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Effects of Floor Space on Economic Efficiency of Broiler Producers in Imo State

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Abstract: This study analyzed the relative economic efficiency of properly and none properly floor spaced broiler farms in Imo state. Farm data were collected with questionnaire from a random sample of 95 broiler farms in 2007 and analyzed using the profit function model estimated jointly with labour demand function. Result show that properly floor spaced broiler farms are more economically efficient than non-properly floor spaced broiler farms. Non-properly floor spaced broiler farms do not have absolute price efficiency, while the properly floor-spaced broiler farms have absolute price efficiency. Broiler producers should consider floor space when stocking broilers if profitability is their primary motive of production.

Key words: Floor, efficiency, broiler, questionnaire, profit, demand

INTRODUCTION

Stocking density (floor space) is a very important consideration in broiler production. Growth in broilers is directly governed by amount of feed consumed and floor space per bird (Okezie and Blime, 2005). Growth and feed conversion are inversely related to floor space per bird (Oluyemi and Roberts, 1998).

Overcrowding broilers reduces weight (Botten and Blair, 2000). As floor space per bird reduces the weight of broiler produced tends to increase and this will increase up to a certain point where there will be increase return on investment (Karanjkar and Soni, 2001). A mature bird of weight 2.3 kg requires 0.09 m^2 of floor space (Patel, 2003).

Overcrowding should always be avoided as it breeds vice habits such as Cannibalism, pecking and rapid spread of disease. Cannibalism induces nervousness thereby lowering feed consumption, feed conversion and consequently growth (Olowe, 2001).

On the other hand, over spacing leads to a lot of exercise, which tends to reduce feed conversion since much of the energy will be used in moving about from place to place (Oluyemi and Roberts, 1998; Malden *et al*., 2001).

It is evident that information is not available on the relative efficiency of non-properly and properly floor spaced broiler farms in Imo state. Research information on the relative efficiency of these 2 classes of broiler farms would provide a better indication of how broiler producers utilize resource inputs and thereby of the likelihood of being able to achieve economic efficiency. This study provides such information for Imo State, Nigeria. It is hypothesized that the economic efficiency (technical efficiency plus price efficiency) of non-properly and properly floor-spaced broiler farms is equal and that non-properly and properly floor-spaced broiler farms have absolute price efficiency at 5% level of probability.

The concept of efficiency has been interpreted in various ways. An operational concept of economic efficiency has been developed by Lau and Yotopoulos (1971, 1972) and Yotopoulos and Lau (1973) to measure and compare performance of farm firms. Differences in economic efficiency among groups of farms may result from variations in technical efficiency (larger output with equal amounts of inputs) and price efficiency (higher profits). Profit maximization is implied if the value of marginal product of each variable input is equal to its price. Thus, we can test relative economic efficiency of non-properly versus properly floor spaced broiler farms by comparing their actual profit functions.

Although, the question of relative economic efficiency of non-properly and properly floor spaced broiler farms is central to a discussion of profitability in poultry production in Nigeria, there is little empirical research due to lack of adequate desegregated data. Some evidence for India has been presented by Chikara and Suhag (2000), indicating that properly floor spaced broiler farms are more efficient than overcrowded farms. However, in studies by Karanjkar and Soni (2001) for poultry in India, there was no difference in efficiency in overcrowded and over spaced poultry farms.

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Properly floor-spaced farms are defined as those with floor space of 0.09 m^2 $broiler^{-1}$, while broiler farms with floor space of less or more than 0.09 m^2 are defined as non-properly floor spaced.

MATERIALS AND METHODS

In this study, the Lau-Yotopoulos model is used to derive values of technical and price efficiency parameters in order to identify and isolate possible differences between non-properly and properly floor spaced broiler farms. These estimates are based on farm-level data collected with questionnaire from a random sample of 95 broiler farms in the three agricultural zones of Imo state, Nigeria. The data were collected in 2007. There are 45 observations for the non-properly floor spaced farms and 40 observations for the properly floors spaced broiler farms.

The model and data: Lau and Yotopoulos (1971) have shown that if the assumed production function is of Cobb-Douglas form, then the estimating Eq. 1 for the profit function is:

$$\text{Ln}\pi = b_0 + b_1 D_p + b_2 \text{LnW} + b_3 \text{LnN} + b_4 \text{LnK} + b_5 \text{LnF} + b_6 \text{LnC} (+)e_1 \quad (1)$$

The interpretation of results is enhanced if the profit function is jointly estimated with a labour demand function (Lau and Yotopoulos, 1972; Yotopoulos and Lau, 1973; Khan and Maki, 1979):

$$-\text{WL/P} = b_7 D_L + b_8 D_n + e_2 \quad (2)$$

The variables in Eq. 1 and 2 are defined as π is profit in Naira (price of output × physical quantity of output (Revenue) minus ((wage rate per man day × number of man days used), summed over all broiler production activities on the farm plus (number of broilers purchased × unit purchase price) plus (Depreciated value of fixed cost items) plus (cost of other inputs)):

D_p = The dummy variable, taking the value of unity for properly floor spaced broiler farm
W = The wage rate in Naira per man day and it is a weighted average of the rates reported for family and hired labour
N = Farm size, which is the number of broilers/farm
K = Capital input in Naira and it is the sum of depreciated values of broiler house, shovel, cutlass, lamp, stove and wheel barrow and costs of poultry equipment and materials such as feeders, waterers and foot match
F = The costs of feed in Naira
C = The costs of other inputs such as medication, water, electricity etc.
L = Man days of family and hired labour used
D_n = The dummy variable taking the value of unity for non-properly floor spaced broiler farms
e_1, e_2 = The error terms
b_1's = The coefficients to be estimated

Since, there are no endogenous variables on the right-hand sides of Eq. 1 and 2, ordinary least squares will yield consistent estimators despite that the fact that we are dealing with contemporary related disturbances. However, following previous studies, we apply Zellner's seemingly unrelated regressions method.

The estimation results are shown in Table 1 for the properly and non-properly floor spaced broiler farms. The Ordinary Least Squares (OLS) results are reported for comparison. All coefficients have expected signs and with some exceptions (b_1 and b_2) are strongly statistically significant. The hypothesis and F statistic values resulting from the tests are shown in Table 2. The hypotheses are tested from the unrestricted estimation.

Hypothesis 1 states that the economic efficiency (technical efficiency plus price efficiency) of properly and non-properly floor spaced farms is equal. This hypothesis is rejected because properly floor spaced broiler farms are more economically efficient. Hypothesis 2 states that non-properly floor spaced broiler farms have absolute

Table 1: Joint estimation of profit function and labour demand function

	Estimated coefficients for the profit function							Estimated coefficients for the demand function	
Regressions	b_0	b_1	b_2	b_3	b_4	b_5	b_6	b_7	b_8
OLS	6.921	-0.071	-0.403	0.812	0.315	0.147	0.109	-0.164	-0.235
	(4.117)*	(-1.302)	(-1.429)	(2.803)*	(2.712)*	(3.116)*	(2.591)*	(-3.013)*	(-2.611)*
Unrestricted	6.703	0.143	-0.071	0.309	0.264	0.081	0.227	-0.113	-0.309
	(5.208)*	(1.013)	(-1.206)	(2.607)*	(3.118)*	(2.496)*	(3.011)*	(-2.712)*	(-3.114)*
1 restriction	7.138	-0.093	-0.516	0.702	0.409	0.113	0.138	-0.206	-0.206
	(5.022)*	(-1.607)	(-1.335)	(4.173)*	(3.192)*	(2.851)*	(3.116)*	(-3.013)*	(-3.013)*
2 restrictions	7.216	-0.106	-0.206	0.392	0.505	0.267	0.169	-0.206	-0.206
	(8.224)*	(-1.903)	(-3.013)	(3.041)*	(2.415)*	(3.919)*	(2.622)*	(-3.013)*	(-3.018)*

t-values are given in parenthesis: 1 restriction: $b_7 = b_8$; 2 restrictions: $b_2 = b_7 = b$

Table 2: Tests on hypothesis regarding relative efficiency of properly and non-properly floor spaced farms

Hypothesis tested	Computed F ratios (degrees of freedom)	
	Properly floor spaced	Non-properly floor spaced
$b_1 = 0$	17.13 (1.38)	4.07 (1.43)
$b_7 = b_2$	1.05 (1.38)	0.98 (1.43)
$b_8 = b_2$	8.26 (1.38)	1.06 (1.43)

Critical values are $F_{0.05}$ (1.38) = 4.08; $F_{0.05}$ (1.43) = 4.05

price efficiency, i.e., they maximize profits by equating the value of labour's marginal product to the wage rate. This hypothesis is rejected.

In comparing, the results for the properly and non-properly floor spaced broiler farms on tests performed on hypotheses of efficiency, we find that properly floor spaced broiler farms are more economically efficient than non-properly floor spaced broiler farms by 53%.

It is also, evident that properly floor spaced broiler farms maximize profits but non-properly floor spaced broiler farms pay labour more than its marginal product leading to loss of profit.

CONCLUSION

The direct implications of the findings of this study would be that floor space considerations and other policies designed to encourage broiler production should be undertaken if efficiency is the paramount motive.

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