Journal of Agriculture and Food Sciences **A.I.N. Kaine and E. E. Chukwuma**
Volume 15 Number 1, April 2017 pp. 28 - 38.

TECHNICAL EFFICIENCY AND PROFITABILITY OF BACKYARD POULTRY FARMING IN IKA SOUTH LOCAL GOVERNMENT AREA, DELTA STATE, NIGERIA

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ABSTRACT

The study focuses on the determination of technical efficiency and profitability of backyard poultry farming in Ika South Local Government Area, Delta State, Nigeria. There is a considerable amount of literature in the field of measurement of efficiency; however, the existing knowledge with respect to technical efficiency and profitability of backyard poultry farming in Ika South Local Government Area, Delta State is limited hence the need for the study. Multi-stage sampling procedure was used to select fifty respondents in the study area. Data was collected using questionnaire. Gross margin analysis and stochastic frontier production function were used to analyze the data. The study revealed that the sum of N57,897 was realized by the average backyard poultry farmer. Further investigation revealed that return on investment was N1.39. This implies that for every one naira invested in poultry production, there was a return of N1.39. This also implies that poultry production was profitable. The production frontier regression analysis also revealed that costs incurred on medication, water and light were positive significant determinants of output (return) while costs of feeds and labour were negative significant determinants of output. The variable costs made up of costs of medication, water and light (1.624101) (1.084313) were underutilized. There is need to increase the use of these resources. Similarly, the factors of production-labour cost (-3.405360) (5.158468) and expenses on feeds (-3.36427) (10.76588) were over utilized. The use of these resources should be reduced. The result also showed their response were technically (55%) efficient.

Keywords: Technical efficiency, profitability, poultry, fixed cost, variable cost and output.
https://dx.doi.org/10.4314/jafs.v15i1.4

INTRODUCTION

Poultry farming involves raising domesticated birds (chicken, turkey, duck, quail and geese) for the purpose of meat or eggs for food. Poultry farming in Nigeria has not only proven to be one of the most important aspects of farming but also a very profitable business venture that provide income and employment. Poultry farming has occupied a very significant position in

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Nigerian economy. It is the fastest growing section of the agro-livestock industries (CBN, 2006).

Marketing of poultry product like egg and poultry meat is continuously on increase near urban areas. Today layer units of 100,000birds and above under the cage system is common. As at 2011 Nigerian egg production totaled 636,000mt and was valued at N527.49 million ranking 19th in the world hen egg production and Nigeria is the top producer in Africa. The value of output from the poultry sector in the country is N51.2 Billion. The percentage of eggs produced in the country is 25% of the agricultural Gross Domestic Product (GDP) (CBN, 2006). This probably accounts for household domestication of birds (backyard poultry) among rural and urban dwellers.

Technical efficiency is a measure of performance. It is the ratio of input used to produce maximum output. Factors affecting technical efficiency are assumed to be due to household specific demographic characteristic (Unai, 2001). Ogunfowora *et al* (1978) observed that gains derived from efficiency are important especially in period of financial stress. Efficiency analysis is also essential in comparing the attributes of the farm operating near the frontier (Alabi, 2005).Efficient farms are said to generate higher income and stand a better position of surviving and prospering (Osuji, 1978).

The existence of technical efficiency in production offers opportunity to curtail the use of input without negatively influencing production. Such opportunities are of great interest to rural poor who are limited in asset (financial, human and natural) since they have the potential of substituting excessive allocation of on-farm labour time for off-farm and thus increasing their level of income generation (Unai, 2001).Similarly, identification of technical inefficiencies is useful to policy-makers interested in conserving the productive potential of fragile agro ecological zones without impacting negatively on the agricultural end users of the natural resources. This so because input reduction (e.g. in forest-vegetation complex) could lead to reserve negative environmental externality effects on the production process.

Although, there is a considerable amount of literature in the field of measurement of efficiency, the existing knowledge with respect to technical efficiency and profitability of backyard poultry farming in Ika South Local Government Area, Delta State is limited. It is against this background that this research was carried out.

OBJECTIVES OF THE STUDY

The general objective of the study is to highlight the technical efficiency and profitability of backyard poultry farming in Ika South Local Government Area, of Delta State, Nigeria. The specific objectives are to:

a. Describe the socio-economic characteristics of backyard poultry farmers in the study area;
b. Determine the net profit margin;

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c. Determine the return on investment of the backyard poultry production ; and
d. Determine the technical efficiency of backyard poultry farmers.

METHODOLOGY

The study area has a total population of 167,060 men (82,214) and women (84,846) (Federal Republic of Nigeria official gazette, 2009). It is purely agrarian setting with large forest reserve. Farming is the primary occupation of the people. Crops grown include; egusi (melon),oil palm, vegetables, pepper, pineapples, plantain, rubber, cassava, and yam. They also practice other form of farming like fishery, poultry farming and micro animals.

A total of fifty respondents were randomly selected for the study. A random selection of ten respondents from each of the five clans that make up the study area was adopted. Both primary and secondary data were obtained for the study. Primary data was obtained by the use of structured questionnaire administered to the respondents in the study area. Secondary data was obtained from journals, research report, textbooks, bulletin, past projects and internet.

Descriptive statistic (such as percentages, frequencies, means and tables) was applied for the data analysis. Net profit, Gross margin analysis and stochastic frontier production function were used to determine data collected. The net profit margin analysis was used to determine the returns or the profitability of poultry production. Stochastic frontier production function was used to determine the technical efficiency of poultry farmer in the study area.

MODEL SPECIFICATION

Stochastic Frontier Production Function

The empirical model of stochastic frontier production function Aigner et al, (1977) is specified as:

$$InQ = a_o + \beta_1 InX_{ji} + \beta_2 InX_{2ji} + \beta_3 InX_{3ji} + \beta_4 InX_{4ji} + \beta_5 InX_{5ji} + \beta_6 InX_{uji} + U_i$$

The subscripts $_j$i refers to the $_j$i-th farmer

Where

Q = Total value of output (N)
$X_{1\ (BIRDQTY)}$ = Quality (Number of birds)
$X_{2\ (FAMCOST)}$ = Depreciated or fixed cost (N)
$X_{3\ (LABCOST)}$ = Family (Household) and Hired labour (monthly)
$X_{4\ (FEEDEXP)}$ = Expenses on feeds
X_5 (MWLEXP) = Expenses on medication, water and light
X_u = A random error term independently distributed with mean zero and δv^2, intended to capture events beyond the control of the farmers.
U_i = Non-negative random variable called technical inefficiency effects associated with technical inefficiency of the farmers.

The parameters of production function model was obtained by maximum likelihood estimation model using the computer programmed, FRONTIER

DETERMINATION OF NET PROFIT MARGINS AND PROFITABILITY

In order to determine the profitability of poultry farmers, the gross margin was used. Gross Margin Analysis (GM) is the difference between Total Revenue (TR) and total variable cost (TVC).Net Revenue (profit) margin is the difference between Gross Margin and depreciation. Gross margin and net profit are expressed as:

GM = TR - TVC
TC = TVC + TFC
NPM = GM - Depreciation.
Where
GM = Gross Margin
TR = Total Revenue (₦)
VC = Variable Cost (₦)
NPM = Net Profit Margin.

Return on Investment

Return on investment (ROI) is a measure of profitability of any given project. It was used in this study to determine the return on investment. It was obtained based on the ratio of the net profit for each of products divided by total cost of production and multiplied by 100. The equation is expressed as:

$$ROI = \frac{\text{Net Profit}}{\text{Total Cost}} \quad X\ 100$$

RESULTS AND DISCUSSION

Socio-Economic Characteristics of Backyard Poultry Farmer: Socio-economic characteristics of the backyard poultry farmer in the study area include gender, age, poultry farming experience, marital status, level of education and house hold size.

Sex: The sex distribution of backyard poultry farmers as indicated in Table 1 showed that twenty-seven (77%) of the backyard poultry farmers were male while the remaining eight (23%) were female. The result showed that poultry farming in the study area was dominated by male. It also revealed that poultry farming in the area was not restricted to male folks only.

Age: The age distribution in Table 1 showed that eighteen (51.42%) of the poultry farmers were within the age bracket of 25-34, six (17.14%) were within the age bracket of 35-44, seven (20%) were within the age bracket of 45-54 and four (11.42%) were within the age bracket of 55 and 64. The mean age of 39 years revealed that poultry farmers in the study area were relatively young. Young farmers are more receptive to technological change and

adoption. The mean age of 43 years reported by Kaine *et al* (2015) was however higher than observed mean age of 39 years in this study. It was equally less than the mean age of 43 years reported by Ike and Inoni (2006) and a mean age of 48 reported by Ajibefun (2002).

Production Experience: The poultry farming experience as indicated in Table 1 revealed that poultry farmers were well experienced, as the mean farming experience was 6.8 years.

Marital Status: Table 1 further showed that majority of the poultry farmers: seventeen (48.57%) were single, sixteen (45.71%), were married, one (2.86%), widow and one (2.86%) divorced. This implies that poultry farming in the study area was not for married people only.

Educational Attainment: Further investigation as indicated in Table 1 showed that literacy level was high. Thirty-two (91.3%) of the poultry farmers had one form of education, or another, three (8.5%) had no formal education.

Household Size: Table 1 also showed that the average household size was six. The result further showed that fifteen (43.86%) of the poultry farmers had family size of between 0-5, eleven (31.47%) had family size of 6-10 while nine (25.71%) had a family size of 11-15. The study on household size was essential as it influences the supply and availability of family labour which depends largely on the household size and its age structure (Ojo and Ajibefun, 2000). House hold size can have influence on the household expenditure on food, clothing and shelter. A large household size is of great advantage in the provision of cheap labour force.

Sources of labour: The analysis of source of labour as presented in Table 1 showed that three (8.47%) of poultry farmers used family labour, twenty (57.14%) used hired labour while the remaining twelve (34.28%) used integrated form of labour.

Net Profit Margin (NPM)

Profitability of poultry farming was determined by computing the value of output of all the respondents for the period of one year and the net change in the farm income was estimated by computing the net profit. For the purpose of uniformity, ease of comparison and evaluation, the current price was used to determine the net poultry income and loses were computed by finding the differences in value of output for the given time frame.

In order to estimate the net income (i.e. profit) or net margin, cost items, averages output and income were estimated and determined using net profit analysis. The cost items were made up of variable cost and fixed cost. Fixed cost items include, cost of acquiring all fixed assets and inputs used. Variable cost items include, cost of purchasing feeds, hired labour, family labour, birds, medicine/vaccine/water and transportation.

Table 3 showed the various cost item used in poultry production in the study area. The result revealed a total income of N2,686,572 was realized. Further analysis showed a net profit

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margin of N2,026,394 with an average of 56 (27broilerand 29 layer) birds per poultry farmer. The value of the net profit margin was positive indicating an increase in productivity. The positive value showed that poultry farmers in the study area were making profits. An average profit of ₦57, 897 was realized by each of the backyard poultry farmer in the study area.
Return on Investment of backyard Poultry Production

$$ROI = \frac{\text{net profit}}{\text{Total cost}} \times \frac{100}{1}$$

Net profit = 2,686,572
Total cost = 1,461,428

$$ROI = \frac{2686572}{1,461,428} \times \frac{100}{1}$$

ROI = 1.39

The calculations above show that for every N1.00 invested in poultry production there was a return of N1.39. This implies that backyard poultry farming in the study area was profitable.

Technical Efficiency of Backyard Poultry Farming

The analysis as indicated in Table 5 showed that the farm expenses on medication, water and light (1.624101) (1.084313) as indicated by their coefficients and standard errors were positively and statistically significant at 5% level. The resources were positive determinants of output. On the other hand, the variables labour (-3.405360) (5.158468) and feed (-3.362427) (10.76588) were negatively statistically significant determinants of output. A detailed investigation further revealed that the factors of production – expenses on medication, water, and light (1.624101) (1.084313) were underutilized indicating that the factors of production must be increased. It also implies that output can be improved by using more of these inputs. Table 5 also showed that the resources labour cost (-3.405360) (5.158468) and expenditure on feed (-3.362427) (10.76588) were over-utilized as indicated by their coefficients and standard errors. This implies that output can be improved by using less of these variables. The t-value of the variables: farm cost-expenses on medication, water and light (1.49816) as in Table 5 were statistically significant as their calculated t-value were greater than their theoretical table value at 5% level of significance.

The R^2 of 0.547660 revealed that about 55% of the systematic variation in backyard poultry farming was technically efficient. The adjusted R-squared (R^2) of 0.510396 revealed that about 51% of the systematic variation was explained by the determinants of technical efficiency. The F-statistic confirmed the overall model is statistically significant at 5% level of significance. The Durbin-Watson statistic of 1.85 showed the absence of auto correction among error terms in the model.

SUMMARY AND CONCLUSION

The study examined the technical efficiency and profitability of poultry production in Ika South Local Government Area, Delta State Nigeria. It also examined the Socio-economic characteristics of the farmers in the study area. Data used for the study were generated through primary and secondary source. The primary source of data was collected through questionnaire distributed to fifty respondents selected from 10 clans that constitute the study area. Data generated were analysed using descriptive statistics (frequencies, means and percentages) and the production frontier.

Conclusion

The study showed that backyard poultry farming in the study area was a profitable venture and that for every one naira invested, there was a good level of return on investment (N1.39). It also established that output was a function of farm size, quantity and quality of birds produced.

Recommendations

Following the result of the study, recommendations were made as follows:

It is recommended that campaign on the potentials, economics and/or profitability of backyard poultry farming and/or poultry production should also be carried out. By this, many youths will be gainfully employed.

Since expenses on medication, water and light were underutilized output can be increased by using more of these resources.

Since resources – Labour and expenditure on feeds were over utilized; there is need for a reduction in the use of these resources.

Since the variable cost items dominated in poultry production, government intervention in price reduction of these commodities is therefore recommended

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Table 1: Socio Economic Characteristics of Backyard Poultry Farmers

Characteristics	Frequency	Percentage	Mean
Gender			
Male	27	77.14	
Female	8	22.86	
Total	35	100	
Age (Categories)			
25-34	18	51.42	
35-44	6	17.14	
45-54	7	20.00	
55-64	4	11.42	
Total	35	100	39
Poultry Farming Experience			
0-5	12	34.28	
6-10	11	31.43	
11-15	5	14.28	
16-20	3	8.57	
20-25	4	11.42	
Total	35	100	6.8
Marital Status			
Married	16	45.71	
Single	17	48.57	
Widow	1	2.86	
Divorced	1	2.86	
Total	35	100	
Level of Education			
No formal education	3	8.57	
Primary school	3	8.57	
Secondary school	13	37.14	
Others	16	45.71	
Total	35	100	
Household Size			
0-5	15	42.86	
6-10	11	31.47	
11- 15	9	25.71	
Total	35	100	6.4
Source of Labour			
Family	3	8.47	
Hired labour	20	57.14	
Mixed	12	34.28	
Total	35	100	

Source: Field Data 2015

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Table 2: Average Depreciated values of Inputs used in Poultry Farming

Inputs	No.	Unit cost	Total cost	Life span Years	Depreciated Value
Cage	4	225,000	900,000	5	180,000
Shovel	4	5,250	21,000	4	5250
De-beaking Machine	3	54,250	162,750	5	32550
Crate	350	85	29,750	4	7438
Feeder	79	550	43,450	5	8690
Drinker	75	550	41,250	5	8250
Pen	38	55,000	2,090,000	5	418,000
Total					660178

Source: Field Data, 2015

Table 3: Average Cost and Return of Backyard Poultry Production and Profitability Analysis

Cost Items	Value (₦)
A. Variable cost (VC)	
Feeds	108,250
Hired labour	25,000
Household labour	15,000
Total labour cost	40,000
Birds	550,000
Medication/vaccine	13,000
Transportation	90,000
Total Variable Cost (TVC)	801,250
B. Total Cost (Depreciated) 660,178	
Total Cost =Total Fixed Cost + TVC	1,461628
C. Total Out Put	
Birds	1,000
Broilers: 950xN2,800	2,660,000
Layers: 1,000xN1,200	1,200,000
Crate (Eggs): 720 x N400	288,000
Sales	4,148,000
Profit	4,148,00
Sales – Total Cost	–1,461,428
Profit	2,686,572
	2,686,572
Net Profit Margin (NPM)	

NPM = Gross Margin – Depreciation	– 660178
NPM	2026394
Average Profit Margin (APM)	2026394/35
	= 57,897

Source: Field Survey, 2015

Table 4: Determination of Technical Efficiency of Backyard Poultry Farming

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	157.3796	134.4257	1.170755	0.2612
X_1 (BIRDQTY)	39.05220	52.95528	0.737456	0.4730
X_2 (FAMCOST)	1.624101	1.084313	1.497816	0.1564
X_3 (LABCOST)	-3.405360	5.158468	-0.660149	0.5199
X_4 (FEEDEXP)	-3.362427	10.76588	-0.312322	0.7594
X_5 (MWLEXP)	12.94658	12.43071	1.041500	0.3153

Source: Field Survey,2015.

Dependent Variable: OUTPUT
Method: Least Squares
Sample (adjusted): 1 20
Included observations: 20 after adjustments

R-squared	0.547660	Mean dependent var	345.4200
Adjusted R-squared	0.510396	S.D. dependent var	151.2563
S.E. of regression	146.6173	Akaike info criterion	31.47754
Sum squared resid	373.0113	Schwarz criterion	31.77626
Log likelihood	308.7754	Hannan-Quinn criter.	31.53585
F-statistic	15.44255	Durbin-Watson stat	1.845071
Prob(F-statistic)	0.040577		