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MEASURING TECHNICAL EFFICIENCY OF BROILER PRODUCTION AMONG RURAL FARMERS IN AKWA IBOM STATE

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Summary
The technical efficiency of broiler production among rural farmers in Akwa Ibom State was investigated using a stochastic frontier production function which incorporates a model for the technical inefficiency effects. Farm – level data from 60 broiler farmers were obtained using well structured questionnaire. Variables included in the model for the inefficiency effects are years of experience, age, extension contact and years of education of the farmers. The parameters of the stochastic frontier production were estimated simultaneously with those in the model of inefficiency effects. Findings reveal that none of the broiler farms in the study area reached the frontier threshold. Results further show a mean technical efficiency index of 0.84.

Keywords: Broilers, Efficiency, Rural farmers

Introduction

Poultry is by far the largest livestock group and is estimated to be about 14,000 million, consisting mainly of chickens, ducks and turkeys (F A 0, 1999). Poultry is the most commonly kept livestock and over 70% of those keeping livestock are reported to keeping chickens (Armar – klemesu and Maxwell, 2000; Etim and Udoh, 2006).The role of livestock as providers of animal protein, rich in the essential amino acids cannot be over – stated. As reported by FAO (1999), poultry production is of considerable significance to the rural as well as the national economy and is also an important source of animal protein. Rural farmers keep livestock for various reasons. Van Eekeren *et al.* (1995) and Nunan (2000) noted that the main reasons and objective for keeping livestock include generating income, keeping animals as an economic asset, having access to dung as a source of fuel and maximum production with as few costs as possible. Olayide *et al.* (1981) posited that the basic biological role of livestock in rural and national economies is the provision of animal protein that sustains the "chemical wheel" through such animal products as meat, eggs, milk, butter, cheese and other animal products. Livestock production like any other rural economic venture uses resource inputs. But to overcome the problems of poor performance and consequent declining contributions of livestock to rural economies, the available resources has to be efficiently utilized. Recent and empirical studies by Udoh and Akintola. (2001), Udoh (2005), Etim *et al.* (2005), Udoh and Etim (2006), Etim and Udoh (2006) suggest that farmers being primary managers of land need to manage problems arising from deteriorating natural resources and use available inputs as efficiently as possible to optimize agricultural production. Inefficiency of resource use and utilization can seriously jeopardize and hamper food production and security (Etim and Udoh, 2006; Udoh and Etim, 2006). This study therefore analysis the resource – use of broiler farmers by measuring the technical efficiency among rural farmers in Akwa Ibom State.

Materials and Methods

Study area

The study was conducted in Akwa Ibom State. The State is located at latitude $4^0 33^1$ and $5^0 53^1$ North and Longitude $7^0 25^1$ and 8^0 25^1 East and occupies a total land area of 7,246 square kilometers. With an estimated population of about 2.4 million (NPC 1991; FOS 1999), the state has 6 Agricultural Development Project (ADP) Zones VIZ: Oron, Abak, Ikot Ekpene, Etinan, Eket, Uyo. Most of the inhabitants of rural communities in the study area are farmers and the crops commonly cultivated include cassava, oil palm, coco yam, fluted pumpkin, okra, water-leaf, bitter-leaf among others. In addition, some livestock are usually raised at backyards of most homesteads.

Sampling and data collection procedure

Data used for this study were primary and were obtained from farmers using structured questionnaire in 2006. Specifically, 60 broiler farmers were randomly selected from rural communities of Uyo. The empirical model utilized multiple regression based on stochastic frontier production function to determine the efficiency of resource use in the broiler farms.

The stochastic frontier production function is defined as

$Y_i = F(X_i ; \beta) \exp(V_i - U_i)$ $1 = 1, 2$ ------ N ------(1)

where: Y is the output of ith farm; Xi is the corresponding (M X Z) vector of inputs, β is a vector of unknown parameter to be estimated; F (.) denotes an appropriate functional form; V is a symmetric error component that accounts for random effects and exogenous shock; and $U \leq O$ is a one sided error component that measures technical inefficiency.

To develop a model that is flexible and can envelop the data, a Cobb-Douglas production function was specified and is expressed as:

$$\text{Ln (Qty)} = \beta o + \beta_1 \text{ Ln (STOD)} + \beta_2 \text{ Ln (L A B)} + \beta_3 \text{ Ln (MED)} + \beta_4 \text{ Ln(FEEDS)} + \beta_5 \text{ (CAP)} + Vi - Ui \text{ ---------- (2)}$$

Where Qty is the value of output in Naira; STOD is the stocking density measured as the total number of birds stocked by the farmer, L A B is the labour employed in farm operation measured in Mandays, medication is the value of drugs measured in naira. FEEDS is the value of concentrates measured in naira, capital is the cost of day old chicks in naira and with $V_i \sim N (o, \sigma V^2)$: and

$$\varrho^{-ui} = \alpha_0 + \alpha_1 \text{ (Exp)} + \alpha_2 \text{ (Age)} + \alpha_3 \text{ (Ext)} + \alpha_4 \text{ (Edu)} + Zi \text{ ---------- (3)}$$

Exp is farming experience in years; Age is the age of the farmers in years, Ext is access to extension contact; Edu is the level of formal education of the rural farmers in years and Zi 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 Discussion

Maximum likelihood (ML) estimates and inefficiency estimates results

The model specified is estimated by maximum likelihood method using FRONTIER 4.1 software. Results on table 1 show ML estimates and inefficiency determinant of the sigma square is statistically significant and different from zero at α =0-01 . Results indicate a good fit and the correctness of the specified distribution assumption of the error term. The variance defined as λ is estimated to be as high as 78 percent implying that the production functions are relatively dominant sources of random error. Thus, the existence of technical inefficiency among the broiler farmers accounts for about 78 percent of the variation in the output level of the broilers kept. Stocking density appears to be the most important factor of production with an elasticity of 0.2140 followed by Feeds and labour with elasticity of 0.2810 and 0.4184 respectively.

The estimated coefficient of the inefficiency function showed that except for age and extension contact, the coefficients of other inefficiency variables were highly significant. Findings are consistent with Ram, (1980); Parikh *et al.*, (1996); Udoh, (2005); 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 shows farm specific resource use efficiency indices.

Results on Table 2 showed considerable variation of efficiency index across the broiler farms. The fact that the technical efficiencies of all sampled broiler farms are less than one implies that no farm reached the frontier of production.

Conclusion

The study estimated the farm level technical efficiency and its determinants using stochastic parametric estimation methods. The farm specific technical efficiency distribution reveals a mean technical of 0.84 implying that production can still be increased by 16 percent using available technology.

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Table 1. ML estimates and inefficiency function

Variable	Coefficients	Asymptotic t-value
Production Function		
Constant term (β_0)	3.6218	10.4767***
Stocking density (β_1)	0.2140	3.2722***
Labour (β_2)	0.4184	1.9506**
Medication (β_3)	0.3816	1.1873
Feeds (β_4)	0.2810	2.4606**
Capital (β_5)	0.6811	1.6520*
Inefficiency Function		
Intercept (α_o)	-0.4279	-1.3593
Exp (α_1)	-0.6351	2.0188**
Age (α_2)	0.2435	1.5343
Ext (α_3)	0.5844	-1.8183*
Edu (α_4)	0.8211	1.1948
Diagnostic Statistics		
Sigma-square (δs^2)	0.3187	19.2918***
Gamma (λ)	0.7814	3.0691***
Ln (Likelihood)	14.1082	
LR test	6.6821	
Quasi Function	1.4250	
Number of Observation	60	

Source: Computed From Frontier 4.1 result

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

Asterisk indicate significance ***1%, **5%, *10%

Table 2. Farm specific technical efficiency

Efficiency Class	Frequency	Percentage
< 0.40	3	5
0.41 -0.50	9	15
0.51 – 0.60	12	20
0.61 – 0.70	15	25
0.71 – 0.80	11	18.33
0.81 – 0.90	7	11.67
>0.91	3	5
Total	**60**	**100**

Mean efficiency = 0.84; Minimum = 0.01; Maximum = 0.97