International Journal of Research Studies in Agricultural Sciences (IJRSAS)
Volume 2, Issue 4, 2016, PP 40-45
ISSN 2454-6224
http://dx.doi.org/10.20431/2454-6224.0204005
www.arcjournals.org

Analysis of Technical Efficiency of Poultry Farmers in Cross River State, Nigeria

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Abstract :*It has been reported that one of the major challenge faced by Nigerian today is lack of adequate protein intake both in quality to feed the nations ever-growing population. Therefore, this study was carried out to analyze technical efficiency of poultry farmers in Cross River State, Nigeria. A purposive and random sampling technique was used to select 295 poultry farmers. Data were collected using structured questionnaires and interview schedule, administered on the respondents were analyzed using descriptive statistics and stochastic frontier production functions. The estimated production function of day –old chicks was significant at 1% level implying that percentage increase of chicks will increase output by 0.401 percent. The coefficients of extension visit, membership of association and credit were found negative implying that the variables increase technical efficiency of poultry farmers. Also, the mean technical efficiency for poultry farmers is 58 percent implying that technical efficiency could be increased by 42 percent given the current level of technology if the available resources are efficiently utilized. It is therefore recommended that: access and use of credit should be encouraged because it can significantly improve productivity and welfare. Government should also encourage extension visit as well as membership of association to poultry farmers in order to increase their efficiency the Study Area.*

Keywords: *Technical, Efficiency, Poultry, Farmers*

INTRODUCTION

Agriculture continues to be a strategic sector in the development of most low-income nations. It employs about 40% of the active labor force globally. In sub-Saharan Africa, Asia and the Pacific, the agriculture-dependent population is over 60%, while in Latin America and high income economies the proportions are estimated at 18% and 4%, respectively (World Bank,

2006). Increased incomes, urbanization and population growth is expected to lead in increasing demand of animal products in the developing world, which can in turn improve incomes of poor farmers and food processors. It is expected, that the demand for animal products will increase by about 50 percent from 19993 to 2020 and mostly attributed to developing countries (Delgado ***et al.*** 1999). In sub-Saharan Africa (SSA) total consumption of meat and milk is expected to double between 1997 and 2020 to reach 11.3 and 35.4 million tonnes (Simon ***et al.*** 2002). This expected increase in demand for animal products has profound implications for food security and poverty alleviation among rural people in SSA. In particular, the expected demand for livestock products presents expanding market opportunities for poor smallholder livestock producers (Sirak and Siegfried, 2007). One of the greatest problems confronting millions of Nigerian today is lack of adequate protein intake both in quality to feed the nations ever-growing population. This inadequacy results in problem of malnutrition. The resultant effect of serious deficiency in the amount of protein intake is that people's health is adversely affected; particularly the mental capability, working productivity and eventually, the overall national economic growth (Okoruwa and Olakanmi, 1999, Kareem *et al.* 2008). It has also been observed that one of the most serious constraints of agricultural growth in Nigeria is the inefficient use of productive resources and that considerable growth can be achieved by simply improving the level of efficiency in resource use (Fabiyi and Adegboye, 1978; Ogunfowora, 1975, Kareem *et al.* 2008). Technical efficiency is the ability to produce a given level of output with a minimum quantity of inputs under a given technology. Efficiency is also an important

factor in productivity growth. In an economy where resources are scarce and opportunities for new technologies are lacking, inefficiency studies will be able to show that it is possible to raise productivity by improving efficiency without increasing the resource base or developing new technology. Estimates of the extent of inefficiency also help in deciding whether to improve efficiency or to develop new technologies to raise agricultural productivity (Tijani, 2006). Numerous studies (e.g. Obwona, 2000; Son *et al*, 1993) have attempted to determine technical efficiencies of farmers in developing countries because determining the efficiency status of farmers is important for policy purposes (Tijani, 2006). Therefore, this study analyzed technical efficiency of poultry farmers in Cross River State, Nigeria.

THEORETICAL FRAMEWORK

Cobb-Douglas Production Function

The theoretical basis of this study focused on Cobb-Douglas (CD) production function which shows a functional relationship between inputs and output. The Cobb-Douglas (CD) function further assumes constant returns to scale and unitary elasticity of substitution.

For two variable inputs, the function can be expressed as $Y = A L^{b1}K^{b2}e$

Where Y = level of output, L and K = variable inputs, A = multiplicative constant, b^1 and b^2 are the coefficient of L and K and they represent the direct measure of elasticity of the respective factors of production, and e = error term. The sum of b^1 and b^2 indicates the nature of returns to scale. Upton (1979); Terfa and Terwase (2011) observed that, the Cobb-Douglas production function cannot show both increasing and diminishing marginal productivity in a single response curve and as a result it does not give a technical optimum and may lead to the over estimation of the economic optimum. Despite these disadvantages researchers still find the Cobb-Douglas production function useful in analysis of survey where many variable inputs are involved and it is necessary to measure returns to scale, intensity of factors of production and overall efficiency of production. It can also provide a means of obtaining coefficients for testing hypotheses (Cobb and Douglas 1928; Erhabor, 1982; Terfa and Terwase, 2011). While commenting on the superiority of Cobb-Douglas production function over other forms of production functions, Terfa and Terwase (2011) stated that, Cobb-Douglas production function is used more than the other two because it satisfies the economic, statistical and econometric criteria of many studies than others**.**

EMPERICAL REVIEW

Obwona, (2006) identified education, credit accessibility and extension services as variables that contribute positively towards the improvement of efficiency and of course productivity of 65 sampled small and medium-scale tobacco farmers in Uganda. Ajibefun and Daramola (2003) highlighted education and age among other determinants of the level of efficiency of micro enterprise in Nigeria. According to Rhaji (2005), credit access for adopters and non-adopters of improved management practices were found to be significant as determinants to the production efficiency of rice in Niger state, north central Nigeria. Bhasin and Akpalu (2001), also noted from the result of their work that business experience, training programme and credit among other variables were found to be statistically significant to the efficiency of micro-enterprises (hair dressers, dressmakers, and wood processor) in Cape Coast. Amaza and Maurice (2005) carried out a study which had as objective the identification of factors that influence technical efficiency in rice-based production systems in Nigeria. They found that there were wide efficiency differentials among farmers in the study area and that rice-based crop production could be increased by 20% through better use of resources. Farmer-specific factors such as education and farming experience were found to contribute positively and significantly to farmers' efficiency levels in the rice–based production. Onyenweaku and Ohajianya (2005) found a positive relationship between education and technical efficiency in rice production in their study of swamp and upland rice farms in south-eastern Nigeria. Aye and Mungatana (2012) reported that improved maize seed, inorganic fertilizers, conservation practices, size of farm holdings, education, and access to extension services, credit and market were found to have significant impact on efficiency of maize farmers in Nigeria.

METHODOLOGY

The Study Area: The study was carried out in Cross River state, south -south Nigeria. The state was created in 1967 from part of the former Eastern region, and was known as the south eastern state until

1976 when it adopted its present name. The state originally included what is now called Akwa Ibom state. Cross River State is a coastal state with an estimated population of 3,104,446 million (census, 2006). It has a land mass area of 20,156km^2 bordering Cameroon to the east. It is named for the cross river which passes through the state. Its capital is Calabar, and consists of 18 local government areas with three major languages of Efik, Ejagham and Bekwara cutting across the three senatorial district of south, central and north respectively.

Population, Sampling Procedure and Data Collection: A two-stage sampling technique was adopted. The first stage was purposive sampling of six local government areas. This was done in due regards to the relative concentration of farms in these areas, viz; Calabar (193), Akamkpa (26), Ikom (32), Obubra (25), Ogoja (15) and Yala (4) local government areas. Data for the number of farms enclosed in brackets were gotten from the Cross River State Ministry of Agriculture, department of livestock development and services 2007. Registered farm had a minimum of two hundred (200) birds in farm. The second stage follows a random sampling process of three local government areas which are Calabar, Ikom and Ogoja. Data were collected from poultry farmers of the sampled area through a well structured questionnaire. Particularly, data was collected from respondent in three local government areas including Ogoja, Ikom, and Calabar through a random sampling process.

Variable Specification/Model Specification: The Cobb- Douglas frontier production function. The model is represented as:

$InY_i = a_o + a_i InX_{ij} + V_i – U_i$ ………………………………………………………………….…. (1)

The inefficiency of production was modelled in terms of the factors that are assumed to affect the efficiency of production of the farmers. Such factors are assumed to be independently distributed such that U_i is obtained by truncation (at zero) of the normal distribution with variance δ^2 and mean u where the mean is defined by

$U_i = \sigma_0+\sigma_1Z_1+\sigma_2Z_2+\sigma_3Z_3+\sigma_4Z_4+\sigma_5Z_5+\sigma_6Z_6+\sigma_7Z_7+\sigma_8Z_8+\sigma_9Z_9+\sigma_{10}Z_{10}$…....................................... (2)

Where;

Y_i = output (value in naira of eggs, spent layers and market weight broilers and cockerels sold) as dependent variable

a_i = parameter

X_{ij} = independent variables including:

σ = a vector of unknown parameters to be estimated

Production Efficiency Variables

X_1 = cost of labour in naira

X_2 = number of day-old chicks

X_3 =quantity of water in litres

X_4 = cost of veterinary services, in naira

X_5 = feed in number of bags (25kg bags)

Technical Efficiency Variables

Z_1 = gender, (1 for male, 0 otherwise)

Z_2 = Age of household head (in years)

Z_3 = Educational level, (1 for above primary, 0 otherwise)

Z_4 = household size (number of person living in each household)

Z_5= years of experience in poultry farming

Z_6 = Distance from enterprise to lending institution

Z_7 = training, attended training 1, 0 otherwise

Z_8 = extension visit in number of times visited

Z_9 = membership of association (1, if yes and 0 otherwise)

Z_{10}= credit (1 if received, 0 otherwise)

RESULTS AND DISCUSSION

Table1*: Maximum Likelihood Estimates of parameter of Cobb-Douglass Stochastic frontier Production function*

Variables	Coefficient	Std-Error	T ratio
Stochastic frontier			
Constant	10.224***	0.654	15.634
X1 (Labour)	0.094	0.74	1.275
X2 (Chicks)	0.401***	0.071	5.695
X3 (water)	0.058	0.058	0.959
X4 (Vet services)	0.055	0.053	1.027
X5 (feed)	0.074	0.046	1.599
Inefficiency Model			
Constant	4.117	2.359	0.175
Z_1 (Gender)	-0.1682	0.783	-0.215
Z_2 (Age of farmers)	-0.7932	0.656	-0.121
Z_3 (Educational level)	0.1734	0.783	0.223
Z_4 (Household size)	-0.4163	0.280	-1.485
Z_5 (Years of experience	0.1734	0.783	10.223
Z_6 (Distance)	-0.6387	0.242	-0.147
Z_7 (Training)	0.3085	0.717	0.429
Z_8 (Extension visit)	-0.999***	0.151	6.626
Z_9 (membership of association)	-0.987*	0.512	-1.923
Z_{10} (credit)	-0.5755**	0.353	2.378
Variance Parameters			
Sigma squared σ^2	1.219***	0.355	3.456
Gamma γ	0.949***	0.024	39.317

*, **, *** significant at 10%, 5% and 1% levels respectively

The variance parameters for σ^2 and γ are 1.219 and 0.949. They are statistically significant at the 1% level. The gamma indicates that systematic influences that are unexplained by the production function are the dominant sources of random errors. While the sigma squared indicates the goodness of fit and correctness of the distributional form around for the composite error term. This indicates that the inefficiency effects make significant contribution to the economic efficiencies of farmers.

The estimated coefficient for the all independent variables, (i.e. chicks, feeds, water, labour, and veterinary services) had positive signs. However, only the variable of number of day –old chicks was significant at 1% level. This implies that a one percent increase the level of chicks will increase output by 0.401 percent.

The result of the inefficiency model shows that the coefficients of extension visit, membership of association and credit are significant variable that affect farmer's efficiency. The signs on the coefficients in the inefficiency model are interpreted in the opposite way, such that a negative sign means that the variable increases efficiency and a positive sign means that it decreases technical efficiency.

The result shows that an increased in the number of extension contact by farmers will increase technical efficiency. Extension contact improves farmer awareness of new innovation and methods that can improve efficiency. Extension visit was found to be statistically significant at 1% level. Again membership of the farmers in poultry association was found to be statistically significant at 10% level. It had a negative relationship with technical inefficiency. Members tend to share business experience and ideas at association level which can improve efficiency of farmers.

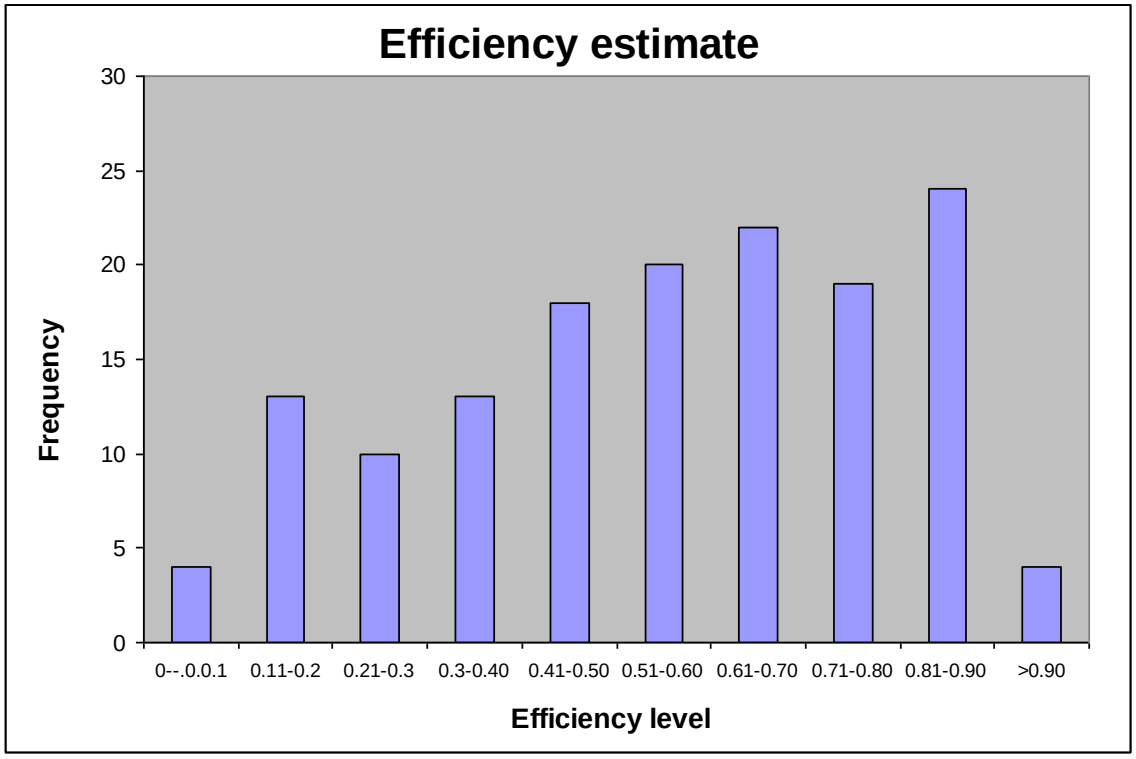
Credit was found to be statistically significant at 5% level. This implies that credit access was a determining factor of the efficiency of the farmers in the study area. The negative sign of the coefficient reveals that inefficiency reduces with the use of credit. Also, an increase in the amount of credit accessed and efficiently utilized by farmers can significantly increase productivity.

Table2. ***Efficiency Estimates:*** *The computed technical efficiency varies between 0.24 and 0.98 with a mean value of 0.58. This result implies that technical efficiency of poultry farmers could be increased by 42% given the current level of technology if the available resources are efficiently utilized.*

Description of Efficiency estimate

Efficiency estimate	Frequency
0-0.1	4
0.11-0.20	13
0.21-0.30	10
0.31-0.40	13
0.41-0.50	18
0.51-0.60	20
0.61-0.70	22
0.71-0.80	19
0.81-0.90	24
>0.90	4

Figure1. *Graphical repre sentation of efficiency estimate of the farmers*



CONCLUSION AND RECOMMENDATIONS

This Study was carried out to analyze technical efficiency of poultry farmers in Cross River State, Nigeria. The results revealed that the estimated coefficient for the all independent variables, (i.e. chicks, feeds, water, labour, and veterinary services) had positive signs. However, only the variable of number of day –old chicks was significant at 1% level implying that percentage increase of chicks will increase output by 0.401 percent. The coefficients of extension visit, membership of association and credit were found negative implying that the variables increase technical efficiency of poultry farmers. Also, the mean technical efficiency for poultry farmers is 58 percent. This suggests that technical efficiency could be increased by 42 percent given the current level of technology if the available resources are efficiently utilized. It is therefore recommended that:

i) Access and use of credit should be encouraged because it can significantly improve productivity and welfare.

ii) Government should encourage extension visit as well as membership of association to poultry farmers in order to increase their productivity the study area.

iii) Since poultry farmers are relatively technically efficient experience farmers should be encouraged to remain into the business

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