ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 11, Issue, 08, pp.6351-6356, August, 2019

DOI: https://doi.org/10.24941/ijcr.36305.08.2019

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

ANALYSIS OF TECHNICAL EFFICIENCY AND ITS DETERMINANTS AMONG SHEEP FATTENING ENTERPRISES IN KEBBI STATE, NIGERIA

[1]Gona, A., [1]Mohammed, I., [2]Baba, K. M. and [3]Tanko, L.

[1]Department of Agricultural Economics and Extension, Kebbi State University of Science and Technology, Aliero, Nigeria
[2]Department of Agricultural Economics and Extension, Abubakar Tafawa Balewa University, Bauchi, Nigeria
[3]Department of Agricultural Economics and Farm Management, Federal University of Technology, Minna, Nigeria

ARTICLE INFO

Article History:
Received 25th May, 2019
Received in revised form
20th June, 2019
Accepted 17th July, 2019
Published online 31st August, 2019

Key Words
Technical Efficiency,
Sheep, Fattening Enterprises,
Kebbi State.

Corresponding author:

ABSTRACT

The study employed a Translog stochastic frontier production function approach to examine the technical efficiency and its determinants among sheep fattening enterprises in Kebbi state, Nigeria. Data were generated from a sample of 160 fatteners using the multi-stage random sampling technique. The results of the analysis revealed that labour, feeds, fattening animals, depreciation, water and transportation are the dominant variables that influenced the level of technical efficiency in sheep fattening with coefficient values of (-2.761, 25.549, 15.609, 9.326, -2.704, and 0.905), respectively. Mean technical efficiency of sheep fatteners ranged between 0.13 to 0.91 having a mean of 0.73, This suggest that the fatteners were not technically efficient in the utilization of existing resources. The results also showed that technical efficiency can be enhanced through provision of credit and increased years of fattening experience.

***Citation: Gona, A., Mohammed, I., Baba, K. M. and Tanko, L.* 2019.** "Analysis of technical efficiency and its determinants among sheep fattening enterprises in kebbi state, Nigeria", *International Journal of Current Research*, 11, (08), 6351-6356.

INTRODUCTION

Livestock production is regarded as an important branch of agricultural production (Odedebo, 2000; Ajibefun and Daramola, 2000). It is a key sub-sector of the agricultural sector of Nigeria. Apart from its importance in the improvement of nutrition and health of the human population, it provides employment and means of livelihood for significant proportion of the rural and urban population as well as the basis for the growth in other sectors of the economy. In the case of its role in the Nigerian agricultural sector itself, the livestock sub-sector is second only to the crop sub-sector and accounted for 19% of agricultures' contribution to GDP in 2007(FGN, 2011). The Nigerian livestock sub-sector, is composed mainly of cattle, sheep, goats, pigs, horses, camels and poultry. In terms of specific output, the subsector can be further categorized down into products such as poultry meat, goat meat, mutton, beef, eggs, milk, hides and skin. Thus, the importance of livestock in the Nigerian economy cannot be over emphasized. The Food and Agricultural Organization (FAO) recommends that the minimum intake of protein by an average person should be 65g per day; of this about 40 percent that is 27g should come from animal sources.

Nigeria is presently unable to meet this requirement. The animal protein consumption in Nigeria is less than 8g per person per day, which is a far cry from the FAO minimum recommendation (Niang and Jubrin, 2001). As a result of the above, widespread hunger and malnutrition are evident in the country. Nigeria is among the least consumers of animal protein in the world. North America, West and Eastern Europe countries consume 66, 39 and 33g per head per day, respectively. The average for Nigeria is 7.5g per head per day, which is below the recommended level of 27g per head per day by Food and Agriculture Organization (CBN 1993; Niang and Jubrin, 2001). In an effort to boost livestock production in particular and agricultural production in general and provide adequate food for the rising Nigerian population, the Federal Government, over the years, formulated various agricultural policies and embarked on a number of intervention projects and programs. Despite the various policy measures, domestic meat production has not increased sufficiently to meet the increased demand. Although, Nigeria has comparative resource advantage such as favorable climate, large area of grazing reserve land, and diverse ecological zones for animal husbandry, meat supply- demand gap persists. As a panacea, to bridge the demand- Supply gap of animal protein in terms of meat in Nigeria, there is the need to adopt other sustainable means of production. Thus, livestock fattening appears to be an alternative to meeting the increasing demand for meat in the nation. Livestock fattening means feeding the animals in order to obtain fast live weight gains in relatively short time (Alawa *et al*., 2008). Meat fattening is a business entity that is aimed at profit making, just like any other firm. The term “fattening” is used in agricultural practice to refer to the preparation of animals for marketing (Jean, 1993; Uza *et al*; 1999). As an economic way of feeding animals whereby the yield of edible carcass is increased during a short period, thus fattening has a role to play in a situation where range animals are so under-nourished that a short period on high level of nutrition is necessary to increase their productivity and to prepare them for market. Fattening therefore, offers rapid means for enhancing productivity.

The measurement of efficiency remains an important area of research both in developing and developed economies. The measurement of efficiency goes a long way to determine profitability of an enterprise and agricultural growth is linked to profit. The relationships between efficiency, market indicators and household characteristics have not been well studied in livestock fattening enterprises. The dearth of empirical studies manifests in near absence of studies that determined the technical efficiency of Sheep fattening enterprises using stochastic frontier production function approach. This study therefore used the stochastic frontier production function approach to provide estimates of technical efficiency and its determinants among Sheep fattening enterprises in Kebbi State, Nigeria.

Theoretical Framework of Stochastic Frontier Production: Efficiency is the ability to produce a given level of output at lowest cost (Farrell, 1957). Economic efficiency is the ability of an enterprise to achieve the highest possible profit, given the prices and levels of resources of the enterprise (Bagi, 1982). The economic theory of production provides the analytical framework for most empirical research on productivity and efficiency. As a result of the pioneering, but independent, works by Aigner *et al.* (1977), Bagi and Huang (1983), Kalirajan and Flinn (1983) as well as Amaza and Olayemi (2001), consideration has been given to the possibility of estimating the stochastic frontier production function. In most of the studies, it was found that the Cobb–Douglas stochastic frontier does not provide an adequate representation for describing the data given the specification of a translog model (Tanko, 2004). Considering a farmer using inputs X_1, X_2, Xn to produce output Y, efficient transformation of inputs into output is characterized by the production function f(X), which shows the maximum output obtainable from various input vectors. The stochastic frontier production is defined as

Yi = f (Xi; β) exp (Vi – Ui) (i = 1, 2………...n)… ……… (1)
Where:

Yi = Production of the i^{th} farm
Xi = Vector of input quantities of the i^{th} farm
β = Vector of unknown parameters of the i^{th} farm
Vi= random error associated with random factors not under the control of the farm
e.g. weather and diseases
Ui= inefficiency effects (one –sided error with U≥0) i.e. Ui’s are non – negative with
technical inefficiency in production.
(Vi - Ui) = composite error term.

The symmetric component, V, accounts for factors outside the farmer’s control such as weather and diseases. It is assumed to be independent and identically distributed as N~(0,δ^2V). A one-sided component V=0 reflects technical inefficiency relative to the stochastic frontier, f(Xi; β) exp (Vi – Ui). Thus V = 0 for a farm output which lies on the frontier and V<0 for one whose output is below the frontier as N~(0, δ^2 U), i.e. the distribution of V is half-normal. Thus, the stochastic production frontier model can be used to analyze cross-sectional data. The model simultaneously estimates the individual technical efficiency of the respondents as well as determinants of technical efficiency (Battesse and Coelli, 1995). The estimation of stochastic frontier production makes it possible to find out whether the deviation in technical efficiencies from the frontier output is due to firm specific factors or due to external random factors. It provides estimates for the technical efficiency by specifying composite error formulations to the conventional production functions (Khumbakar, 1990; Coelli, 1995; Battesse and Coelli, 1995). Technical efficiency of an individual farmer is defined as the ratio of the observed output to the corresponding frontier output, conditional on the levels of inputs used by the farmer. The technical efficiency of farmer (i) in the context of the stochastic production function in equation (1) is

TE= Yi/Yi* (2)

=f(Xi; β) exp (Vi – Ui)/f(Xi; β) exp Vi (3)

=exp (-Ui) (4)

Where:

Yi=Observed value of output
Yi*=frontier output (or potential output)

Given the density function Ui and Vi, the frontier production function can be estimated by the maximum likelihood technique. The value of the technical efficiency lies between zero and one. The most efficient farmer will have value of one, whereas the least efficient farmer will have value lying between zero and one. The stochastic frontier of the translog type was specified for this study. The maximum likelihood technique was used to estimate the parameters of the stochastic frontier and the predicated technical efficiency/inefficiency of the farmers.

MATERIALS AND METHODS

Sampling technique and sample size: The study was conducted in Kebbi State Nigeria. This was purposively selected due to its importance in livestock fattening. The sampling method used was the multi-stage sampling technique. The State was divided in to four according to Kebbi State Agricultural Development Project (ADP) zones, namely Argungu, Bunza, Yauri and Zuru Zones. In the first stage, two Local Government Areas (LGAs) were randomly selected in each zone through lottery method (drawing lots), making a total of eight LGAs in the study. These include Argungu and Dandi LGAs in Argungu zone, Jega and Bunza LGAs in Bunza zone, Yauri and Ngaski LGAs in Yauri zone and Danko-Wasagu and Zuru LGAs in Zuru zone. Secondly, from each of the LGAs, two leading villages noted for sheep fattening were purposively selected giving a total of sixteen villages and from each village ten livestock fatteners were randomly selected through snow ball technique giving a total of 160 fatteners that were interviewed for the study.

Data and the model: Data were collected at fortnight intervals so as to get comprehensive data using the cost route approach. Information on primary data collected include socio-economic characteristics, input – output data on fattening enterprises. The weight of sheep fattened was obtained using a bathroom scale and a weigh band. The body weight was measured by measuring the weight of a research assistant alone and then while carrying the animal in his hands using bathroom scale. The difference in the human weight from the total weight for each weighing was recorded as the individual animals' weight. The difference between the initial body weight and the final body weight gives the weight gain. The weigh band is also set at the circumference of the body of the animal at a point immediately behind the fore- legs, perpendicular to the body axis. The weight in kilogram was then recorded. The difference between the initial body weight and the final body weight gives the weight gain.

Empirical model

Model for Transcendental Logarithmic Stochastic Frontier Production Function was specified as follows:

$$Ln\, y = \beta_o + \beta_1 LnX_1 + \beta_2 LnX_2 + \beta_3 Ln\, X_3 + \beta_4 Ln\, X_4 + \beta_5 LnX_5 + \beta_6 Ln\, X_6 + \beta_7 LnX_7 + \tfrac{1}{2} \beta_{11} Ln\, X_1^2 + \tfrac{1}{2} \beta_{22} LnX_2^2 + \tfrac{1}{2} \beta_{33} LnX_3^2 + \tfrac{1}{2} \beta_{44} Ln\, X_4^2 + \tfrac{1}{2} \beta_{55} Ln\, X_5^2 + \tfrac{1}{2} \beta_{66} Ln\, X_6^2 + \tfrac{1}{2} \beta_{77} LnX_7^2 + \beta_{12} LnX_1 LnX_2 + \beta_{13} LnX_1 In\, X_3 + B_{14} LnX_1 LnX_4 + \beta_{15} LnX_1 LnX_5 + \beta_{16} LnX_1 LnX_6 + \beta_{17} LnX_1 LnX_7 + \beta_{23} LnX_2 LnX_3 + \beta_{24} LnX_2 LnX_4 + \beta_{25} LnX_2 LnX_5 + \beta_{26} LnX_2 LnX_6 + \beta_{27} LnX_2 Ln\, X_7 + \beta_{34} LnX_3 LnX_4 \beta_{35} LnX_3 LnX_5 + \beta_{36} LnX_3 LnX_6 + \beta_{37} LnX_3 LnX_7 + \beta_{45} LnX_4 nX_5 + \beta_{46} LnX_4 LnX_6 + \beta_{47} LnX_4 LnX_7 + \beta_{56} LnX_5 Ln\, X_6 + \beta_{57} LnX_5 LnX_7 + \beta_{67} LnX_6 LnX_7 + Vi - Ui \quad (5)$$

Where:

β_o=Constant term
β_1- β_{67}=Parameters to be estimated
Ln=Logarithm to base e.
Y =Output (Weight gain in Kg)
X_1=Labour in Man-days
X_2 =Expenses on medication and veterinary services (₦)
X_3=Expenses on feeds and feed supplements (₦)
X_4=Expenses on fattening animals purchased (₦)
X_5=Depreciation on livestock fattening facilities such as housing, drinkers, ropes, rake, watering basin etc. (₦)
X_6=Quantity of water utilized in (liters)
X_7=Cost of transportation (₦)
Vi=Normal random errors which are assumed to be independently and identically distributed having zero mean and constant variance.
Ui =Non – negative random variables associated with the technical inefficiency of the enterprise(s) involved.

Ui=$\delta_o + \delta_1 z_1 i + \delta_2 z_2 i + \delta_3 z_3 i + \delta_4 z_4 i + \delta_5 z_5 i + \delta_6 z_6 i + \delta_7 z_7 i$ ………. (6)

Z_1=Age of the livestock fattener in years
Z_2=Level of education in number of years spent in school
Z_3=Fattening experience in years
Z_4=Household size
Z_5=Herd size
Z_6=Dummy variable for credit access (1 for access to credit, 0 otherwise).
Z_7=Dummy variable for membership of co-operative (1 for membership, 0 otherwise)
δ - δ_7=Unknown parameters estimated

RESULTS AND DISCUSSION

The results in Table 1 show that the sigma square (δ^2 = 2.031) and the variance ratio(r = 0.94) are quite high and significant at 1% level. The high and significant value of the sigma squared (δ^2) indicates the goodness-of-fit and the correctness of the specified assumptions of the composite error terms distribution. Ajibefun and Aderinola (2003) and Okoye and Onyenweaku (2007) obtained similar results in their various investigations. On the other hand, the variance ratio (r = 0.943) on estimation is quite high as 94.3%, suggesting that systematic influences that are unexplained by the production function are the dominant source of random errors. It implies that 94.3% of the total variation in aggregate livestock fattening output (weight gain) is due to technical inefficiency. In other words, the presence of technical inefficiency among the sample farms explains about 94.3% of the variation in the output level of the sheep fattening enterprise. This confirms that in the specified model, there is the presence of one-sided error component. This also implies that the effect of technical inefficiency is significant and that a classical regression model of production function based on ordinary least squares estimation would be an inadequate representation of the data. The results of the diagnostic statistics therefore confirm the relevance of stochastic parametric production frontier and maximum likelihood estimation.

The results in Table 1 also shows that for the first order coefficients, feeds (25.549), fattening animals (15.609), and depreciation(9.326) all have positive sign and are significant at 1% levels respectively. Transportation (0.905) had positive and significant relationship with weight gain at 5% level. On the other hand, labour (-2.761) and water (-2.704) had negative relationship with weight gain at 1% and 5% probability levels respectively. The negative sign recorded against the slope coefficient of labour and water indicate that as more of these variables are added on the farms, after reaching the maximum level, the contribution of labour and water can reduce the weight gain in sheep fattening. Increasing feeds and fattening animals by 1% will increase weight gain in sheep fattening by 25.55 and 15.61% as revealed in Table 1. The high value of these coefficients indicates the importance of these variables in the production structure of the farmers. Studies consistent with the result are Ogundari and Ojo (2006) and Okoye and Onyenweaku (2007). Therefore result reveals that feeds and fattening animals are the most important variables affecting technical inefficiency in sheep fattening enterprises in the study area with coefficient values of (25.549) and (15.609), respectively. This corroborates the findings of Beli (2009) and Moses (2017) who found that feed and water are the most important variables that determine fattening. Most of the interaction terms (2nd order coefficients) were statistically significant at the conventional significance levels, implying the suitability of the Translog function (Okoye and Onyenweaku, 2007). Among the second order terms, the coefficients of the square term for feeds, fattening animals, and depreciation are positive and highly significant at 1% level, showing a direct relationship with output (weight gain).

Table1. Translog parameter estimates for technical inefficiency in Sheep fattening enterprises, Kebbi State, Nigeria

Production factor	Parameter	Coefficient	Standard error	t-ratio
Constant term/intercept	β_0	-116.379	2.633	-44.196***
Labour	β_1	-2.761	0.957	-2.884***
Medication	β_2	-0.046	0.159	-0.287
Feeds	β_3	25.549	1.392	18.359***
Fattening Animals	β_4	15.609	1.015	15.384***
Depreciation	β_5	9.326	1.941	4.804***
Water	β_6	-2.704	1.169	-2.311**
Transportation	β_7	0.905	0.388	2.333**
Squared terms				
Labour x Labour	β_{11}	-0.839	0.288	-2.919***
Medication x Medication	β_{12}	0.001	0.029	0.009
Feeds x Feeds	β_{33}	3.151	0.233	13.500***
Fattening Animals x Fattening Animals	β_{44}	1.733	0.188	9.195***
Depreciation x Depreciation	β_{55}	1.305	0.383	3.405***
Water x Water	β_{66}	-0.409	0.201	-2.038**
Transportation x Transportation	β_{77}	0.132	0.069	1.886*
Interaction among inputs				
Labour x Medication	β_{12}	-7.594	0.882	-8.612***
Labour x Feeds	β_{13}	-29.700	4.484	-6.622***
Labour x Fattening Animals	β_{14}	10.613	4.034	2.629***
Labour x Depreciation	β_{15}	19.459	2.881	6.754***
Labour x Water	β_{16}	12.044	1.777	6.778***
Labour x Transportation	β_{17}	3.611	1.557	2.319**
Medication x Feeds	β_{23}	29.035	3.103	9.357***
Medication x Fattening Animals	β_{24}	-5.058	2.919	-1.732*
Medication x Depreciation	β_{25}	-17.615	1.595	-11.045***
Medication x Water	β_{26}	-9.342	1.328	-7.035***
Medication x Transportation	β_{27}	-2.632	1.133	-2.323**
Feeds x Fattening Animals	β_{34}	0.139	0.491	0.285
Feeds x Depreciation	β_{35}	63.256	0.764	82.765***
Feeds x Water	β_{36}	-36.587	0.688	-53.192***
Feeds x Transportation	β_{37}	-2.491	0.680	-3.661***
Fattening Animals x Depreciation	β_{45}	-54.573	0.729	-74.868***
Fattening Animals x Water	β_{46}	38.396	0.650	59.062***
Fattening Animals x Transportation	β_{47}	4.102	0.671	6.109***
Depreciation x Water	β_{56}	-5.928	0.791	-7.498***
Depreciation x Transportation	β_{57}	0.409	0.880	0.464
Water x Transportation	β_{67}	-2.359	0.774	-3.046***
Diagnostic statistics				
Log likelihood function		-104.893		
Sigma square ($\delta°$)		2.031	1.155	1.759*
Gamma		0.943	0.035	27.235***
LR test		27.846		

Source: Computer printout of Frontier 4.1, survey data; Asterisks ***, ** and * implying significant at 1, 5 and 10% levels respectively

Table 2. Distribution of sheep fatteners according to technical inefficiency indices, Kebbi State, Nigeria

Technical Efficiency index	Frequency	Percentage (%)
< 0.50	12	7.50
0.51-0.60	13	8.13
0.61-0.70	31	19.37
0.71-0.80	40	25.00
0.81-0.90	60	37.50
0.91-1.00	4	2.50
Total	160	100.00
Mean Technical efficiency	0.73	
Standard Deviation	0.15	
Minimum Technical efficiency	0.13	
Maximum Technical efficiency	0.91	

Table 3. Maximum likelihood estimates of the determinants of technical inefficiency in sheep fattening enterprise, Kebbi State, Nigeria

Variable	Parameter	Coefficient	Standard error	t-ratio
Intercept	Z_0	5.192	2.191	2.380**
Age	Z_1	-0.127	0.058	-2.191**
Level of education	Z_2	0.295	0.206	1.429
Fattening experience	Z_3	0.110	0.055	2.006**
Household size	Z_4	0.126	0.083	1.531
Herd size	Z_5	-1.942	0.976	-1.990*
Credit access	Z_6	2.256	1.192	1.893*
Membership of cooperative	Z_7	-1.862	0.766	-2.433**

Source: Computer printout of Frontier 4.1 survey data; ***, **, * are significant levels at 1, 5 and 10% respectively.

The squared terms for labour and water showed negative and significant levels at 1 and 5%, respectively, suggesting that at this point, both labour and water have been utilized beyond optimal levels. Coefficients of interaction terms from Table 1 reveal that labour x medication, labour x feeds, labour x fattening animals, labour x depreciation, labour x water, medication x feeds, medication x depreciation, medication x water, feeds x depreciation, feeds x water, feeds x transportation, fattening animals x depreciation, fattening animals x water, fattening animals x transportation, depreciation x water and Water x transportation are highly significant at 10% levels of probability, while labour x transportation and medication x transportation are significant at 5% and medication x fattening animals are significant at 10% level. This means that increasing a unit of these interaction terms for positive coefficients would lead to a corresponding increase in weight gain while increasing a unit of these interaction terms for negative coefficients would lead to a corresponding decrease in weight gain.

Table 2 shows the distribution of sheep fatteners according to technical inefficiency estimates. It reveals that technical efficiency ranged from 0.13 to 0.91, indicating that a wide gap exists between the efficiency of best technically efficient farmers and that of the average farmers. The mean technical efficiency was 0.73. The estimates show that for average sheep fattener to attain the level of the most technically efficient fattener in the sample, he/she would require a cost savings of 19.78 percent that is (1-0.73/0.91%). The least technically efficient fattener will have an efficiency gain of 85.71 percent (1-0.13/0.91%) in sheep fattening if he or she is to attain the efficiency level of most technically efficient fattener in the State. This shows that sheep fatteners in the survey area are technically inefficient. Amaza (2000) observed that a wide variation in farmer specific efficiency level is a common phenomenon in developing countries. Moses (2017) found that the efficiencies of beef cattle fattening in Yobe State was also inefficient.

Results of the analysis in Table 3 indicate that the coefficients of age (-0.127), is statistically significant at 5% level and maintained the right a priori negative relationship with technical efficiency. The older a fattener becomes, the more his efficiency drops. This is in disagreement with the findings by Moses (2017). It has been observed that the innovativeness of a farmer, his mental capacity to cope with the daily challenges and demands of farm production activities and his ability to do manual work, all of which bear directly on his production efficiency, tend to decrease, the older he becomes (Nwaru *et al*., 2006). The coefficient for fattening experience (0.110) had a significant positive effect on technical inefficiency at 5% level. This implies that a fattener who has a large number of years of experience in fattening will be able to understand the intricacies of sheep fattening and therefore will always aim to achieve higher level of technical efficiency. Effiong (2005) and Moses (2017) obtained similar results in their various studies among selected livestock farmers at both AkwaIbom and Yobe States in Nigeria. Herd size (-1.942) is statistically significant and negative at 10%, implying that the more the herd size, the more inefficient the farmer becomes. This result could be due to the fact that increasing the size of the herds will automatically mean more costs on inputs and a situation whereby most of the fatteners are smallholder fatteners who have little meager resources, increasing herd size without corresponding increase in other resources might affect the feeding and drinking regime of the animals with a corresponding decrease in efficiency. This is a scenario of many animals fed on what can only be available for few animals. The result however, is at variance with the findings of Nganga *et al* (2010) who obtained a non-significant relationship in their study of Kenyan small holder milk producers. But the result is in line with the findings of Owualah (1999) and Sanusi (2003) which admitted that small scale enterprises enjoy a competitive advantage over large scale enterprises and there is an inverse relationship between farm size and farm growth in developing countries. Credit access (2.256) is positive and significant at 10% level. Thus, a fattener who has ready access to credit will be able to obtain the necessary production inputs timely, and to allocate them efficiently. The result corroborates the findings of Bravo-Ureta and Evenson (1994) in their study of farmers in Paraguay.

Membership of co-operative (-1.862) has a significant negative effect on technical efficiency at 5% level. Membership of co-operative is expected to increase the farmer's interactions with his fellow farmers and other entrepreneurs. It is hoped that such interactions would help them to receive and synthesis new information on economic activities in his locality and even beyond. But the negative effect of membership of co-operative on technical efficiency in this study might be attributed to the fact that the fatteners have just started the co-operative newly and because of that, they have not been able to tap from the benefits of membership of a cooperative. This reveals why the findings is in disagreement with studies by Okike *et al.* (2001). Tanko and Jirgi (2008), Nwaru *et al* (2006) whose results show that membership of cooperative have a positive relationship with efficiency.

Conclusion

The results of the study indicated that labour, feeds, fattening animals, depreciation, water and transportation are the dominant variables that influenced the level of technical efficiency in sheep fattening with coefficient values of (-2.761, 25.549, 15.609, 9.326, -2.704, and 0.905), respectively. Mean technical efficiency of sheep fatteners was 73% revealing that the fatteners were technically inefficient in the utilization of existing resources.

Recommendation

The results of the study revealed that sheep fatteners were not efficient in the use of existing resources and therefore recommended that technical efficiency can be improved through timely access to credit and increase in the years of fattening experience.

REFERENCES

Aigner, D.,Lovell, C. A. K., and Schmidt, P. 1977. Formulation and Estimation of Stochastic Frontier production Models .*Journal of Economics* 6: 21-37.

Ajibefun, I. A. and Adenirola, E. 2003. Determinants of Technical Efficiency and Policy Implications in Traditional Agricultural Production: Empirical study of Nigerian Food Crop Farmers, Report Presented at the Annual Research Workshop of AERC, Nairobi, Kenya, May 24-29.

Ajibefun, I. A. and Daramola, A. G. 2000. Measurement and Sources of Technical Inefficiency in Poultry Egg

Production in Ondo state, Nigeria. *Journal of Economics and Rural Development* 14(1): 85-93.

Amaza, P. S. 2000. Resource Use efficiency in Food Crop Production in Gombe State, Nigeria Unpublished PhD Thesis, University of Ibadan, Nigeria.

Amaza, P. S. and Olayemi, J. K. 2001. The Influence of Education and Extension Contact on Food Crop Production in Gombe State Nigeria", *Journal of Agribusiness and Rural Development*, 1(1): 80-90.

Amogu, U. 2010. Markets and Marketing Challenges in the Nigerian Livestock Business in Proceedings of 15th Conference of ASN held on the 13th-15th September, 2010. University of Uyo, Nigeria.

Bagi, F. S. and Huang, C. J. 1983. Estimating Production Technical Efficiency for Individual Farms in Tennesse Canadian *Journal of Agricultural Economics*, 31(1): 249-256.

Bagi, F. S.(1982). Economic Efficiency of Share Cropping: Reply and Some Further Results" Malayan Economic Review, 27(1); 86-95.

Battesse, G. E. and Coelli, T. J.(1995).A Model of Technical Inefficiency Effect in Stochastic Frontier production Function for Panel Data, *Journal of Empirical Economics,* 20:325-332.

Beli, S. A. 2009. Economic Analysis of Bull Fattening: A Case study of Bull Fatteners in Rogo and Karaye Local Government Areas of Kano State. An M. Sc. Thesis submitted to the Department of Agricultural Economics and Rural Sociology, Institute of Agricultural Research, Ahmadu Bello University, Zaria, Nigeria.

Bravo-Ureta, B. E. and Evenson, R. E.1994. Efficiency in Agricultural Production. The case of peasant farmers in Eastern Paraguay" Agricultural Economics 10 (1): 27-37.

Central Bank of Nigeria (CBN) 1993. Statistical Bulletin, Lagos, December.

Coelli, T. J.(1995). Recent Developments in Frontier Modeling and Efficiency Measurement Australian *Journal of Agricultural Economics,* 34(3): 219-245.

Effiong, E. O. 2005. Efficiency of Production in Selected Livestock Enterprises in AkwaIbom State, Nigeria. Unpublished PhD Dissertation. Department of Agricultural Economics, Micheal Okpara University of Agriculture, Umudike, Pp 120.

Farrell, M. J.1957.The Measurement of Productive Efficiency. *Journal of Royal Statistics Society Series A*., 21(1): 253-281.

Federal Government of Nigeria (FGN) 2011. Agricultural Transformation Agenda: We will Grow Nigeria's Agricultural Sector. Federal Ministry of Agriculture and Rural Development, Abuja, Pp89

Jean, P.1993. *Animal Production in the Tropics and sub-Tropic. Revised Edition*. Farming press Ltd, London, pp 138-147.

Kalirajan, K. P., and Flinn, J. C. 1983. The Measurement of Farm Specific Efficiency". Pakistan *Journal of Applied Economics* 2 (2): 167-180.

Khumbhakar SC. 1990. Production Frontiers, Panel Data and Time Varying Technical Inefficiency *Journal of Econometrics*, 46: 201-211.

Moses, J. D. 2017. Assessment of the technical Efficiency of Beef Cattle Fattening in Yobe State, Nigeria. *Sky Journal of Agricultural Research*.3(2): 224-241.

Nganga, S. K. J., Kungu, J., Rider, N. and Herero, M. 2010. Profit Efficiency among Kenyan Smallholder Milk producers: A Case Study of Meru-South District Kenya. *African Journal of Agricultural Research*. 5(4): 332-337.

Niang, T. and Jubrin, S. (2001).Quarterly Newsletter of the Nigeria Agriculture Question and Answer Service Vol. 1 No.3

Nwaru, J. C. (2004). Rural Credit Markets and Arable Crop Production in Imo State of Nigeria.Unpublished Ph. D. Dissertation.Department of Agricultural Economics, Michael Opara University of Agriculture, Umudike, Pp 120.

Odedebo, S. O. 2000. Poultry Farmers Access to Extension Services in Iddo Local Government Area of Oyo State. Re-Inventing Animal Production in the 21st Century. Proceedings of the 5th Annual Conference of Animal Science Association of Nigeria, September 19-22 Port-Harcourt pp 209-212.

Ojo, S. O. andAjibefun, I. A. 2000. "Effects of Training on Labour Productivity and Efficiency in Oil Palm Production in Ondo State, Nigeria:„*Journal of Sustainable Agric. And Environment,* 2: 275-279.

Okike I.Jabbor, M. A., Manyong, V., Smith, J. W.,Akinwumi, J. A. and Ehui, S. K. 2001. Agricultural Intensification and Efficiency in West Africa Savannahs.Evidence from Northern Nigeria.Socio-Economic and Policy Reseach working paper 33 ILRI, Narirobi.

Okoye, B. C.andOnyenweaku, C. E. (2007)."Economic Efficiency of Small-holder Cocoyam Farmers in Anambra State", A Translog Stochastic Frontier Cost Function Approach, *Agricultural Journal* 2: 535-542.

Onu, J. J., Amaza, P. S. Okunmadewa,F. Y. 2000. "Determinants of Cotton Production" Economic Efficiency in Business and Economics Research, 1(2):35-40.

Owualah, S. I. 1999. Entrepreneurship in Small Business Firm. GMAG Investment Educational Publishers, Ikeja, Lagos, Nigeria.

Sanusi, J. O. 2003. Overview of Government Efforts in the Development of SME's and the Emergence of Small and Medium Industry Equity Investment Scheme (SMIEIS) Organized by the Bankers Committee and Lagos Chamber of Commerce and Industry (LCCI) Lagos on 15th June.

Tanko, L. 2004. Optimum Combination of Farm Enterprises in Kebbi State, Nigeria: A linear programming Approach. Unpublished Ph.D Dissertation, Department of Agricultural Economics, Michael Okpara University of Agriculture, Umudike, Nigeria.

Tanko, L.and Jirgi, A. J. 2008. Economic Efficiency among Smallholder Arable Crop farmers, Kebbi State, *Nigeria. Continental Journal of Agricultural Economics* 2: 14-22.

Uza, D. V.,Avibodo, S. O.,Abubakar, A. and Ahmed, U.H. 1999. Transferable Technology for Enhancing Small Holder Livestock Production" Onairi Publishers Ltd. Makurdipp 7-72.

Weir, S. and Knight, J. 2000. Education Externalities in Rural Ethiopia: Evidence from Average and Stochastic Frontier Production Functions, Working Paper CSAE WPS/2000 4, Centre for the Study of African Economics, University of Oxford.

****