



NIGERIAN SOCIETY FOR ANIMAL PRODUCTION



Proceedings of

33rd
Annual

Conference

(NSAP - OGUN 2008)



THEME:

**ANIMAL AGRICULTURE
TOWARDS MILLENNIUM
DEVELOPMENT IN NIGERIA**

Edited by:

O. A. Adeyemi ■ A. M. Ogungbesan ■ A. O. Dada ■ O. O. Eniolorunda
H. A. Awojobi ■ D. B. Oke ■ J. A. Agunbiade

COLLEGE OF AGRICULTURAL SCIENCES

Olabisi Onabanjo University

Yewa Campus, P.M.B. 0012, Ayetoro, Ogun State.



DETERMINANTS OF TECHNICAL EFFICIENCY IN POULTRY PRODUCTION: THE CASE OF URBAN BROILER FARMS IN CALABAR, NIGERIA

E. J. UDOH AND N. A. E TIM

Department of Agric. Economics and Extension, University of Uyo, Nigeria.
Email: etimbobo@yahoo.com.

Summary

Farm level output-oriented technical efficiency indices are estimated by fitting stochastic production frontier function on survey data collected from Urban broiler farmers. Through ML technique, asymptotic parameter estimates are evaluated together with efficiency determinants. Stocking density, labour and feed are revealed to be the most critical production factors. The mean efficiency term is 0.69, showing that there exists scope for increasing broiler output by 0.31 with the available technology.

© 2008 Nigerian Society for Animal Production. All rights reserved.

Introduction:

The role of poultry in providing the needed animal protein for the increasing population particularly in urban areas cannot be over stated. Poultry is raised for various reasons. According to Van Eekeren et al (1995) and Nunan (2000), the main reasons and objective for keeping animals are as an economic asset, having access to dung as a source of fuel and maximum production with as few costs as possible. Armar-Klemesu and Maxwell (2000); Etim and Udoh (2006; 2007) reported that Poultry is the most commonly kept livestock and over 70% of those keeping livestock are reported to keeping chickens. Protein intake of Nigerians has been on a decline due to ever increasing population particularly in the urban areas. Bamigbose et al (2002) documented that this level of animal protein intake has direct effect on health and the general well being of the teeming Nigerian populace. Therefore, Broiler production remains one of the veritable sources of supply of high quality animal protein (Pinchason et al, 1985; Apata and Ojo, 2000). The demand for animal protein in Nigeria is higher than the supply. This could be attributed to low level of animal protein production. (Ekwe et al; 2007). But Broiler production like any other agricultural enterprise is dependent on resource inputs. But to ensure optimum production, desired animal protein and sustainability, there is need for judicious and efficient management of resources employed in the broiler enterprise.

Recent and empirical studies by Udoh and Akintola (2001), Etim et al (2005), Etim and Udoh (2006) and Udoh and Etim (2006) (2007) suggest that farming in general has to use available inputs as efficiently as possible to optimize agricultural production and farmers being primary managers of land need to manage problems arising from deteriorating natural resources (Rosegrant et al; 2005). Inefficiency of resource use and utilization can seriously jeopardize and hamper food production, and availability (Etim and Udoh, 2006; 2007; Udoh and Etim, 2006; 2007). This

study therefore aims at estimating the determinants of technical efficiency in urban broiler farms.

Materials and Methods

Study Area, Sampling and Data Collection Procedure

The study was conducted in Calabar South Local Government Area of Cross River State. It has an estimated population of 191,630 with 95,399 and 96,231 males and females respectively (NPC, 2006). The area lies within the humid tropical rainforest zone with two distinct seasons viz:- the rainy season and short dry season. The occupation of the residents reflect the economic characteristics of the area. The annual precipitation ranges from 2000 3000mm per annum.

Farm level survey conducted in 2006 provided the basic cross-sectional data used in the study. A total of 60 broiler farmers were randomly selected for the study using well-structured questionnaires.

Analytical Techniques

The study utilized multiple regression based on stochastic production frontier to estimate the efficiency of resource use among broiler farmers. The model incorporates efficiency determinants into the inefficiency error components as hypothesized by Coelli and Battese, (1996). By definition, stochastic frontier production function is:

$$Y_i = F(X_i; \beta) \exp(V_i, u_i) \quad i = 1, 2, \dots, N) \quad (1)$$

Where Y_i is the output of ith broiler farm

X_i is the corresponding (M X 2) vector of inputs

β is a vector of unknown parameters to be estimated.

$F(\cdot)$ denote an appropriate functional form.

V_i is a symmetric error component that accounts for random effects and exogenous shock

$u_i \leq 0$ is a one-sided error component that measures technical efficiency.

To develop a model that is flexible, which can envelop the data, a Cobb-Douglas production function was

specified. This is expressed as:

$$\ln Y = \beta_0 + \beta_1 L_n X_1 + \beta_2 L_n X_2 + \beta_3 L_n X_3 + \beta_4 L_n X_4 + \beta_5 L_n X_5 + V_i - u_i, \dots \dots \dots (2)$$

Where Y is the value of output in Naira; X_1 is the stocking density measured as the total number of birds stocked by the farmer, X_2 is the labour employed in farm operation measured in mandays, X_3 is the value of drugs in naira, X_4 is the value of concentrates in naira; X_5 is the cost of day old chicks in naira.

With $V_i \sim N(0, \sigma^2)$ and

$$e^{-u_i} = \alpha_0 + \alpha_1 (X_6) + \alpha_2 (X_7) + \alpha_3 (X_8) + \alpha_4 (X_9) + Z_i$$

where X_6 is educational level (years); X_7 is farming experience in years, X_8 is the age of the farmer in years, X_9 is the access to extension contact and Z_i is an error term assumed to be randomly and normally distributed. The values of the unknown coefficients in equations (1) and (2) are jointly estimated by maximizing the likelihood function (Yao and Liu, 1998; Udoh and Akintola, 2001; Etim et al 2005; Udoh and Etim, 2006).

Results and Discussions

Maximum Likelihood (ML) and Inefficiency Estimates

The model specified is estimated by maximum likelihood method using FRONTIER 4.1 Software. Results on table 1 reveal ML estimates and inefficiency determinant of the specified model. The sigma square (0.3833) is statistically significant and different from zero at $\alpha = 0.01$. Results indicate a good fit and the correctness of the specified distribution assumption of the error term. The variance ratio is estimated to be as high as 68.17% suggesting that the systematic influences that are unexplained by the production are relatively dominant sources of random error. This implies that the existence of technical inefficiency among the urban broiler producers accounts for about 68 percent of the variation in the output level of the broilers kept. Stocking density appears to be the most important resource input in broiler production with an elasticity of 0.5187 followed by labour and feed with elasticity of 0.4221 and 0.3216 respectively.

The estimated coefficient of the inefficiency function revealed that except for age and extension contact, the coefficient of other inefficiency variables specified in the model were highly significant. Results are consistent with Ram (1980); Parikh et al (1996); Etim and Udoh (2006).

Resource Use Efficiency Distribution

A very important feature of the stochastic production frontier is its ability to estimate individual, farm specific technical, allocative and economic efficiencies. Table 2 reveal farm-specific resource use efficiency indices. Findings on table 2 showed considerable variation of efficiency index across the urban broiler farms. The fact that the technical efficiencies of all the sampled broiler farms are less

than one imply that none of the farms reached the frontier threshold.

Conclusion

The study estimated farm-level technical efficiency and related determinants of broiler production using stochastic parametric estimation methods. A Cobb-Douglas production frontier was estimated by ML estimation procedure to obtain parameter estimates and inefficiency determinants of broiler production. The parameters obtained were asymptotically efficient, unbiased and consistent. With a mean efficiency value of 69%, the analysis revealed that frontier threshold in broiler production has not been achieved.

References

- Apata, D. F. and Y. Ojo (2000). Efficacy of the *Trichoderma Viride* enzyme complex in broiler starter fed cowpea Testa Based Diets. Proceedings of 25th Annual Conference of Nigeria Society for Animal Production. March 19 23, 2000.
- Armar-Klemesu, M. and D. Maxwell (2000) Accra: Urban Agriculture as an Asset Strategy: Supplementing income and diets, in N. Bakker, M. Dubbeling, S. Gundel, U. Sabel-Koschella, H. de Zeeuw (eds) Growing Cities, Growing Food.
- Ekwe, C. C., S. N. Ukachukwu and K. C. Ekwe (2007) Performance and Nitrogen Retention of Weaner Rabbits Fed Graded Levels of Composite Cassava Meal eds O. O. Olufajo, D. F. Omokore, G. N. Akpa and S. A. Sanni. Processing Drugs of 41st Annual Conference of the Agricultural Society of Nigeria held at Institute for Agricultural Research, Samara, Ahmadu Bello University, Zaria.
- Etim, N. A. and E. J. Udoh (2006) Efficiency of Resource Utilization: The Case of Broiler Production by Urban Farmers in Uyo Metropolis eds. G. N. Asumugha, A. O. Olojede, J. G. Ikeorgu, A. O. Ano and U. Herbert. Proceedings of 40th Annual Conference of Agricultural Society of Nigeria held at National Root Crops Research Institute, Umudike, October 16 20, 2006.
- Etim, N. A. and E. J. Udoh (2007) Measuring Technical Efficiency of Broiler Production Among Rural Farmers in Akwa Ibom State. Eds. E. A. Agiang, L. N. Agwunobi and O. O. Olawoyin. Proceedings of 32nd Annual Conference of the Nigerian Society for Animal

Production held in University of Calabar
March 18 21, 2007.

Etim, N. A., E. J. Udoh and T. T. Awoyemi (2005) Measuring Technical Efficiency of Urban Farms in Uyo Metropolis. *Global Journal of Agricultural Sciences* Vol. 4 No. 1 pp.91-95.

NPC (National Population Commission) 2006. Population Census of the Federal Republic of Nigeria: Analytical Report at the national level, National Population Commission, Abuja.

Nunan, F. (2000) Waste recycling through Urban Farming in Hubli-Dharwad. In N. Bakker, Dubbling S. Gundel, U. Sabel-Koschella, H.de Zeeuw (eds) *Growing Cites, Growing Food*.

Parikh, A., F. Ali and M. K. Shah (1995) Measurement of Economic Efficiency in Pakistan agriculture, *American J. Agric. Econ.* 77: 675-85.

Pinchason, Y., I. Nir and Z. Nitson (1985). Metabolic and Anatomical adaptations to heavy broiler chicks to intermittent feeding, feed intake, growth rate, organ weight and body composition. *Poult. Sci.* 64: 2098.

Ram, R (1980) Role of Education in Production: A Slightly ned approach, *Quarterly J. Eco.* 95: 365-73.

Udoh, E. J. and N. A. Etim (2006) Estimating Technical Efficiency of Waterleaf Production in a Tropical Region. *International Journal of Vegetable Science* 12(3) pp. 5-13.

Udoh, E. J. and N. A. Etim (2007), Measuring Farm Level Technical Efficiency of Fluted Pumpkin Production in Uyo, Nigeria. Eds. O. O. Ojufajo, D. M. Omokore, G. N. Akpa and S. A. Sanni. *Proceedings of the 41st Annual Conference of the Agricultural Society of Nigeria held at Institute for Agricultural Research, Samaru, Ahmadu Bello University, Zaria 22nd - 26th October, 2007.*

Udoh, E. J. and J. O. Akintola (2001) Measuring the Technical Efficiency of Crop Farmers in the South Eastern Nigeria. *Nig. Journal of Economics & Social Studies* 43(1):93-104.

Van Eekeren, A., H. Mass, W. Saatkamp and Verschuur (1995): *Small Scale Poultry Production in the Tropics*. CTA Agromisa Agrodok-Series.

Yao, S. and Z. Liu (1998) Determinants of Grain Production and Technical Efficiency in China *J. Agric Econ.* 49: 171-94.

Table 1 ML Estimates and Inefficiency Function

Variable	Coefficient	Asymptotic T-value
Production Function		
Constant term ($\hat{\alpha}_0$)	0.2814	0.4817
Stocking density ($\hat{\alpha}_1$)	0.5187	3.2120***
Labour ($\hat{\alpha}_2$)	0.4221	2.5943***
Drugs ($\hat{\alpha}_3$)	0.2186	1.0351
Feed ($\hat{\alpha}_4$)	0.3216	1.9827*
Capital ($\hat{\alpha}_5$)	0.1285	1.6514*
Inefficiency Function		
Intercept (γ_0)	0.1732	0.3611
Education (γ_1)	0.3212	2.0503**
Farming Experience (γ_2)	0.5296	2.6751***
Age (γ_3)	0.2180	1.3678
Extension Contact (γ_4)	0.3871	1.4255
Diagnostic Statistics		
Sigma-Square $\hat{\alpha}^2$	0.3833	2.8519***
Gamma	0.6817	3.2160***

Note: All explanatory variables are in natural logarithms. A negative sign of the parameters in the inefficiency function means that the associated variables have a positive effect on technical efficiency and a positive sign indicates the reverse is true.

Source: Computer Printout of Frontier 4.1

Table II: Farm-specific resource use efficiency indices

Efficiency Class	Frequency	Percentage
0.01-0.12	3	5
0.13-0.39	16	26.67
0.40- 0.66	28	46.67
0.67-0.93	11	18.33
>0.94	2	3.33
Total	60	100
Mean value	=	0.69
Minimum value	=	0.03
Maximum value	=	0.96