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Profit Efficiency and Sources of Inefficiency of Small-holder Ram Fattening Enterprise in Borno State, Nigeria

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Abstract
This examine the profit efficiency and its determinants in ram fattening farms of Bama Local Government Area of Borno State, Nigeria, using the stochastic profit function analysis. Primary data were used for this study which was collected using the interview method. The data collected include those on the socio-economic variables of the ram fatteners, the cost of inputs used and price of output produced. The result revealed mean profit efficiency of 0.82, implying that there exists the scope of increasing efficiency by about 18%. The main variables contributing to inefficiency were household size, and educational qualification. The study recommends that the state governmentshould provide feed subsidy and formal loan to the fatteners in the study area in an effort to alleviate the endemic poverty in the state. Also, training and extension services should be provided to the fatteners to further improve their efficiency.

1. Introduction

Livestock particularly sheep and goat has been playing a vital role in the socio-economic life of the rural society. A part from the serving as the source of employment opportunity, they provide a year round flow of essential products (meat, milk and hide), income and manure for crop enterprises. It is reported that small ruminants are considered as a saving account especially for women in the rural areas of the country. This is because ruminant are much easier and quicker to sell than cattle when cash is needed to meet household expenditure (Gazali, 2010).

Ram production has gain increase popularity in the developing countries. It is reported that all over the world, there is a tendency to change the entire conception toward breeding sheep for mutton production. This might be due to people's preference for mutton especially lean, soft succulent mutton with fine fibred Cola and Cola (2006). Similarly, sheep and goat are relatively cheap to acquire, can reproduce quickly thereby assisting the farmers as a means of acquiring cattle. Moreover, these animals have a better advantage over the large ruminants like as a result of their easy adaptation to the environments, and their ability to utilized poor the land (Gazali, 2010). Likewise, sheep provide more convenient source of meat than cattle because of their small size.

Ram fattening is a market oriented programme designed to increase off-farm income through intensive feeding of ram months before the festival of Eid-kabir Sallah celebration. It is one of the oldest farming enterprises in the study area which is been practice for over a century. Usually the fatteners feed the ram for the average duration of 3 to 11 months in anticipation for Sallah celebration. The animal would be prepared for marketing through increase weight gain. Ram fattening is particularly attractive venture if is targeted towards the Muslim feast of Eid-dulKabir.

Ram fattening is a profit motivated farming enterprise aim at profit maximization (Shiarwoya 2006). It is believed that if properly harness, ram fattening could be used as a poverty reduction strategy to eradicate the wide spread poverty in the study area. However, there are little or no study conducted to examine the profit efficiency of ram fattening farms in the study area. This study was conducted to examine the profit efficiency and its sources and subsequently recommends appropriate policy measures to increase profit efficiency of ram fatteners in the study area.

2. Methodology

Borno state is located between latitude 10^{o}N and 14' and longitude 11'3E and 14^{o}45'E, it is the largest state in the federation in term of land mass with an area of 69,436sq km. The state has a population of 4,151,193 people (NPC, 2006), which is projected to be 4,708,599 for 2013 base on 3.2 per cent annual population growth. The population density is approximately 60 inhabitants per square kilometer. The state shares borders with the Adamawa to the south, Yobe to the west and Gombe to the south west. It also occupies the greatest part of the Chad Basin and Shares borders with the Republic of Niger to the North, Chad to the North-east and Cameroun to the East (Borno state official Diary, 2008).

The state is hot and dry for the greater part of the year although the southern part is slightly milder. The rainy season last from June to September in the north and May to October in the south with a mean annual rainfall of 650mm per annum. The temperature is high within the range of 24^{o} – 34^{o}Cfor the greater part of the year. The relative humidity is about 49% and evaporation of 203mm per year (Sulumbe, 2012).

Multi-stage, sampling technique was use to select the total number of the respondents. The first stage involves a purposive sampling of three Local Government Areas in the state, namely;Bama,Jere and Maiduguri

metropolitan council,based on prevalence of ram fattening enterprise. The second stage involves a random selection of 120of ram fattening enterprise.

Primary data was used for this study. The data was collected using a structured questionnaire designed to collect data on outputs, inputs and input prices. The datagathered include those on socio-economic variables of the ram fatteners such as age, years of experiences, educational qualification, Family size, type of feed used, number of animals fattened in a batch, contact with extension worker and access to formal credit facilities Others are output (revenue) and inputs used in naira value such as feeds used, labour used and Veterinary services.

3. Analytical framework

Profit efficiency is defined as profit gain from operating on the profit frontier, taking into consideration farm specific prices and factors.

Farm profit is measured in term of gross margin (GM), which is the difference between the total revenue and total variable cost. That is;

$GM (\pi) = \Sigma (TR - TVC) = \Sigma (PQ - WX_1)$ ………………………………….……………... 1

Where

TR = total revenue
TVC = total variable cost
P = Price of output (Q)
X = quantity of optimized input

The Cobb-Douglas profit function which specifies the profit efficiency of the fatteners is express as follows;

$\pi_i = f(P_i, Z_i) \exp(V_i - U_i) = 1, 2 \ldots N$ ………………….......................... ………….. 2

Where:

π = gross margin
P_1 = price of output (Q)
Z_1 = price of inputs used
V_i = random error which are assumed to be independent and identically distributed, having normal N (OδV) distribution. They are independent of the U, δ.
U_i = Are the profit inefficiency effects, which are assumed to be non-negative truncation of the half-normal distribution $N(U, \delta^2 U)$.

The profit efficiency is expressed as the ratio of predicted actual profit to the predicted maximum profit for a best-practiced fattener in the study area. This is represented as follows;

Profit Efficiency (Eπ)

$$\Pi = \frac{\exp(\pi(P_1 Z)\exp(Inv)\exp(-Lnu) - 0}{\pi^{max}\exp\ (\pi\ (P_1\ Z)\exp(LnV) -\ 0} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..3$$

Forms profit efficiency is the mean of the conditional distribution of it; given by Eπ and defined as;

$E\boldsymbol{\pi} = E\ \{\exp(-U_i)/Ei\}$ …. ………………….………………………………………4

E**π** takes the value between 0 and 1. if U1 = 0, it implies that the fattener is on the frontier, obtaining potential maximum profit given the price of faces and the level of fixed factors. IfUi> 0, the farm is inefficient and losses profit as a result of inefficiency.

Empirical Profit Model Specification for Borno State Ram Fattening Enterprise

The Cobb-Douglass profit function for ram fatteners in Borno state is specified as

$In\ \pi i = In\ P_0 + P_1 InZ_1 i + P_2 InZ_2 i + P_3 InZ_3 i + P_4 InZ_4 i + P_5 InZ_5 i + (V_i - U_i)$ …………………………..5

Where:

Πi = normalized profit
P_1 = average price of feed used
P_2 = average price per man day of labour
P_3 = average price of Vaccine
P_4 = average prices of ram per batch
V_1 and U_i = are the composite error.

This was used to compute the profit efficiency of the ram fattening enterprise in the study area.

The profit Inefficiency Model

It is assumed that the profit effects are independently distributed and U_{ij} arises by truncation (at zero) of the normal distribution with mean U_{ij} and variance, δ^2. The profit inefficiency effects (U_{ij}) is defined by:

$U_ij = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_{5+} \delta_6 Z_6$……………………………..…………………… 6

Where:

U_{ij} = Represents the profit inefficiency of the ithenterprise

Z_1 = Number of years of schooling (years)
Z_2 = Fattening experience (years)
Z_3 = Size of household
Z_4 = Herd size(number of ram/batch)
Z_5 = Extension contact
Z_6 = Access to credit facilities(amount)

These variables are included in the model to indicate their possible influence on the profit efficiencies of the fatteners. The B, S_i 65 are scalar parameters to be estimated. The variances of the random errors, $\delta^2 v$ and that of the profit inefficiency effects $\delta^2 V$ and overall variance of the model δ^2 are related thus; $\delta^2 = \delta^2 v + \delta^2 u$ and the ratio $y = \delta^2 v / \delta^2$, measures the total variation of revenue from the frontier which can be attributed to profit inefficiency (Battesse and Corra, 1977).

The parameters of the frontier model are estimated such that the variance parameters are defined as;
$\delta^2_5 = \delta^2_{vi} + \delta^2_{Ui}$ and $Y - \delta^2 / \delta_5$
wherethe X has a value between 0 and 1. The stochastic frontier profit functions and inefficiency effects were estimated using the computer programme, FRONTIER VERSION 4.0 developed by Coelli (1996).

4. Results and Discussions

4.1. Technical Efficiency of Ram Fattening Enterprise

Table 1 revealed the profitfunctionmaximum likelihood estimates. The gamma (γ) which is the proportion of deviation from frontier that is due to inefficiency was 0.86.This indicates that more than 86% of the variation in profit is due to the difference their efficiencies.

The study revealed that the mean profit efficiency of the ram fatteners was 82%, implying that on the average, the ram fatteners are able to obtain about 82% of potential output from a given mix of production inputs. Thus, in the short-run, there is a scope for increasing ram profit by 18%, by adopting the technology and techniques used by the best ramfattener in the study area.This finding agrees with that of Rahman (2003) who reported mean profit efficiency of 77% for Bangladesh rice farmers.

Table 1: Estimates of Profit Efficiency Model for RamFatteners in Borno State

Variable	Parameter	Coefficient	t-ratio
Constant	βo	5.247	7.660***
Feedcost (x_1)	β1	-0.306	3.112***
Laborcost (x_2)	β2	-0.241	5.615***
Vaccinecost (x_3)	β3	0.351	0.089
Farm size (x4)	β4	0.651	
Variance Parameters			
Sigma (δ^2)		0.392	6.468
Gamma (γ)		0.86	7.240
Log likelihood		-27.356	
Mean profit efficiency		0.821	

***P<0.01, **P<0.05,*P<0.10

The estimated coefficient for feed cost (-0.306) was negative and statistically significant at 1% (p<0.01), implying that 1% increase in feed cost reduces profit by about 3 %. The coefficient for labor(-0.241)was also negative and significant at 5% (p<0.05) level indicating 1% increase in the wage cost decrease profit by 2%. Similarly, the coefficient of vaccine (-0.351) was also negative and significant at 1% level (p<0.01), implying 1% increase in cost of veterinary services and vaccine reduce profit by 3%. However, the coefficient of farm (0.651) size was positive and significant at 1% (p<0.01) level, implying that 1% increase in farm size will increase profit level by about 6%. This is probably because the success of any ram fattening depends on the number of ram produced within a given period of time. This finding agrees with those of Rahman (2003) who reported mean profit efficiency of 77% for Bangladesh rice farmers andTijjani, *et al.* (2006) who reported a similar finding for poultry eggs farmers of Aiyedoto farm settlement in Nigeria.

4.2. Frequency Distribution of Profit Efficiency of Ram Fatteners

Table 2 presents the profit efficiency distribution of the ram farms in the study area. The mean profit efficiency of the sampled fatteners in the study area was 0.821, with 0.94 for the bestfattener and 0.32 for the least fattener. This means that on the average, output fell by 18% from the maximum possible level due to inefficiency. The result also indicates that for the average fattener in the sample to achieve profit efficiency of his most efficient counterpart, they need about 18 per cent (1 – 82.1/94.6) x 100) cost savings while the least profit efficient fattener would need 90 per cent (1 – 0.32/0.94) x 100) cost savings to became the most efficient fattener.

Table 2: Frequency Distribution of Profit Efficiency of Ram Fatteners

Efficiency	Frequency	Percentage
0.10 – 0.49	2	1.67
0.50 – 0.59	5	4.17
0.60 – 0.69	11	9.17
0.70 – 0.79	32	26.17
0.80 – 0.89	46	38.33
0.90 – 0.99	24	20.0
Total	**120**	**100**

4.3. Profit Inefficiency in Ram Fattening Enterprise

The estimates of the coefficient of the profit inefficiency model are shown in Table 3. Generally, a negative sign on a parameter means that the variable reduces profit inefficiency, while a positive sign increases profit inefficiency. The result shows that years of ram experience, extension contact with fatteners, years ofcooperativemembership and amount of credit received by fatteners have negative signs while age, educational level, and household size have positive signs.

The coefficient of education (-0.142) was negative but not significant, implying thatthe level of education attained had no influence on profit efficiency. This is probably attributed to the fact that higher level of education is not desired for farming of ram and indeed. The coefficient of household size was (0.042) positive and significant at 5% ($p<0.05$). The positive sign indicates that the larger the family size, the greater is the profit inefficiency. This might probably due to the fact that larger households allows little kitchen wasteto be fed to the animals as usually the case with most ram fatteners in the study area. The ram fatteners believe that leftover foods contribute to the weight more than any other feed.

The coefficient of years of experience (-0.025) was negative and significant at 1% ($p<0.01$), implying that profit inefficiency decrease with years of fattening experience. A plausible explanation for this could be experience fatteners knew when to buy the animal for fattening, the features to look for and equally when to sell the animal to achieve the highest maximum profit.The coefficient of herd size(–0.132) was negative and statistically significant at 1% ($p<0.01$), meaning it increases profit efficiency of the fatteners.

The coefficient of extension contact (-1.255) was negative and not significant. This indicates that extension services in the study area are not efficient. The farmers in the study area receive little extension attention. However, the coefficient of credit is negative and significant 10% ($p<0.10$) level. The credit availability enables the farmers to procure the appropriate inputs at the appropriate time. This finding confirms that Ogunniyi (2008) who reported that large farm and access to credit reduces profit inefficiency in Cocoa yam producers of Osun State in Nigeria.

Table 4:Estimates of Profit Inefficiency Effects in Ram Fattening

Variables	ParameterCoefficient	t-ratio
Constant	δ_0	4.019 0.014
Years of experience	δ_1	-0.025 -1.640***
Level of Educational	δ_2	-0.142 -1.216
Household size	δ_3	0.042 2.314**
Herd size	δ_4	-0.132 -3.950***
Extension contact	δ_5	-1.255 2.197
Access to credit	δ_6	-0.037 -1.909*

***P<0.01, **P<0.05,*P<0.10

5. Conclusion and recommendations

The result of profit efficiency revealed high profit efficiency of 82% in ram fattening in the study area. However, there exists the scope of improving the profit efficiency by about 18%. Based on the findings of the study, the study recommends that the state government should provide feed subsidy and formal loan to the fatteners in the study area in an effort to alleviate the endemic poverty in the state. Similarly, training and extension services should be provided to the fatteners to further improve their efficiency. Also, formal education at all levels should be provided to improve farmer's awareness and ability to adopt new innovations and techniques of farming.

References

Battese, G.E. and Corra, G.S. (1977).Estimation of Production Model with Application to Pastoral Zone of Eastern Australia.*Australian Journal of Agricultural Economics,***21**: 169-179.

Coelli, T.J. (1996). A guide to FRONTIER version 4.1 computer programme for stochastic Frontier Production and Cost Function Estimation, CEPA working paper 96/67 Centre for Efficiency and Production

Analysis, University of New England, Armidale, Australia.

Cola, M. and Cola, F. (2006).Intensive Fattening in in Housing Conditions of YoungSheep Merino typePrimijeno: *Stocarsvo*, **60**(1):31 – 34.

Gazali, U. (2010). Economic Analysisi of Small Animal Production in Kano State, Nigeria. Unpublished M.Sc. Thesis of the Department of Agricultural Economics and Rural Sociology Ahmadu Bello University, Zaria

Nyagata, D. O. Ubare, G. A. Omitti, J.M. and Nyuyo, W. (2010). Technical Efficiency in Resource use: Evidence from Small Irish Potato Farmers in Nyandarua North District, Kenya. African Journal of Agricultural Research, 5 (11): 1179-1186.

Ogunniyi, L.T. (2008).Profit efficiency Cocoa yam producers in Osun State of Nigeria.*International Journal of Agricultural Economics*, 71(2): 303-310.

Rahman, S. (2003).Profit efficiency among Bangladesh Rice Farmers.*Food Policy*, 28: 483- 503.

Umar, A.S.S. (2007). Financial Analysis of small-scale Cattle Fattening Enterprise in Bama Local Government Area of Borno State. Unpublished M.Sc. Thesis of the Department of Agricultural Economics and Rural Sociology Ahmadu Bello University, Zaria

Shiawoya, E.L. (2006). Sheep Fattening Enterprise as a Strategy for Poverty Reduction: A Case Study of Some key Local Government of Niger State. *Journal of Human Ecololgy,* **20**(1): 11 – 14.

Sulumbe, I.M. (2012). Analysis of Economic Efficiency of Urban Agricultural Enterprises ofBorno State, Nigeria.Unpublished Ph.D. Thesis. University of Maiduguri, Nigeria.

Tijani, A.A. Alimi, T. and Adesiyan A.T. (2006). Profit Efficiency among Nigerian Poultry Egg Farmers: A Case Study of Aiyedo Farm Settlement, Nigeria. *Research Journal of Agricultural Biological Science*, 2 (6): 256-261.