***	220.754 (3.313)**
Salt-lick	0.263 (0.787)*	0.001 (0.779)*	0.015 (0.901)*	9636 (1.094)*
Water	0.009 (1.829)**	1.66E-005 (1.620)*	0.034 (0.948)*	20.658 (1.076)*
Length of Fattening	29.799 (1.092)*	0.56 (1.004)*	0.54 (0.513)*	23.086 (0.414)*
R ²	0.416	0.375	0.607	0.560
F-ratio	9.839***	8.296***	21.328***	17.579***
Standard Error	184.510	960.37872	0.30044	160.17271

Table 1; Results of Multiple Regression Analysis for Estimated Sheep Fattening In Gombi Local Government Area Of Adamawa State

Source: computer print-out 2013

Key;

**** = significance at 1% level of probability*

*** = significance at 5% level of probability*

** = significance at 10% level of probability*

All figures in parenthesis are t-values.

5. Resource Use Efficiency

The results of the efficiency of resource used is presented in Table 3; which shows that Feeds was over-utilized with ratio of its marginal value product to marginal factor costs. This result revealed that ratio is below unity and by implication, the resource is over-utilized. While medication and salt-lick was below the economic optimal level that is the ratio is above unity. This also revealed that the resource (medication and salt-lick) was under-utilized.

From the above results of resource use efficiency, more of medication and salt-lick is recommended to farmers in the study area while less use of feeds for the fattening cycle is commended for higher output in weight. Therefore, for optimum resource utilization, more of medication services and salt-lick should be used and the use of feeds should be minimized in the study area in order to maximize profit.

Regression	coefficient	standard error	t-value	r ²
Constant	5.263	0.452	11.637***	61
Feed	0.068	0.046	1.494*	
Medication	0.771	0.077	10.052***	
Labour	0.540	0.125	4.320***	
Sal-lick	0.015	0.017	0.901*	

Table 2: Regression Coefficient Estimated Parameter

Resource:	MPP	MVP	UFC	r = MVP/UFC
Feed	0.037	1294.1592	3626.448	0.3568
Medication	83.435	2889819.2840	288.244	10025.600
Labour	0.228	7874.1849	6723.4375	1.17115
Salt-lick	0.224	7739.5616	172.384	44.8961

Table 3: Resource Use Efficiency
Computer print 2013

6. Identified Problems Faced by Sheep Fatteners

Analysis of the problems faced by the fatteners in the study area revealed that about 14.88% reported that there is a high cost in feeding the animals, 13.90% reported inadequate credit to improve their business, while about 12.5% complained that high cost of medication affect their fattening venture. About 12.10% of the respondents reported that pest and disease as a threat to the business. Notably 11.90% reported poor pricing as a factor that affects the profitability of the business. About 9.92% of the respondents were of the opinion that transportation has been a problem affecting business. Other problems mentioned among fatteners are inadequate extension service as reported by 8.92%, high cost of water by 7.94%, high cost of labour about 6.94% and 0.99% reported by others. High cost of feeds (14.88%) and inadequate credit facilities (13.90%) constituted the major problem to sheep fattening in the study area. High cost of feeds was revealed to be as a result of the nature of fattening process being an intensive project that requires regular demand for feeds in the study area.

Similarly, inadequate credit could be as a result of lack of collateral which has made it almost impossible for him to be able to access credit from the bank.

Problems	Frequency	Percentage
High cost of feeds	75	14.88
Inadequate credit facilities	70	13.90
High cost of medication	63	12.5
Pest and disease attack	61	12.10
Poor pricing policy	60	11.90
Transportation problems	50	9.92
Inadequate extension services	45	8.92
High cost of water	40	7.94
High cost of labour	35	6.94
Others	5	0.99

Table 4: Problems Affecting Sheep Fattening

7. Conclusion

From the finding of this study, sheep fattening business was revealed to be profitable and worth venturing into as a source of income. However, feed and medication services were revealed to be over-utilized and under-utilized respectively. Hence less and greater uses of feeds and medication are recommended respectively for optimal profit maximization. It was also discovered in the study that keeping sheep longer than necessarily led to depreciated profit at long run

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