

# PRODUCTION FUNCTION ANALYSIS OF SMALL-SCALE POULTRY PRODUCTION IN JOS SOUTH LOCAL GOVERNMENT AREA OF PLATEAU STATE, NIGERIA

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## ABSTRACT

Poultry production data were collected from a random sample of 62 broiler and 92 layer producers using questionnaires in Jos South Local Government Area. The results were subjected to analysis using production function and beta coefficient models. Results for layer enterprises indicated that all production inputs have direct influence on egg output except feeds which exhibited a negative trend. For broilers, all regressors except medicaments had positive coefficients implying a direct relationship with poultry meat output. Furthermore, the explanatory powers of all selected inputs were confirmed by high coefficient of determination ( $R^2$ ) values despite the fact that decreasing returns to scale prevail for both layer and broiler enterprises. Beta coefficient results puts feeds and day-old-chicks as the most critical inputs for both layer and broiler enterprises while housing, labour and medicament exhibited varying relative importance for the two enterprises. The study therefore recommends that farmers need not increase their production inputs, but should rather improve on the quality and cost effectiveness of feeds and day-old-chicks that they commit to poultry production. The genuine need for research and government focus towards achieving this cannot be overemphasized.

**Keywords:** Production function, Beta coefficient, Broiler and layer enterprises, Jos South Local Government Area, Plateau State.

## KEYWORDS:

## INTRODUCTION

Poultry production is no doubt one of the most important ways of alleviating the scourge of protein deficiency in Nigeria and other developing countries. This is true because poultry can be set up under different climatic settings and its products are acceptable to all races and religious groups (Okon, 1983). Furthermore, the potential for higher profit exists in poultry more than in other livestock enterprise because of its quick and higher rate of turnover (Ikpi and Akinwumi, 1979). A close look at the poultry industry in Nigeria however shows that production is low as the industry has been underfeeding the nation with meat and eggs (Abubakar, 1997). This could be as a result of the endemic problem of high capital investment cost resulting from scarcity of raw materials for plants, fixtures, buildings, equipments as well as feeds (Famure, 1988). Though several studies on cost, returns and overall profitability of the poultry enterprise have been conducted, not much have delved into individual inputs/output relationship. Against this backdrop, this study was undertaken to shed more light on the rate of relationship between poultry output (meat or eggs) and the various inputs committed to its production. And this could best be achieved through production studies.

The production function is a mathematical relationship describing the way in which the quantity of a particular product depends on the inputs used. The kind of product which will be obtained is a function of the kind of input used. In this study, the production function of the

poultry industry is described as the relationship of different amounts of resource inputs viz: feeds, day-old-chicks, labour, medicaments and housing, which can be used to produce eggs (for layer enterprises) and meat (for broiler enterprises). Here, light is given concerning the quality of eggs or meat that may be expected when the various production inputs are combined in a specified manner by poultry producers in Jos South Local Government Area of Plateau State.

## SIGNIFICANCE OF THE STUDY

The Nigerian poultry industry though endowed with potentials is not without some shortcomings like high cost of feeds, pest and disease menace, low quality/resistant breeds etc. Investors in this regard need a justification of the quantity and quality of resource inputs committed into poultry production and the output obtained. Economic efficiency in the utilization of inputs is therefore, paramount and speaks a lot on the corresponding profitability. This study seeks to achieve just that and will also serve as a reference material to students of agriculture, poultry investors, researchers and policy makers interested in making the Nigerian poultry industry more efficient and productive.

## METHODOLOGY

Jos South together with Jos North Local Government Areas constitutes the administrative and commercial capital of Plateau State. The predominant

occupations of the inhabitants are trading, farming and tin mining. Data for the study were collected from primary sources using structured questionnaires. A random sample of 62 small-scale broiler producers and 92 small-scale layer producers were drawn from various farms scattered across the study area. Data on poultry production inputs were obtained from them and analyzed using the Cobb-Douglas production function and beta (standardized) coefficient model. The study was conducted between April and November, 1999.

The Cobb-Douglas production function and Beta coefficient model were formulated as follows:

$$(a) \text{Log}Y = \text{Log}b_0 + b_1 \text{Log}X_1 + b_2 \text{Log}X_2 + b_3 \text{Log}X_3 + b_4 \text{Log}X_4 + b_5 \text{Log}X_5 + e$$

Where Y = Total output (kg for broilers and number of eggs for layers)

- X<sub>1</sub> = day-old-chicks (number of birds)
- X<sub>2</sub> = feeds (kg)
- X<sub>3</sub> = medicaments (litres)
- X<sub>4</sub> = labour (man days)
- X<sub>5</sub> = housing/utilities (N)
- e = error term

$$B = b_i \frac{S_{xi}}{SY}$$

Where; B = beta coefficient  
 b<sub>i</sub> = estimated regression coefficient  
 S<sub>xi</sub> = standard deviation of the independent variable  
 S<sub>y</sub> = standard deviation of the dependent variable

The criterion here is that the higher the beta coefficient for a particular regressor (input), the more important the regressor (input).

RESULTS AND DISCUSSION

Production function Results

Results from Cobb-Douglas production function for layer enterprises show that all the coefficients of the selected explanatory variables are positive except feeds (X<sub>2</sub>), indicating their individual contributions to egg production (table 1). The negative sign of feeds (X<sub>2</sub>) implies that additional feeds will not necessarily lead to increase in egg output. This could be attributable to the fact that many of the farmers fed their birds with low quality feeds to avert the high cost of feeds. This leads to a situation where large quantities of feeds do not lead to commensurate output of eggs. The study revealed that farmers feed birds with about 12.6 kg/bird from 1-20 weeks with sub-standard feeds. This value exceeds the recommended 8.7 kg/bird of feeds from 1-20 weeks (C.T.A., 1983). The coefficient of determination (R<sup>2</sup>) is 0.898 indicating that 89.8% of egg output is explained by the selected explanatory variables. The remaining 10.2% may be due to other factors not included in the model like level of technology, genetic factors etc (table 1).

For broiler enterprises, Cobb-Douglas production function results show all the coefficients of the regressors to be positive except medicaments (X<sub>3</sub>) indicating their individual contributions to broiler meat production. The negative sign of medicaments is attributable to the fact that no major disease outbreak was reported throughout the period of the study and most farmers have undertaken the basic preventive measures for their birds. Therefore, they need not commit more medicaments to facilitate any increase in output. The coefficient of determination (R<sup>2</sup>) is 0.906 implying that 90.6 of broiler output are explained by the selected explanatory variables. The remaining 9.4% may be due to other factors not included in the model like type of breed, level of technology etc (table 2).

Table 1: Production Function Results (Cobb-Douglas) for Layer Enterprises in Jos South Local Government Area of Plateau State.

Predictor	Coefficient	Standard deviation	t-ratio	Beta-coefficient
Constant	2.2196	0.5233	4.24	-
Day-old-chicks (X <sub>1</sub> )	0.1746	0.091	1.92*	0.0198 (2)
Feeds (X <sub>2</sub> )	-0.4700	0.2103	-2.24***	0.1232 (1)
Medicaments (X <sub>3</sub> )	0.0127	0.099	1.28	0.0117 (5)
Labour (X <sub>4</sub> )	0.1339	0.703	1.90*	0.0117 (3)
Housing (X <sub>5</sub> )	0.002	0.0147	0.29	0.0007 (4)

R<sup>2</sup> = 0.898  
 \* = p < 0.10  
 \*\* = p < 0.50  
 \*\*\* = p < 0.01

Note: Figures in parenthesis are ranks of regressors

Table 2: Production Function Results (Cobb-Douglas) for Broiler Enterprises In Jos South Local Government Area of Plateau State.

Predictor	Coefficient	Standard deviation	t-ratio	Beta-coefficient
Constant	2.4017	0.5809	6.13	-
Day-old-chicks(X <sub>1</sub> )	0.1693	0.1339	2.26**	0.0359 (2)
Feeds (X <sub>2</sub> )	0.1355	0.0668	2.03*	0.1434 (1)
Medicaments (X <sub>3</sub> )	-0.819	0.0963	-0.85	0.0124 (4)
Labour (X <sub>4</sub> )	0.1024	0.0441	2.32**	0.0071 (5)
Housing (X <sub>5</sub> )	0.1313	0.0423	0.76	0.0209 (3)

R<sup>2</sup> = 0.898  
 \* = p < 0.10  
 \*\* = p < 0.50  
 \*\*\* = p < 0.01

Note: Figures in parenthesis are ranks of regressors

**(b) Beta (standardized) Coefficient Results**

Based on beta coefficient analysis, the regressors in decreasing order of importance for layer production are; feeds, day-old-chicks, labour, medicaments and housing (table 1). The immense importance of feeds and day-old-chicks is further confirmed by the t-ratios, which show that feeds and day old chicks are significant at 10% and 5% levels respectively. Beta coefficient results for broiler enterprises put the regressors in decreasing order of importance as follows; feeds day-old-chicks, housing, medicaments and labour. The importance of feeds and day-old-chicks in broiler production is implied here. Furthermore, both explanatory variables are significant at 5% level, which further confirms their explanatory powers.

**(c) Returns to Scale**

The sum of all elasticities of production with respect to all the inputs used in layer and broiler production are 0.1446 and 0.3566 respectively. This implies that if all the variables included in the model are simultaneously increased by 1%, the total output will increase by 0.1446 for layer enterprises and 0.3566 for broiler enterprises. Decreasing returns to scale therefore prevail in the area. Thus poultry farmers in Jos South Local Government Area would not be advised to increase their production inputs.

**CONCLUSION AND POLICY IMPLICATIONS**

The study elucidates the relationship between poultry output (broiler meat and layer eggs) and the various production inputs amongst small-scale farmers in Jos South Local Government Area of Plateau State. It was discovered that all production inputs have significant influence on poultry meat and egg production. Furthermore, poultry farmers were found to be operating at decreasing returns to scale, hence need they not apply more of the production inputs for increase in output.

To facilitate a more responsive and productive poultry enterprise, the study therefore recommends that policy and research emphasis should be geared towards quality and affordability of feeds and breeds as well as

extension of appropriate technology to farmers in Jos South Local Government Area of Plateau State. To achieve these however, the public and private sector as well as researchers need to face the poultry industry with a collaborative approach. These could be in many ways such as joint research, sharing result findings, adequate funding of research institutes and faculties of agriculture in the universities.

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