DETERMINANTS OF EGG PRODUCTION IN KWARA STATE, NIGERIA

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ABSTRACT

The study aims to identify the determinants of egg production in Kwara state. Primary data were collected from eighty poultry egg farmers selected randomly from one hundred and five registered egg farms in the state using a set of structured questionnaire. The data were analysed using descriptive statistics and regression analysis. The analysis revealed presence of multicollinearity among the explanatory variables. Principal component analysis was used to reduce the influence of multicollinearity and the results obtained showed that the four variables explained ninety per cent variation in egg output. Policy aimed at increasing egg production should center on these four variables. It is further suggested that a hatchery be established in the state.

Keywords: Determinants, egg production, principal component analysis,

INTRODUCTION

Livestock production constitutes a very important component of the agricultural economy of developing countries, a contribution that goes beyond direct food production but includes multipurpose uses. Poultry are closely linked to the social and cultural lives of several million of resource – poor farmers for whom animal ownership ensures varying degrees of sustainable farming and economic stability, (FAO1993). Tewe, (1997), found that, although cattle was the most important single livestock species in Nigeria, in terms of protein value and availability, the poultry industry gives the highest promise for increasing animal protein supply. In an earlier report, Adegeye and Dittoh, (1982) reported that the existing acute shortage of protein in Nigeria and the ever increasing demand for livestock products point to poultry meat and eggs as a quick means of bridging the protein deficiency gap. They opined that poultry production was one of the agricultural enterprises that can give a high return on capital invested. Also eggs are easily affordable and available to the average man than other protein sources. As at year 2003 a tray of eggs sells for an average of ₦300 that is ₦ 10 per egg.

Despite all these attributes, the growth in poultry production has not matched up with the growth in human population. The annual growth rate for egg production in year 2000 was a mere 0.4 per cent while the annual population growth rate was 2.7 per cent (CBN,2000). This study therefore aims at identifying the factors that determine egg production in Kwara state. The specific objectives are to:

(1) Highlight the socio – economic features of egg farmers in the state.
(2) Determine the major factors affecting egg production.
(3) Make recommendations based on findings.

METHODOLOGY

The information used in this study were obtained through structured questionnaire. The questionnaires were administered to egg farmers in the State between October 2001 and June 2002. Matters relevant to the study but not covered by the questionnaire were also obtained from the officials of Agricultural development project (ADP) and members of Poultry Association of Nigeria (PAN), in the state. Based on the information supplied by these institutions and following Akinwunmi et.al.(1979) there are small, medium and large-scale farmers in the state. According to this classification a large scale farmer maintains at least 5000 birds. The information also revealed that, there are seventy-one (71) medium farmers, thirty (30) small-scale farmers and four (4) large-scale farmers. Out of these 105 farmers, 54 were selected from medium, 18 from small scale and 4 from the large scale categories. Four other large but non-registered farmers were also included in the study. Data were obtained on socio-economic characteristics of farmers and on input-output relationships of egg enterprise.

Multiple regression technique was used as the major analytical tool. Output of egg (Y) was assumed to be dependent upon four inputs which are number of laying birds (x_1), quantity of feed consumed in kilograms (x_2), labour employed in man days (x_3) and other variable input costs (x_4). The model employed is implicitly stated below:

$$Y = f(X_1, X_2 X_3, X_4, U). \quad \text{Eq.1}$$

Where: Y = Number of eggs laid

X_1= Number of laying birds

X_2 = Quantity of feed consumed in Kilograms

X_3, = labour employed in man days

X_4= Other variable cost which include cost of transportation, cost of drugs, utilities etc.

U = Stochastic error term.

With the presence of multicollinearity, the principal component analysis was also used. Principal component analysis was employed in this study to minimise the problem of multicollinearity since the increase in the sample size and inclusion of new variables like farming experience and years of schooling of farmers did not reduce the identified problem (Tobin,1950;Kuh,1963;Kmenta,1971). Principal component is a special case of the more general method of factor analysis. It is a computational process in which a group of variables is reduced in number to a more fundamental set of variables (Morrison 1967). The aim of the method is the construction out of a set of new variables Xj's (j=1,2--k) of new variables (pi) called the principal components, which are linear combinations of the X's. The X's in this case are the 0explanatory variables in the original model.

$$P_1=a_{11} X_1+a_{12}X_2 + \text{---}a_{1K}X_K$$
$$P_2=a_{21} X_1+ a_{22} X_2 + \text{---}a_{2k}X_k$$
$$P_k=a_{k1}X_1 +a_{k2} X_2 +\text{---}a_{kk} X_k$$

Where a's called the latent vector loadings are chosen such that the constructed principal components satisfy two conditions:
(a) The principal components are uncorrelated orthogonal.
(b) The first principal components P_1 absorbs and accounts for the maximum possible proportion of the total variation in the set of all the explanatory variables and so on.

RESULTS AND DISSCUSSIONS

Majority of the sampled farmers obtained their day old chicks from neighbouring states since there was no hatchery in Kwara State at the time of the survey. Over eighty per cent of the farmers obtained their day old chicks from Ibadan, and the remaining twenty per cent obtained theirs from Lagos.

In order to determine the variability in egg output (Y) explained by the explanatory variables (X_1, X_2, X_3 and X_4), equation 1 was fitted to various functional forms using the multiple regression analysis. The estimates of the analysis of these production functions are shown in table (2). The coefficient of determination (R^2) was found to be high for all the forms The values range between 0.62 (semi- Log) and 0.848 (linear function). The linear function has the highest R^2 and appreciable magnitude of the estimated coefficients. The poultry scientists have generally supported the linear functional form for egg production. Hansen (1949), supported this notion of constant marginal efficiency of feed until a maximum egg output per hen is attained.

Also the number of laying birds (X_1) was found to be significant at five per cent for all the functional forms, and its estimated coefficient bore the a priori sign. The estimated coefficient of 292.85 suggested that if the number of laying birds (X_1) was increased by one, output (Y) would increase by 292.85 all things being equal. Thus the higher the number of laying birds the more eggs are laid. Also, when the stepwise regression analysis was employed using all the functional forms, variable (X_1) number of laying birds only entered the regression equations for all the functional forms. The variable has the coefficient of determination (R^2) values that range between 0.604 –0.843. This shows that this variable alone accounted for between 60-84 per cent of the variation in egg output. The implication of this is that for any meaningful improvement to be achieved in egg production, good breed of pullets must be obtained by farmers at affordable price.

The values of the F – statistic (using the stepwise regression) was found to have more appreciable value than those obtained from the multiple regression analysis. The effects of the excluded variables in the model were however added to the error sum of square as excluded variables. This shows that the excluded variables (quantity of feed consumed in kilogram(X_2),labour employed in man days(X_3)and other variable cost(X_4) are important to the model and their removal might lead to specification bias. Since the decision to add or drop a variable in regression analysis is usually made on the basis of the contribution of the variable to the error sum of square (ESS) as adjudged, by the F-test (Guraji,1982), the dependent variable which is the number of eggs laid by birds (Y) in this case is expected to be a function of one or more of the explanatory variables which are the number of laying birds (X_1), the quantity of feed consumed by birds in kilograms (X_2), the labour employed in man days (X_3), the cost of drugs, cost of veterinary services and cost of utilities all lumped together as (X_4).

The standard error of the estimated coefficients were found to be very large. The correlation matrix shown in table (3) recorded high partial correlations between the variables. The values range between 0.340 to 0.998, the zero order correlation obtained for all the variables were also very high showing some linear association among the pairs of the variables. The exclusions of these other important variables in the stepwise regression analysis and the insignificant coefficients obtained for these variables in the multiple regression analysis might probably be due to the existence of imperfect multicollinearity among the explanatory variables. With the presence of multicollinearity, the ordinary least squares (OLS) regression method breaks down, although it still retains its best, linear unbiased(BLUE) property but it might be impossible using the OLS method to isolate the individual effects of the explanatory variables.

The sample data was used to obtain the latent vector loadings (1) and (2)

	1	2
a_1	0.00438	-0.02300
a_2	0.19081	-0.98135
a_3	0.00539	-0.0052
a_4	0.98166	0.19084.

and the percentage variation of the two sets of vector loadings were found to be 99.66 and 0.33 respectively. The latent vector loadings (2) was disregarded since the latent vector loadings (1) gave 99.66 percentage variation in the set of the explanatory variables, the set of latent vector loading (1) was now used to obtain the principal component P_1 such that

$Pij = \Sigma\, a_1 X_1 + a_2 X_2 + a_3 X_3 + a_4 X_4$

and ditto for all the Pij to generate new set of data called P_1. The number of eggs laid (Y) was now regressed on the P_1 such that

$Y = f\,(P_1)$

and the estimated regression line $Y = \hat{m} P_1 + v$

where $\hat{m}$ estimated coefficient of theP_1(principal component)

v = random variable

The result obtained indicated that the P_1 was significant in explaining the variation in egg output. The coefficient of determination (R^2) was found to be 0.90. This means that the P_1 gives ninety per cent explanation of the variation in egg output. That is variables X_1, X_2, X_3 and X_4 combined to give ninety per cent variation in egg output. The coefficients of P_1 were found to be significant at five percent. The principal component analysis, further established that the excluded variables X_2, X_3 and X_4 are important in determining the variation in egg output and their removal from the model might therefore lead to specification bias.

Farmers are advised to come together as co-operators to avail themselves the benefits that are inherent in such associations. As cooperative society hatcheries could be established for the benefits of members. Importation of good breeds of parent stocks by government would also go along way to improve productions. Farmers are also employed to keep good records of their day to day operations to allow for quality research data. The combined effect of all the included variables was found to explain ninety nine per cent of the variation in egg production.. Policy aimed at increasing egg production in the state in particular and in Nigeria will revolve around these variables. It is suggested that further efforts of research be geared towards isolating the individual effects of the explanatory variables.

Table 1. Regression Estimates

	Constants	X_1	X_2	X_3	X_4	R^2	F
	31913.243	293.854	-.170	2.792	-.248		
inear	(29456.180)	(185.818)	(4.447)	(3.811)	(.188)	0.848	10004.63
	5.077	.10004	.1000001	.0000032	0.00000039		
emi- og	(0.037)	(0.000)	(0.000)	(0.000)	(0.000)	.620	30..6551
	3.076	1.073	-.205	0.098	-0.047		
ouble og	(0.459)	(0.00271)	(0.279)	(0.083)	(0.089)	.764	60.65
TEP VISE							
	34230.73	237.997					
inear	(29034.458)	(11.610)	–	–	–	0.843	42.194
emi og	5.08	.0001610	–	–	–	0.604	119.109
ouble og	2.733	.890	–	–	–	0.755 7	242.453

Source: Computer Print Out 2002.

Table 2. Correlation Matrix

	Y	X_1	X_2	X_3	X_4
Egg output(y)	1				
Number of laying birds(x1)	.918	1			
Kilograms of feed (x2)	.915	.998	1		
Labour in manday9x3)	.340	.344	.345	1	
Other variable cost (x4)	.857	.953	.956	.356	1

Source: Computer Print Out

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