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Profitability and Resource Use Efficiency of Poultry Egg Production in Yobe State, Nigeria

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ABSTRACT

The study was carried out to determine the profitability and resource use efficiency of poultry-egg production in Yobe State. A sample of 200 poultry-egg farmers was selected by multistage sampling technique and data were collected by using a structured questionnaire. The data were analyzed using descriptive statistics, budgetary analysis, and Stochastic Frontier Analysis techniques. The study revealed that poultry-egg production enterprise is profitable in the study area. Maximum Likelihood Estimate of coefficients of the stochastic frontier model for poultry-egg production were all positive and the parameters estimates of farm size, veterinary services, feed intake and labour were statistically significant, indicating that they contributed incrementally to the total value of poultry-egg output in the study area. Analysis of inefficiency model shows that factors influencing technical efficiency were years of experience, access to credit, cooperative membership and extension contact. Recommendations include the establishment of feed producer cooperative society, provision of adequate and timely veterinary services, and access to credit, frequent extension contacts and adult education classes for the farmers.

Key Words: profitability, resource use efficiency, stochastic frontier model, technical efficiency

Introduction

Poultry production is one of the important sub-sectors in the Nigerian economy. In addition to its contribution to the Gross Domestic Product (GDP) and provision of employment opportunities, poultry production is a major source of protein in the country. Poultry farming is an important agribusiness enterprise that has a great potential for providing additional income to our farming community and educated unemployed persons of the rural areas through creating self employment opportunities (Ohajianya, Mgbada, Onu, Enyia, Henri-Ukoh, Ben-Chendo and Godson-Ibeji, 2013). Due to the high population growth in Africa and growing income, the demand for eggs and poultry meat has significantly increased in recent years across large parts of the continent (World Health Organization 2010). According to estimates by the USAID (United States Agency for International Development), this trend is very likely to continue over the next few years. Therefore, the consumption of poultry and eggs will increase by 200% between 2010 and 2020 for at least some countries in sub-Saharan Africa (FAO, 2013; USDA 2013).

Eggs are considered a wholesome diet since an egg contains adequate amounts of protein, energy, amino acid, vitamins and minerals to satisfy the body needs. According to Ukoha and Anyanwu(2007) poultry egg nearly approaches a perfect balance of all food nutrients. The egg yolk and albumen contains 17.5% and 10% protein by weight respectively. A medium sized egg supplies about 80 calories of energy to our bodies and vitamin A. An average egg weighs about 65 gm with shell, about 50 gm without shell and contains about 6 gm of protein. A child or adult who eats egg every day is therefore sure of meeting at least one fifth of his daily requirement of animal protein from egg alone. Finally, eggs, one of the major products of poultry production, are more affordable for the common person than other sources of animal protein (Aboki et al. 2013). Tijani, Alimi, and Adesiyan (2006) reported that eggs have a number of uses apart from domestic consumption in households; they are used in confectionery, bakery products, ice cream, and cosmetics and egg shell is a good source of calcium.

Nigeria is a large Poultry egg producer recording an average annual growth rate of 4% between 2000 and 2012 when output of egg reached 640,000 tonnes. However, the rate of expansion has slowed to around 2.5% since 2008, reflecting a large increase in input costs and their impact on profitability (Food and Agriculture Organisation (FAO), 2012). Within the past few years, poultry egg production has increased significantly, the growth rates of poultry egg production has increased but not impressive. The output level still remains low compared to the input committed in production and the poultry products are grossly inadequate because the supply is lower than demand. A short fall in egg production in Nigeria has been as a result of grossly high demand for poultry egg and a dwindling supply of the product (Ojo, Jirgi and Ajayi, 2012).

This forms the focus of this study, using Yobe State as a case study because of its large unexploited market. There are few or almost non existence of literature on technical efficiency of poultry egg production in Yobe State. To this end, an up-to-date knowledge of the profitability and efficiency of resource utilization in the industry will go a long way in bridging some knowledge gap and help in formulating policies aimed at ensure increased and more profitable poultry production in the country. The study therefore specifically sought to: estimate the profitability of poultry egg farming and determine the resource-use efficiency in poultry egg farming in the study area.

Analytical Framework

Farm Budgeting Technique

Budgeting technique was used to achieve the objective I of this study. The indicators used include Net Farm Income (NFI) and profitability index. NFI = $\sum_{i=1}^{n} PiYi - \sum_{j}^{m} PxjXj - \sum_{K=1}^{K} FK$ ------(1)

Where: NFI = Net Farm Income (per 100 birds)

Yi = Output (in Crates per 100 birds)

Pi = Unit price of outputs (N/Crate)

Xj= Quantity of variable input per 100 birds (where j = 1, 2, 3,…, m)

Pxi= price/unit of variable input (N)

Fk = Cost of fixed inputs (where K =1, 2, 3… k fixed inputs)

Σ = Summation sign.

Profitability index (rate of return on an investment) was employed to explain the extent to which a Naira invested into the business will contribute to total value of outputs. The rate of return of investment into an enterprise is the ratio of net income to total cost of egg output.

The stochastic frontier production function in efficiency studies is employed in this study. The modeling, estimation and application of stochastic frontier production functions to economic analysis assumed prominence in econometrics and applied economic analysis during the last two decades. Early applications of stochastic frontier production function to economic analysis include those of Aigner *et al.* (1977) in which they applied the stochastic frontier production function in the analysis of the U.S agricultural data. Battese and Corra (1977) applied the technique to the pastoral zone of Eastern Australia, and more recently, empirical applications of the technique in efficiency analysis have been reported by Battese *et al.* (1993); Ajibefun and Abdulkadri (1999); Ojo and Ajibefun (2000).

The stochastic frontier production function was specified as;

$Y = f(X_i, \beta_i) \exp(V_i - U_i)$, i = 1,2,…..n (1)

Where,

Y is output in a specified unit,

X_i is actual input vector, $\sum_{i=1}^{n} PiYi - \sum_{j}^{m} PxjXj - \sum_{K=1}^{K} FK$ ------(1)

B_i is vector of production function parameters,

V_i is random error term with zero mean,

and U_i is non-negative one sided error term.

The V_i and U_i cause actual production to deviate from the production frontier. The V_i is the systematic component, which captures the random variation in output, which is due to the factors that are not within the influence of the producers (e.g. temperature, moisture, natural hazards). The U_i is a non-negative term representing the deviations from the frontier production function, which is attributed to controllable factors poultry egg production (technical inefficiency).

In this study, a Cobb-Douglas function was fitted to the stochastic production frontier of the Poultry-egg farmers using the Maximum Likelihood method. The Technical efficiency of an individual firm is defined in terms of the observed output (Y_i) to the corresponding frontier output (Y_i*) given the available technology, that is, TE = Yi/Yi*

Materials and Methods

Study Area

Yobe State is located in the north-east geopolitical zone of Nigeria and has an estimated population of about 2.5 Million. The major ethnic groups in the state include the Kanuri, Fulani, karekare, Bade and Hausa. Yobe State Covers a total of 54, 428sq km land area and borders the Nigerian states of Bauchi, Borno, Gombe, and Jigawa and to the north Niger Republic. Annual rainfall ranges from 500mm-1000m and the rainy season is normally from June to September in the North and May to October in the South. Yobe state is an agricultural state it also has rich fishing grounds and mineral deposits of gypsum in Fune LGA, kaolin, and quartz. The state's agricultural products include: gum arabic, groundnuts, beans, cotton. The state is also said to have one of the largest cattle markets in West Africa located in Potiskum.

Sampling Technique and Data Collection:
The data for this study were primary data collected from 200 poultry-egg farmers selected from Zone B of the Yobe State Agricultural Development Project. Zones A and C were left out because of the state of insecurity there then. Multistage sampling technique was employed in selecting the sample for this study. The first stage involved a purposively sampling. Two local government areas (Potiskum and Nangere) based on the population of poultry farmers, size and availability of market for the poultry products. The second stage involved a simple random selection of 100 respondent poultry egg farmers from each local government area. Personal interview was used to elicit data from respondents using structured questionnaires as interview guide. Data were collected on socio-economic characteristics of poultry (egg) farmers, poultry production data (such as resources used, costs, returns, prices, constraints to poultry production, number of eggs harvested per day, feeding cost, vaccination, access to and use of credit among others.

Result and Discussions

Table 1: Distribution of respondents according to socio-economic characteristics

Demographic factors	Frequency	Percentage
Age		
≤ 30	36	18
31-40	68	34
41-50	83	41.5
>50	13	6.5
Gender		
Male	88	44
Female	112	56
Marital status		
Married	136	68
Single	34	17
Divorced	30	15
Household size		
1-10	110	55
11-20	62	31
>20	28	14
Level of Education		
Formal	89	44.5
Non formal	111	55.5
Experience (years)		
1-5	106	53
6-10	51	25.5
>10	43	21.5
Flock size		
10-50	34	17
51-100	80	40

101-150	53	26.5
151-200	20	10
>200	13	6.5
Membership of Association		
Yes	60	30
No	140	70
Extension contact		
0-1	155	77.5
2-3	33	16.5
>3	12	6
Access to credit		
Yes	190	95
No	10	5

Source; Survey data, 2015

As indicated in table 1, the results of the study revealed that, the majority of the poultry egg farmers (75.5%) fall within the age range of 31-50years. This implies that poultry egg production in the area was embarked upon by men and women who were physically strong and mentally alert to face challenges which poultry farming in the developing countries like Nigeria requires. This indicate that majority of the respondents have high level of vitality for agricultural activities. The result shows that we have more women (56%) than men who are involved in poultry egg production enterprise in the study area. The dominance of women can be explained by the fact that men were the greater casualty of the insurgence in the study area when the study was carried out. Majority of the respondents (68%) are married. This shows that the society places high premium on marriage and can be considered responsible and rational in taking decisions that affect agricultural productivity and income. Table 1 also reveals that most of the respondents have large household size. This can be explained by the fact that polygamy is an acceptable way of life in the study area. It is also suggested that large household sizes enhance family labour availability, since it reduces labour constraints in poultry-egg production.55.5% of the farmers lack formal education. This can be explained by the fact that the state is generally regarded as a backward state. The low literacy level of the respondents would deny them the opportunity to understand and adopt modern farm practices thereby reducing productivity and profitability. The result shows that 53% of the respondents have between 1-5 years experience in poultry egg enterprise. Their low experienced indicates that they are not likel to understand the rudiments of egg poultry farming, because it is expected that experience in poultry-egg production usually determines the effectiveness of farmers' decision with respect to inputs combinations or resource allocation.

The study revealed that about 17% of the respondents keep between 10-50 layers, 66.5% of the respondents keep between 51-150 layers. Only 6% keep more than 200 layers. This indicates that poultry-egg enterprise in the study area is dominated by small scale farmers. Majority of the farmers (77%) receive 0-1 day contact with extension agents in a month. This poor contact with extension agents could lead to low adoption of poultry production technologies. Table 1 reveal that 90% of the respondents don't

have access to credit, while 70% don't belong to any farming association. This implies that they are less likely to benefit from sharing of information on improved technologies and collective actions of co-operative groupings.

Profitability of Poultry egg production in Yobe State

Table 2: Average Costs and Returns of Commercial Poultry egg Production Per 100 Layers

Items	Amount (₦)	Percentage
A: Variable Cost		
Cost of Feeds	152,600.40	65.59
Cost of labour	18,245.03	7.84
Cost of Flock	35,367.10	15.20
Cost of Medication	8680.30	3.73
Cost of Water	9334.74	4.01
Cost of Electricity	4736.28	2.04
Cost of Litter material	2620.13	1.13
Total Variable Cost (TVC)	231583.98	99.54
B: Fixed Cost		
Depreciation cost on:		
Depreciation on housing	398.25	0.17
Depreciation on equipment	672.88	0.29
Total fixed cost (TFC)	1071.13	0.46
Total cost of production (TC)= TFC + TVC	232655.11	
C: Revenue		
Sales of eggs	401340.60	
Sales of spent layers	75000	
Sales of poultry manure	8028.50	
Total Revenue (TR)	484369.10	
D: Net Farm Income (NFI)	251713.99	
Return to Naira invested (NFI/TC)	1.08	

Source: Field Survey, 2015

Profitability of poultry-egg production in Yobe State

The cost and returns associated with commercial poultry egg production per 100 layers in the study is presented in Table 2. Revenue was generated from the sale of eggs, sale of spent layers and poultry droppings as organic manure for utilization on crop farms. The cost of feeds constitute a proportion (65.59%) of the total cost of commercial poultry egg production (per 100 layers) and this is in tandem with the findings by Hassan, Ahmadu, Oseni, Dawang, Rahman, and AbdulSalam (2016); Emokaro and Erhabor (2014) who reported that feeds constituted the highest percentage (68%, 73% and 78.09% respectively) of total cost of poultry egg production in their studies on profitability of poultry enterprise in Nigeria. Cost of flocks and cost of labour accounted for 15.20 % and 7.84% respectively of the total cost incurred in commercial poultry egg production (per 100 layers) in the study area. This indicates that the three most important cost components of commercial poultry egg production in the study area were cost of feeds, cost of flocks and cost of labour with the cost of feeds accounting for a larger proportion (88.63%) of the total cost of poultry egg production. Thus the commercial poultry egg farmers can increase their profitability level by exploring the avenue of reducing the costs of feeds. This is in line with the findings of Tijjani, Tijani, Tijjani, and Sadiq (2012) who obtained similar results in a study on the economic analysis of poultry egg production in Maiduguri and environs of Borno State, Nigeria. The total cost of production was ₦232655.11 per 100 layer birds per production cycle. The Gross revenue realized from the sales of eggs, spent layers and poultry manure was computed to be ₦484369 per 100 layer birds per production cycle. The net farm income was estimated to be ₦251713.99 per 100 layer birds per production cycle, while the return to Naira invested is I.08. This implies that commercial poultry egg production in the study area was profitable. This finding agrees with Rahji, Akinyemi, and Akun (2015); Mukthar(2012) whose study revealed that the poultry egg business is a profitable enterprise. From the estimated net farm income and total cost of production, the returns to Naira invested in commercial poultry egg production in the study area was estimated to be 1.08 and this implies that that for every one naira invested in commercial poultry egg production, a return of N1.08 is earned as profit and this further indicated that commercial poultry egg production is profitable in the study area.

Table 3: Maximum Likelihood Estimates of the Stochastic Frontier Production Function for Poultry Egg Production in Nigeria

Variable	Coefficient	Std. error	t-ratio
General model			
Constant	1.527*	0.531	2.876
Flock size	0.182*	0.087	2.092
Feeds	0.126**	0.154	0.818
Veterinary services	0.229*	0.073	3.137
Labour	0.267*	0.053	5.037
Capital	0.047	0.733	0.064
Utilities and other expenses	0.023	0.042	0.548
Inefficiency model			
Constant	0.592	0.649	0.912

Age of poultry farmer	2.373	3.086	0.769
Experience of farmer	-0.018*	0.006	-3.000
Level of Education	-0.001	0.038	-0.026
Gender	0.151	0.495	0.305
Membership of association	-0.341*	0.119	-2.867
Access to credit	-0.363*	0.103	-3.536
Extension contact	-0.011**	0.005	-3.524
Diagnostic statistics			
Gamma (γ)	0.243*	0.007	6.021
Sigma square (δ2)	0.979**	0.460	2.145
Log likelihood function	14.99		

Source: Field Survey, 2015

Estimates of the Stochastic Production Function

The Maximum likelihood estimates of the stochastic frontier production function for poultry egg production in Yobe State are presented in Table 3. The value of gamma (γ) = 0.99 is statistically significant at the 5% level, which implies that 99% of the residual variation egg output was due to the inefficiency effect. This was further confirmed by a test of hypothesis for the presence of inefficiency effects using the generalized likelihood ratio test. The sigma (δ2) on the other hand was 0.243 and significant, indicating the correctness of the specified assumption of the distribution of the composite error term. The major factors affecting the output of poultry eggs were farm size, veterinary services, feed intake and labour. The coefficient of farm size had a positive and is significant at 1% level. This implies that poultry egg production increased with increase in number of birds kept. This finding is consistent with the findings of Ohajianya, Mgbada, Onu, Enyia, Henri-Ukoh, Ben-Chendo and Godson-Ibeji 2013); Mouktar(2012). Similarly, the coefficient of veterinary services was positive and significant at 1% level which implies that proper management involving the provision of adequate, qualitative and timely veterinary services to the birds will improve the technical efficiency of the farmers. This finding agrees with the finding of Akinyemi, Okuneye and Hosu (2015). The coefficient of feed cost was also positive and significant at 5% level. This indicates that the higher the feed intake by the birds, the greater the technical efficiency of the farmers. The positive and significant sign of the coefficient is in line with the findings of Ashagidigbi, Sulaimon and Adesiyan (2011). Furthermore, coefficient of labour variable is positive and significant at 1% level. That is an increase in labour input leads increase in the output of poultry eggs.

The analysis of the inefficiency model (Table 3) shows that the signs and significance of the estimated coefficients in the inefficiency model have important implications on the Technical efficiency of the farmers. A positive sign of their coefficients implies negative effect on efficiency while negative sign a positive effect. In this respect, the result of the inefficiency model showed that age and gender negatively influenced inefficiency of poultry egg production in the study area. This implies that poultry egg farmers in the study area tended to be more efficient technically when there were more male and younger people involved in poultry egg farming. The year of experience is negatively signed and highly significant at 1% level of probability which implies that farmers with more years of experience tend to be more technically efficient in poultry egg production. Continuous practice of an occupation for a long period presumably makes a person more experienced and more productive in practice. This agrees with (Adeoti, 2004), who reported that years of experience reduce farmers inefficiency. The estimated coefficient of access to credit is significant at 1%level. This suggests that poultry-egg producers who have greater access to credit tend to be more efficient in poultry egg production. This might be because access to credit enables the farmer to acquire improved technology which invariably promotes efficiency. The findings are consistent with earlier results of Ajibefun (2006).

Furthermore, the coefficient of membership of cooperative is negative and statistically significant at1% level. The implication is that inefficiency of poultry egg production will reduce with membership of cooperative. That is, poultry-egg producers that belong to one or more cooperative societies tend to be more technically efficient in their production. This is because membership of organisation affords the operators the opportunity of sharing information on modern poultry egg production practices by interacting with other farmers. This assertion seems to be in consonance with the findings of Idiong *et al.(* 2007).

The coefficient associated with extension in the inefficiency function was negative and statistically significant at 5% level, implying that the variable reduced farm's technical inefficiency. Poultry-egg producers access to extension in this model clearly illustrate that those who had been regularly trained and visited by extension agent, trained and participated in some demonstration trials were more technically efficient. This is probably because extension agents frequently introduce packages and information which enhance the productivity of the farms and promote their efficiency. Similar result was also obtained by Ojo,Ojo, Jirgi and Ajayi (2012).

Conclusion

The role played by poultry-egg production cannot be over emphasized. It is therefore imperative that poultry-egg farmers should be efficient in their production. This study estimated the profitability and resource use efficiency of technical and economic efficiencies of poultry-egg farmers in Yobe State, Nigeria. Based on the findings from the study, it can be concluded that the poultry-egg production is a profitable venture and that the resources were inefficiently utilized in poultry-egg production in the study area.

Recommendation

Based on the finding, the following recommendations are made:

i. Farmers should form agricultural cooperative groups that will enable them obtain credit from government and financial institutions.
ii. The establishment of adult education classes will improve poultry-egg farmers education which will make them more receptive to technological changes and invariably improve efficiency.
iii. Poultry-egg producers in the study area should establish poultry-feed producer cooperative society which will ensure regular supply of cheap feed to the farmers. Also private initiatives should be encouraged to establish feed mills.
iv. Availability and adequate provision of veterinary services at appropriate time for maximum egg producing capacity.
v. There should be increase in stock of birds to ensure full utilization of labour.
vi. Farmers should be provided loan and credit facilities at low interest rate in order to help them boost their poultry egg production level in the study area.
vii. Extension agents in the state should be properly trained and provided with all necessary technological packages required to teach and guide farmers on improved poultry egg production.

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