International Journal of Biotechnology and Microbiology
Onlien ISSN: 2664-7680; Print ISSN: 2664-7672
Received: 02-11-2018; Accepted: 04-12-2018; Published: 04-01-2019
www.biotechnologyjournals.com
Volume 1; Issue 1; 2019; Page No. 05-10

Technical Efficiency in small and medium scale poultry (egg) production in ogun state, Nigeria

Akerele EO[1], Ologbon OAC[2], Akintayo BD[3]
[1-3] Department of Agricultural Economics and Farm Management, College of Agricultural Sciences, Olabisi Onabanjo University, Yewa Campus, Ayetoro, Ogun State, Nigeria

Abstract
This study focused on technical efficiency among small and medium scale poultry farmers in Ogun State, Nigeria. The data analysis was carried out with the use of primary and secondary data through the use of structured questionnaires administered on 80 poultry farmers. The respondents were selected by multistage sampling techniques. Descriptive analysis was used to analyze the socio-economic characteristics of the poultry farmers in the study area. Multiple regression analysis was done to determine the effects of resources use on poultry production. Also, stochastic frontier production function was used to access the effect of socio-economic factors on poultry production. The findings revealed that 76% percent of the farmers had formal education up to tertiary level and 8.8% had poultry farming as their main occupation. The stochastic frontier analysis result revealed that some variables such as educational level, farm experience and credit obtained have negative coefficient and statistically significant, which implies increase in these variables will decrease the technical inefficient and positive coefficient variables will increase the technical efficiency of the poultry farmers. It is therefore recommended that the small-scale poultry farmers should be encouraged financially since the success of poultry production depends on them in the short run.

Keywords: education, birds, efficiency, budgetary, poultry

Introduction
Commercial poultry became a recognized segment of Nigeria Agriculture around 1955, (Adene and Oguntade 2006) [1]. Prior to this period all poultry products were imported from overseas countries to supplement locally available meat and egg from local chickens. In Nigeria, the production of food has not increased at the rate that can meet the increasing population. While food production increase at the rate of 2.5%, food demand increases at a rate of more than 3.5% due to high rate of population growth of 2.83% (CBN, 2004) [5]. The apparent disparity between the rate of food production and demand for food in Nigeria has led to increasing resort to food importation and high rates of increase in food prices

The demand and supply gap for animal protein intake is so high. The FAO recommends that the minimum intake of protein by an average person should be 65gm per day: of this, 36gm (i.e 40%) should come from animal sources. Nigeria is presently unable to meet this requirement. The animal protein consumption in Nigeria is less than 8gm per person per day, which is a far cry from the FAO minimum recommendation (Niang and Jubrin, 2001) [12]. As a result of the above, widespread hunger and malnutrition are evident in the country. Poultry meat and egg offer considerable potential for bridging the nutritional gap in view of the fact that high yielding exotic poultry are easily adaptable to our environment and the technology of production is relatively simple with returns on investment appreciably high. Animal scientists, economists and policy makers are of the opinion that the development of the livestock industry is the only option for bridging the generally known protein deficiency gap in a Nigerian's diet (Mbanassor and Nwosu, 1998) [11].

Apart from its contribution to the gross domestic product and provision of employment opportunities, poultry production is a major source of protein in the country, (Ajibefun and Daramola, 1999) [3], the need to meet source of protein requirement from domestic sources demands intensification of production of meat and eggs derived from prolific animals like poultry birds. Poultry production has long been recognized as one of the quickest ways for a rapid increase in protein supply in the shortest run.

Of recent, there has been a recorded improvement in poultry production sub- sector in Nigeria with its share of the gross domestic Product (GDP) increasing in absolute terms. Poultry eggs and meat contribution of the livestock share of the GDP increase from 26% in 1995 to 27% in 1999, (CBN, 1999) [4] and the relative ease of compounding efficient food using easily available local feedstuff (Afolabi and Ojo, 2000) [2]. This improvement could further be sustained with a proper analysis of the factors affecting technical efficiency of the poultry farmers. Determining the efficiency status of farmers is very important for policy purposes. In an economy where technologies are lacking, efficiency studies show the possibility of raising productivity by improving efficiency without increasing the resource base or development new technology. It also helps to determine the underutilization of factors- inputs. Most of the empirical literatures dealing with farm efficiency, at least in Nigeria have been concern with measurement of efficiency by using production function, profit function or stochastic production frontier model as analytical techniques. The first analyses of efficiency measure

started with Farell (1957) who drawing inspiration from Debreu (1951) and Koopmans (1951) [8] proposed a division of efficiency into two components: technical efficiency which represents a firm's ability to produce a maximum level of output from a given level of inputs and a locative efficient which is the ability of a firm to use inputs in optimal proportions, given their respective prices and available technology. The combinations of these two measures yield the level of economic efficiency.

Small and medium scale poultry farmers are faced with a lot of problems which have stood as barrier to their existence and growth and which in one way or the other affect not just the agriculture sector but the Nigeria economy at large (Laseinde 1982) [10]. Some of these problems are attributable to the risks that are encountered in poultry farming. Absence of detailed analysis and management of the risks in poultry farming has acted as a clear impediment to the growth of the subsector.

Objectives of the Study

The broad objective of the study is to analyze technical efficiency in small and medium scale poultry (egg) production in Ogun State. The specific objectives are to assess the factors affecting efficiency of resource use in poultry (egg) production in the study area; and determine the effect of socio- economic variables on the productivity of egg producing farms.

Methodology

Study Area and Methods of Data Collection

The empirical setting for this study is Yewa Division of Ogun State, Nigeria. Both primary and secondary data were used for the study. The primary data were collected through structured questionnaires coupled with oral interview to collect information bothering on socio-economic variables, input cost, labour, output level, risks on productivity etc. while secondary data were obtained from past records, journals, magazines, internet and periodical publications.

Sampling Techniques

Multistage sampling technique was used for the study. The first stage involved the selection of two Local Government Areas, namely: Yewa North and Imeko A fon Local Government Area out of the six Local Government Areas in the study area. The second stage involved random selection of 4 communities from the two selected local government areas. while, the third stage involved random selection of 10 poultry farmers from the selected communities. A total of 80 respondents were used for the study. Out of the 80 sampled farms, fifty (50) were small while the thirty (30) were medium scale poultry farms. Following Ojo (2003) [13], farms containing was <1000birds were considered as small farms; farms with 1000- 3000 birds as medium farms while those having 3000 and above birds were classified as large farms.

Methods of Data Analysis

Both descriptive and inferential statistics were used in analyzing data collected for this study. Descriptive statistical technique was employed. The tools involved the construction of frequency tables and charts which were used to describe and compare the different socio-economic characteristics such as age, sex, educational level, occupation and household size of the farmers.

Model Specification

The Cobb-Douglas functional form of the production function for the stochastic frontier production approach was assumed because it is self-dual and therefore possible to derive the corresponding cost estimates needed to compute economic efficiency. The logged empirical Cobb-Douglas function is written as:

$$InY = \beta_o + \beta_1 InX_1 + \beta_2 InX_2 + \beta_3 InX_3 + \beta_4 InX_4 + \beta_5 InX_5 + \beta_6 InX_6 + \beta_7 InX_7 + e_i (V_i - U_i) \ldots\ldots \ldots\ldots \ldots\ldots \ldots\ldots \ldots\ldots \ldots\ldots \ldots\ldots.. \text{(i)}$$

Where:

Y = Number of eggs produced (in crates).

X_1 =Farm size (number of birds in stock)

X_2 = Age of layers (weeks)

X_3 = Location of the farm (site in village 1, site in the town = 0)

X_4 = Total quantity of feed given to birds (kg)

X_5 = Total amount of family/hired labour used (manday)

X_6 = other variables expenses except feed and labour (N) (i.e energy, electricity, water, drugs, etc)

X_7 = Total cost of fixed inputs includes insurance and depreciation on poultry housing, cages and other fixed equipment (N)

β_o = Constant (intercept)

β_I = Parameters to be estimated

U_i = Input inefficiency effects which are assumed to be identically and independently

Distributed with zero mean and constant variance N ($\mu\sigma^2_v$)

V_i = are non-negative truncation at zero or half normal distribution with N ($\mu\sigma^2_u$)

If $U_i = 0$, no allocative inefficiency occurs, the production lies on the stochastic frontier.

If Ui > 0, production lies below the frontier and the system is inefficient.

In addition to the general model, this inefficiency model was defined to access the effect of socio-economic factors on production efficiency. The inefficiency model is defined as:

$$U_i = \delta_o + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5 + \delta_6 Z_6 \ldots\ldots \quad (2)$$

Where:

Z_1 = Age of Farmers (years)

Z_2 = Sex of Farmers (Male = 1, Female =0)

Z_3 = Farmers' level of formal education

Z_4 = Farmers' experience (years)

Z_5 = Marital status (married = 1, otherwise = 0)

Z_6 = Family size (number)

Z_7 = Credit obtained (Naira)

δ's,β's and Y coefficient are unknown parameters to be estimated along with the various parameters which are expressed in terms of $\delta^2 s = \delta_v^2 + \delta_u^2$; Y (gamma) = $\delta_u^2/\delta^2 s$ where the Y – parameter has value between zero and one (0<Y<1).

To determine the effect of socio–economic variables on the productivity of egg farms

Ordinary Least Square (OLS) Regression model was used.

$$Y= b_o+ b_1X_1 + U$$

The Implicit form is

$$Y= Bo+b_1X_1+b_2+X_2+b_3X_3+\ldots\ldots\ldots\ldots b_8X_8 + U$$

Where:

Y = Dependent variable (TFP)

B_0 = Constant (intercept)

$\beta_1 = (b_1- b_9)$ = Coefficient of explanatory variables (X_1-X_9)

X_1 = Farm location

X_2 = Gender (male = 1, female = 0)

X_3 = Marital Status

X_4 = Age (years)

X_5 = Year of formal education (years)

X_6 = Year of experience in poultry production (years)

X_7 = Labour (manday)

X_8 = Monthly income (Naira)

U = Error Term

Results and Discussion

Table 1: Socio- Economic Characteristics of Poultry Farmers

Variables	Frequency	Percentage
Age (years)		
21-40	40	50.0
41-60	35	43.8
61-80	5	6.3
Sex		
Male	57	71.3
Female	23	28.8
Educational Level		
No formal education	19	23.8
Primary School	7	8.8
Primary school	22	27.5
NCE/OND	14	17.5
B. Sc/HND	10	12.5
MBA and above	8	10.0
Location		
Rural	63	83.0
Urban	17	17.0
Marital Status		
Single	26	32.5
Married	47	58.8
Divorced	2	2.5
Widow	5	6.3
Household Size		
Less than 5	48	60.1
6-10	31	38.9
11 or more	1	1.3
Farming Experience (years)		
1- 2	20	25.0
3 - 5	40	50.1
6 - 8	15	18.7
9 - 11	2	2.5
12 – 14	3	3.7
Main Occupation		
Poultry farming	79	98.7
Others	1	1.3
Source of Income		
Personal savings	46	66.0
Other and personal savings	34	34.0
Total	80	100

***Source*:** Field Survey, 2014

From findings revealed that the age of the farmers is an important factor that affects their level of productivity and overall coping ability in poultry business. Age is also believed to influence the level of physical work and the willingness to take risk. Age distribution showed that the majority of the respondents are below 60 years. This implies that the age groups of the farmers are within the active ages; thus, having high level of productivity. This is because this age group is

less risk averse, more educated and more likely to adopt innovation that would enhance production. Poultry farming like any other business require experience and managerial skill, which are associated with age. The greater proportion of the economically active age group is indicative of the potential that exist for adoption of any intervention that could serve as a preventive measure for future outbreak of birds flu and other poultry diseases.

Sex determines the ability to perform some physical works. It also known that men are more competent in farming than women. This is because they are more energetic than their women. Table 1 showed that 71.3% of the respondents are males while 28.8 % of the respondents were females. This is means that poultry farming in the study area was dominated by male poultry farmers. This could be due to the energy demands of the venture.

Educational level is a key factor in shaping the perception of farmers and it also influences adoption decision of farmers. This study shows that farmers with formal education have a great ability to adopt new technology and innovation. This is expected to have a positive influence on their level of efficiency. The finding showed that 76% the respondents had their formal education, while 24% of the respondents had no formal education. The high level of education among farmers in the area of study could mean that most of the farmers are into other professions and only embraced poultry rearing as a part – time venture.

The study revealed that the poultry farmers are more concentrated in rural areas than in the urban areas. About 83% of the farms were located in the rural areas, 16% of the farms were located in the areas while 1% of the farm were located in both the rural and the urban areas. This is so because rural areas have more land to spare for poultry production and for dispose of poultry wastes. The distribution according to marital status showed that 58.8% of the respondents were married. This means that majority of the respondents were settled family people and also have family responsibilities. As households expand, there is increased need to get more income through poultry production so as to meet the needs of the family

Household size is the total number of people living together in a house, feeding from the same pot. It is expected to have a negative influence on efficiency. Okike (2000) [14] confirmed the negative influence of household size on farmer's efficiency. Large family size having economic inefficiency is reasonable considering the value of the farm products that could have been sold but are consumed directly by the household size is large and only a small proportion of the farm labour is derived from it, then inefficiency effects is expected to be greater. This implies that the labour requirements of poultry farming can be easily obtained from family source if so required.

Farming experience could have negative or positive effect on the efficiency of the farmer. Parikh *et al* (1995) [15] reported a positive relationship between the age of the farmers (which is positively correlated with farming in Pakistan and Ethiopia respectively. This finding stem from the fact that farmers with more years of experience are older and are therefore less willing to adopt new efficiencies in production. The table indicates that 50% of the respondents had 3 to 6 years of farming experience. These findings indicate that the farmers must use of improved inputs to the increase the level of production. This implies that appreciable proportion of the farmers were quite knowledgeable in poultry production and management. The number of year of experience of a poultry farmer could be an important factor in predicting adoption behaviour.

It is common for some farm household to engage in other non-farming activities to complement their earning from the farming occupation for their livelihood. It could be positive or negative (Dada 2000).From the findings, it is revealed that about 98% are into poultry production as the main occupation while few 1.3% are into other business. The table above, revealed that majority (98.7%) of the poultry farmers are into full time poultry farming while 1.3% of the respondents engaged in other non-farm activities. This implies involvement of the farmers in poultry production is profitable and positively influenced their standard of living. About 66% of the respondents had their source of income from their personal saving while 34% of the respondents had their source of income both personal saving and other sources like loan from bank or cooperative societies etc. It is revealed that farmers also acquire credit for their production. This implies that credit has a direct, positive and significant relationship with the farm output.

Affecting the Efficiency of Resources Use in Poultry Production

Production was done to examine inputs efficiency in poultry production. The production function and inefficiency model estimate were estimated by Maximum Likelihood Estimate (MLE) and the result are presented in Table 2. There was presence of technical in efficiency using the generalized likelihood ratio test. The coefficient of types of birds reared, total amount of family and hired labour, location of the farm and the total cost of fixed inputs are significant at 1%, 5% and 10% respectively; while the coefficient of all other variable expenses were not significant. The estimated model has been derived as:

$$InY= 0.145 - 0.249X_1 + 0.552X_2 + 0.128X_3 +0.140X_4 - 0.600X_5 - 0.756X_6 +0.258X_7 + V_i - U_i$$

From the above equation, it shows that four X_2,X_3,X_4 and X_7 of the coefficient contributes positively to technical efficiency, farm size, total family/hired labour and total variable expenses affected technical efficiency negatively. Thus, this implies that variable allocation and use of the three positive coefficients were in stage of economic relevance of the production function (Stage 1). From the model equation it follows that a unit increase in the age of birds (in week) reared will increase output by 0.552, while productivity of bird will increase by increasing the quantity of feeds give to the birds as they gradually increase in age.

The analysis of the inefficiency model showed that the signs and significance of the estimated coefficients in the inefficiency model have important implication. The co-efficient of farmer's age is positive indicating that this factor leads to an increase in technical inefficiency. This result may be due to the fact the older farmers, even though they may have acquired much experience, may not be active enough to cope with the rigors of the routine management practices. The

negative sign of the educational level variable indicates that the more the farmers get educated the lesser the technical inefficiency, that is, increase in education will increase technical efficiency of the poultry farmers. Other variables such as farm size and farm experience have their co-efficient statistically significant, implying that increase in these variables will decrease the technical inefficiency of the farmers.

Table 2: Production Function and Inefficiency Estimates in the Poultry (Egg) Production System

Variable name	Parameters	OLS	MLE
Stochastic Frontier			
Constant	β_0	0.185 (0.921)***	0.145* (0.179)
Farm size	β_1	-0.337 (-0.104)	-0.249. (-0.132)
Age of layers	β_2	0.451 (0138)**	0.552** (0.260)
Location of the farm	β_3	0-130 (0-119)	0-128** (0.150)
Quantity of feeds	β_4	0.188 (0.129)	0.140.. (0.158)
Total family/ hired labour	β_5	-0.352 (-0.871)***	-0.600* (-0.190)
Total variable expenses	β_6	-0.762 (-0.116)	-0.756 (-0.142)
Total cost of fixed input	β_7	0.260 (0.124)**	0.258*** (0.171)
Inefficiency model			
Constant	δ_0	-	0.173 (0.821)
Farmer's age	δ_1	-	0.677*** (0.220)
Farmer's sex	δ_2	-	-0.589 (-0.569)
Famer's level of education	δ_3	-	0.364 0.986*
Famer's experience	δ_4	-	-0.135 (-0.199)
Marital status	δ_5	-	-0.711 -0.116**
Family size	δ_6	-	(-0.157) (0.1650
Credit obtained	δ_7	-	-0.123 (-0.165)
Variance parameter			
Sigma – squared		0.181	0.202 (0.334)
Gamma		0.133	0.487 (0-209)
Log-likelihood function			0.125
LR test			0.146
Mean technical efficient			0.581

Figures in parenthesis are t- value; *= significant at 1%, ** = significant at 5%, *** = significant at 10% Source: Field Survey 2014

Input Uses and Technical Efficiency

Input use varies across all farms and range of technical efficiency. The most efficiency producers (technical efficiency greater than 25%) use more input than producers who are technical less efficient Table 3 detailed input used across various level of technical efficiency. They used input combinations such as labour, capital and land. However, though, they still use input below the recommended rates, for example, the drugs and feeds are slightly below the recommended rate. There is an input substitution among the least technically efficient producers.

Table 3: Decile Range of Technical Efficiency

Range	Frequency	Percentage
0.10 – 0.19	5	6.3
0.20 – 0.29	7	8.8
0.30 – 0.39	6	7.5
0.40 – 0.49	10	12.5
0.50 – 0.59	8	10.0
0.60 – 0.69	13	16.3
0.70 – 0.79	11	13.8
0.80 – 0.89	20	25.0
Total	80	100.0

***Source*:** Computed from the Results of Translog Stochastic Frontier. Field Survey, 2014

Problems Encountered By Poultry Farmers

As shown in Table 4, the study revealed that high cost of feeds (54%) was a major problem facing the poultry farming in the study area. Poor management and lack of funds and capital are also other major problems in the study area. Reason for this may be due to the fact that only few respondents had access to credit facilities or loan from financial institutions. Disease outbreak, reduced laying capacity and high cost of equipment, high cost of feeding were also problems that facing poultry farmers in the study area. Efforts must be made to make fund available for farmers' production in order to increase their output.

Table 4: Problems Encountered by Poultry Farmers.

Problems	Frequency	Percentage
High cost of feed	54	67.5
Inadequate capital	10	12.5
Poor management	7	8.75
Disease outbreak	5	6.25
High cost of equipment	2	2.50
Pilferage and reduced capacity laying	2	2.50
Total	80	100.0

***Source*:** Field Survey 2014.

Conclusion and Recommendations

The study examined the technical efficiency among small and medium scale poultry farmers in Yewa Division, Ogun State. From the findings, it was found that the poultry production is generally profitable but the extent of profitability was depended on poultry farm size, the total quantity of feed, total of all variable expenses, total amount of family and hired labour. The location of the farms and total cost of fixed inputs have positive effect on the poultry production. This indicates that the output of poultry farms increased with a positive effect in the types of bird reared, location of the farm and total quantity of feeds. To achieve a higher level of poultry production, there is need to increase the technical efficiency of the poultry farms in Ogun State. The stochastic frontier analysis revealed that some variables such as educational level, farm experience and credit obtained have negative coefficient and are statistically significant which implies increase in them will decrease the technical inefficiency of the poultry farmers. Based on the findings, it is therefore recommended that Government should encourage the establishment of more livestock feed mill to increase the availability of concentrate at affordable prices. This will reduce the total production cost in poultry that is allocated to feeds increasing the maximum intake by birds for eventual growth in production. Education should be provided for risk, pests and diseases that are often after the poultry production output

References

1. Adene DF, Oguntade AE. The Structure and Importance of the Commercial and Village-Based Poultry Industry in Nigeria. FAO (Rome) Study. October, 2006.
2. Afolabi, Ojo SO. Economic Analysis of Replacing the Fish meal component in broiler Starter Mash with gliricidia sepium. Animal Option Book of Proceeding. Edited by S.N Ukachukwu *et al*., A. F. Farming J. Jan/Feb, 2000, Pp. 4
3. Ajibefun IA, Daramola AG. Measurement and Sources of Technical Inefficiency in Poultry Egg Production in Ondo State, Nigeria. Journal of Economics and Rural Development. 1999; 13(2):85-94.
4. Central Bank of Nigeria, Annual report and statement of accounts CBN publications, 1999.
5. Central Bank of Nigeria, Annual Report and Statement of Account CBN Publications, 2004.
6. Central Bank of Nigeria, CBN Statistical Bulletin, CBN Publication, 2004.
7. Dada SL. Problems and prospects in Poultry Production. B. Agric Project, Almadu Bello University, Zaria, 2000, pg 63.
8. Debereu, Koopmans. The Coefficient of Resources Utilization' Dams Econometrica, 1951, pp. 273-292.
9. Farrel MJ. The Measurement of Productive Efficiency. Journal of Royal Statistical Society (Series A, General. 1957; 120(3):253-290.
10. Laseinde EAO. Theory and Practical on Poultry Farming. Agricultural Colleges Newsletter. Ahmadu Bello University, Zaria, Nigeria. 1994; 5(2):22-28.
11. Mbanassor JA, Nwosu AC. Economic Revival and Sustenance in Nigeria. The Analysis of Livestock Industry. Proceeding of silver Anniversary Conference of NASP/WASAP Inaugural Conference March 21 -26, Nigeria Paper No, 1998, 223, Pp 442
12. Nang T, Jubrin S. Quarterly Newsletter of the Nigeria Agricultural Question and Answer Service, 2001, 1:3.
13. Ojo SO. Productivity and Technical Efficiency of Poultry Egg Production in Nigeria. International Journal of Poultry Science. 2003; 2(6)459.
14. Okike I. crop Livestock Interactions and Economic Efficiency of farmers, 2000.
15. Parikh A, Shah K. Measurement of Technical Efficiency in the North-West Frontier Province of Pakistan". Journal of Agricultural Economics. 1995; 45:132-138.