

EVALUATING THE FACTORS INFLUENCING POULTRY FARMERS' PARTICIPATION IN EGG PRODUCTION: A BINARY LOGIT REGRESSION MODEL

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Abstract:

Insufficient information on the determinant of poultry farmers' interest in egg production often limits the opportunity to predict the level of preference for poultry production. To develop policies in addressing poultry farmers' problem in respect of their participation in egg production, the determinants and the level of their interest in agriculture have to be adequately explored and understood. Towards this end a study has been conducted in Ilorin, Kwara state capital to evaluate the factors influencing poultry farmers' participation in egg production. The study area was divided into three and a stratified random sampling technique was adopted in selecting a total sample size of 300 respondents, out of which 50 registered poultry egg producers and 50 registered poultry non egg producers were selected from each division. A structured questionnaire was administered to obtain the information needed from the sampled producers. Data analysis was done using binary Logit regression. The result revealed that year of education, Farm size, income, participation in cooperative society and credit are the significant factors contributing to their participation. The marginal probability

done on the significant binary Logit regression showed that participation in cooperative society had highest influence on the poultry egg farmer's interest and credit access showed the extent of their interest in the elasticity of probability. The study concluded that socioeconomic variables such as years of education, farm size, income, participation in cooperative society and access to credit are the determinant of poultry egg farmer's interest in egg production. It was recommended that Credit which had a positive and significant effect on the interest of poultry egg farmers is necessary to encourage technical innovations and timely availability of necessary inputs. Government should influence by reducing borrowing rates on credit in order to encourage and accelerate the transformation of poultry industry.

Keywords: Poultry farmers', participation, binary Logit model

1.0 Introduction

Developing countries (Nigeria inclusive) face the dual tasks of increasing agricultural productivity and ensuring sustainability of resource base on which agriculture fundamentally depends (Ersado *et al.*, 2004). Livestock is important for increased productivity in Nigerian agriculture. It provides food, fuel, fertilizer and draught power to sustain the rural economy. Among livestock-based vocations, poultry occupies a pivotal position because of its enormous potential to bringing about rapid economic growth particularly for the benefit of the weaker sector (Rajendran and Samerendu, 2003). The importance of poultry production to the biological needs, economic and social development of the people in any nation cannot be overemphasized (Oladeebo and Ambe-Lamidi, 2007).

According to Sani *et al.*, (2000) poultry can be establish with minimum capital aid as a side project but understanding the factors influencing poultry farmers' participation in egg production seems to be difficult for the fact that farmers generally are always willing not to give adequate information. Probably in respect of their in interest in egg production and factors that influence the determinant have to be understood. Towards this end, the application of Logit model to poultry production is not common. However, Agada *et al.*, (1997) applied Logit model in a study to identify the socioeconomic factors determining the participation of poultry farmers in agricultural insurance scheme in Kaduna state. Likewise Rahman (2001) employed Logit model to identify factors determining farmers' willingness to continue practicing cereal legume mixtures in Giwa and Roba local government area of Kaduna state.

Seeing that research on this topic has yet been conducted in Ilorin, the results of this study may assist policy makers and particularly poultry farmers in their understanding of factors influencing their participation egg production. The study may also promote further research on the feasibility of the poultry egg production policy in the context of Nigerian Agriculture. The main objective of this study is to estimate the factors influencing poultry farmers' participation in egg production using binary Logit regression model.

2.0 Methodology

2.1 Study area

The study was carried out in Ilorin, the capital city of Kwara state. Ilorin city consist of three local Government areas namely: Ilorin west, Ilorin south and Ilorin east. Ilorin had an estimated population of about 847,582 people as of 2006 (NPC, 2007).

Ilorin is located on latitude 8° 30' N and longitude 4° 35'E. It is situated in the middle belt zone of Nigeria and occupies an area of about 150km² (Ajibade *et al.*, 2005). The state falls within the Guinea Savannah vegetation Zone with hot and humid season and lies along the country's most important linking commercial route from the Northern part to Southern part of Nigeria. The major ethnic groups are the Yoruba, the Hausa, the Fulani, the Babura and the Nupe people and the occupations of the people in the metropolis are craftwork, carving, cloth weaving and to a greater extent farming. Trading and poultry keeping are flourishing business of the people.

2.2 Sampling procedure and sampling size

The study area was divided into three: Ilorin south, Ilorin east and Ilorin west, chosen based on predominance of registered poultry farmers as contained in the information from poultry association of Nigeria (PAN), Kwara State chapter. These three divisions have the highest percentage share of poultry farmers in the state. A stratified random sampling technique was adopted in selecting 50 registered poultry egg and 50 registered non-poultry egg farmers respectively from each division to make up a total sample size of 300 respondents.

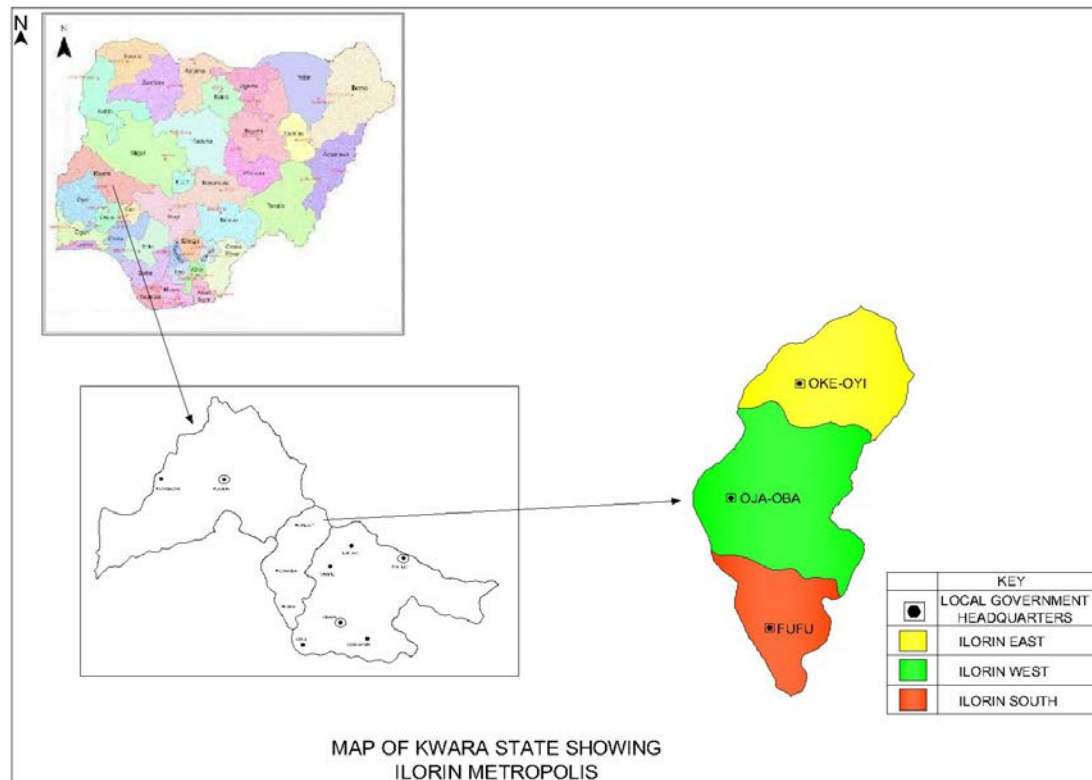


Figure 1: Map of the study area.

2.3 Data collection

The Data was obtained through a structured questionnaire and administered to the sampled farmers. Secondary information was obtained from journals, previous work and textbook. Primary data was collected on socio-economic characteristic which include age, primary occupation, gender, years of schooling, educational level, Poultry farming experience, farm size, family size, years of participation in cooperative society and number of extension workers contact. Data was also collected on farm inputs and outputs such as number of birds, feeds, credit and number of labour used.

2.4 Model

Binary Logit regression: This was used to determine the factors affecting farmers' participation in poultry egg production. There are two reason for choosing binary Logit model for this study instead of linear probability and probit models according to Rahman and Alamu (2003).

- I. Logit models ensures production of probability of choice within (0, 1) range. This is an advantage over linear probability model.
- II. It is easier and more convenient to compute than probit model.

Probability:

$$Y_i = \frac{1}{X_{ij}, j=1-9} = F(Z_i) = \frac{1}{1 + e^{-Z_i}} = \frac{e^{Z_i}}{e^{Z_i} + 1}; i=1-n$$

Where, $z_i = \alpha + \beta_1 X_{i1} + \beta_2 X_{i2} + \dots + \beta_9 X_{i9} + U$

F(.)= cumulative logistic distribution.

Z_i is an unobservable variable in the sense that X^s are generated from the field; β^s are not observable. In order to obtain the value of Z_i the likelihood of observing the sample needs to be formed by introducing a dichotomous response variable Y_i :

$$Y_i = \begin{cases} 1 & \text{if } y^* > 0 \\ 0 & \text{otherwise} \end{cases}$$

1= poultry egg farmers

0= poultry non egg farmers

i=Number of poultry egg farmers

j=1-9 are the socio economic characteristic of ith poultry egg farmers defined as:

X_1 =Farm experience (yrs)

X_2 =Education (yrs)

X_3 =Farm size (number of birds)

X_4 =Age (yrs)

X_5 =Labour (man days)

X_6 =Income (₦)

X_7 = Participation in cooperative society (years)

X_8 = Extension contact (numbers)

X_9 = Credit (₦)

$\beta_1- \beta_9$ = Logit coefficient

α = Constant term.

U= error term which will be assumed to be normally distributed with zero mean and constant.

The marginal probability of factor determines the interest of poultry egg farmers was estimated based on derived expression from the Logit models as:

$$\frac{d\hat{p}}{dx} = bj[\hat{p}(1 - \hat{p})]$$

In order to determine the responsiveness of the probability with respect to jth factor elasticity of probability of poultry egg farmers; which can be defined as the ration of percentage change in magnitude of factor determining poultry egg farmer's interest as:

$$Ep = bj \bar{x}_j (1 - \hat{p})$$

Where b_j =estimate of Logit regression coefficient,

\bar{x}_j =arithmetic mean of poultry egg farmer's jth factor,

$(1 - \hat{p})$ =estimated probability of poultry egg farmer's interest in egg production,

Ep =elasticity of probability.

3.0 Result and discussions

3.1 Binary Logit regression analysis

Table 1 shows the distribution of maximum likelihood estimate of poultry egg producer's level of participation in egg production as related to their socio-economic characteristics in Ilorin, Kwara state. The table shows that poultry experience, Age, labour, extension contact and sex had a negative coefficient and not significant, but years of education had a significant negative coefficient. The farm size, Income, participation in cooperative and credit had significant positive coefficient. It is being noted that a positive sign on a parameter indicated that higher values of variables tends to increase the likelihood of poultry egg production. Similarly, a negative value of coefficient implied that higher values of the variables would reduce the probability of poultry egg production.

Table 1: Maximum likelihood estimate of poultry egg farmer's level of participation in egg production as related to their socio-economic characteristic in Ilorin, Kwara state.

	Coefficient	Std. Error	Z	p-value	
Constant	1.10525	1.923	0.5748	0.56546	NS
Poultry experience(years)(X ₁)	-0.036922	0.127837	-0.2888	0.77272	NS
Education(years)(X ₂)	-0.219367	0.0796653	-2.7536	0.00589	***
Farm size(numbers)(X ₃)	0.0082784	0.0018029	4.5917	<0.00001	***
Age(years)(X ₄)	-0.0675136	0.05584	-1.2091	0.22664	NS
Labour(man-day)(X ₅)	-0.372504	0.453752	-0.8209	0.41168	NS
Income(N) (X ₆)	0.0021216	0.000688	3.0666	0.00217	***

Participation in cooperative(years)(X ₇)	0.369402	0.136083	2.7145	0.00664	***
Extension contact(numbers)(X ₈)	-0.447328	0.425077	-1.0523	0.29264	NS
Credit(N)(X ₉)	0.0000204	0.000006	3.2997	0.00097	***
Log-likelihood	-43.24302				
Omnibus test	329.398			<0.00001	***

Source: field survey 2012, ***=1%, NS=not significant

The result indicates that education, farm size, income, participation in cooperative and credit are the factors that influenced poultry farmers' interest in egg production. All these factors have positive coefficient which are significant at 1% level except education which has negative coefficient but significant at 1% level. Considering education it implies that for every one year increase in formal education of the poultry egg farmers reduces the probability to participation in egg production. The implication of this result may be that the likelihood of poultry egg farmers' acquires formal education the less they partake in poultry production. This could be because they are likely to be more sensitive to risk in their decisions and actions which may affect their productivity. This finding agrees with Wainaina *et al.*, (2012) that an increase in years of education by one year may reduce the likelihood of farmers to participate in contract farming. While for every one unit increase in number of farm size increase the likelihood of poultry egg farmer's participation in egg production. The implication of this is that increase in farm size is expected to increase the income of the farmers.

The result of income and participation in cooperative imply that a poultry egg farmer whose income has increase and who participate more in farmers cooperatives would be more involved in egg production. This finding agrees with Okoh *et al.*, (2010) and also supports the findings of Wainaina *et al.*, (2012) that increased income increases the likelihood of farmers to participate in contract farming. This may be attributed to the fact that once there is an increase in farm size, income may also be increased and increase in years of participation in cooperative society may give more room to assessing credit facility to enhance their productivity. The result support the findings of Rahman (2001) who employed Logit model to identify factors determining farmers' willingness to continue practising cereal legumes mixture found that farm size and cooperative participation were significant factors

determining the farmers' wiliness to continue practising cereal legumes mixture cropping system.

The log-likelihood (-43.24302) indicate that there is no close relationship within the variables and the omnibus test of the model which gives the overall fit test indicate a chi-square value of 329.398 which is significant ($p < 0.01$) implies that the model as a whole fit significantly better.

Marginal and elasticity of probability

The predicted probability of poultry egg farmer's interest in egg production as related to the significant socio-economic variable is shown in Table 2. The Table showed that years of education have a negative marginal and elasticity of probability of 0.00527 and 0.081 respectively. The farm size shows a positive marginal and elasticity of probability of 0.000219 and 0.075 respectively. Income also shows a positive marginal and elasticity of probability of 0.0000523 and 0.027 respectively. Participation in cooperative society also reveal a positive marginal and elasticity of probability of 0.00713 and 0.025 respectively and credit also display a positive marginal and elasticity of probability of 0.000000566 and 0.109 respectively.

Table 2: Predicted probability of poultry farmer's interest in egg production as related to the significant socio-economic variables

Variables	Marginal probability	Elasticity of probability
Years of education	-0.00527	-0.081
Farm size (number)	0.000219	0.075
Income (₦)	0.0000523	0.027
Participation in cooperative society (years)	0.00713	0.025
Credit (₦)	0.000000566	0.109

Source: field survey 2012

The result shows that years of education may not necessary be a factor contributing to poultry farmer's interest in egg production meaning that they may not be educated to be a poultry egg farmer. Participation in cooperative society has the highest extent of influence to

which a unit change increases the probability of the poultry egg farmer's interest in egg production. The implication is that it increases the likelihood of more access to credit facilities, distribution of other benefits apart from loans and creates market power for members.

However, the elasticity of probability which is the factor that predicts the level of poultry egg farmer's interest in egg production shows that access to credit facilities is the main factor for their interest. The implication of this is that the more opportunity the poultry egg farmers have to credit; the more they tend to increase their farm size, with a tendency to increased income. This will lead to an increase in their participation in cooperative society because savings equals investment.

4.0 Conclusion and recommendation

The socioeconomic variables such as years of education, farm size, income, participation in cooperative society and access to credit contributed significantly to poultry egg farmer's interest in egg production. Cooperative society had the highest influence factor on the poultry egg farmer's interest in egg production and the predicted level of which influences the interest of poultry egg farmers is accessibility to credit. Therefore, the study recommends that: Credit which had a positive and significant effect on the interest of poultry egg farmers is necessary to encourage technical innovations and timely availability of necessary inputs. Government should influence by reducing borrowing rates on credit in order to encourage and accelerate the transformation of poultry industry.

References:

- Agada, J.E., D.O.A. Phillip and R.S. Musa (1997).A Logit regression for evaluating poultry farmers' participation in the agricultural insurance scheme in Kaduna state, Nigeria. *Nigerian journal of rural economy and society*, 1(3):49-55
- Ajibade, L.T., P.O. Fatoba, U.A. Raheem and B.A. Odunuga (2005).Ethnomedicine and Primary Healthcare in Ilorin, Nigeria, *Indian Journal of Traditional Knowledge*. Vol. 4(2) pp 150-158.
- Ersado L., G. Amacher and J. Alwang (2004).Productivity and Land Enhancing Technologies in Northern Ethiopia: Health, public investments, and sequential adoption", *Am. J. Agric. Econs.*, 86(2): 321-331.
- National Population Commission (NPC), (2007).Population Census Data Ilorin, Kwara State, Nigeria, Federal Republic of Nigeria Official Gazette, National and State Provisional Total

Census, Printed and Published in 2007 by Federal Government Printer, Lagos, Nigeria. No 21 vol.94, pp 175-200.

Okoh, S.O., S.A. Rahman and H.I. Ibrahim (2010).Gender Participation in Commercial Poultry Production in Karu and Lafia Areas, Nasarawa State, Nigeria. *Livestock Research for Rural Development* volume 22 Article 160 Retrieved September 30, 2012 from <http://www.irrd.org/irrd22/9/Okoh22160.htm>

Oladeebo, J.O. and A.I. Ambe-Lamidi (2007).Profitability, Input Elasticities and Economic Efficiency of Poultry Production among Youth Farmers in Osun State, Nigeria, *International Journal of poultry Science* 6 (12): 994-998.

Rahman, S.A. (2001).Resource use Efficiency in Cereal Legume Mixtures in Giwa and Soba Local Government Areas of Kaduna State, Nigeria. Ph.D. Thesis. Department of Agricultural Economics and Rural Sociology, Ahmadu Bello University, Zaria cited in Rahman, S.A. and J.F. Alamu (2003).Estimating the Level of Women Interest in Agriculture: An Application of Logit regression model, *The Nigerian Journal of Scientific Research* volume 4, (1) 45-49.

Rahman, S.A. and J.F. Alamu (2003).Estimating the Level of Women Interest in Agriculture: An Application of Logit regression model, *The Nigerian Journal of Scientific Research* volume 4, (1) 45-49.

Rajendran, K. and M. Samarendu (2003).Comparative Economic Analysis and Constraints in Egg Production under Cage vs. Deep Litter Systems of Rearing in India, *International Journal of Poultry Science* 2 (2): 153-158.

Sani, R.M., S.A., Musa, M.I. Daneji, M.T. Yakasai and O. Ayodele (2007).Cost and Returns Analysis in Poultry Production in Bauchi and Gombe metropolis area. *Continental Journal of Agricultural Economics* 1:14-19.

Wainaina ,P. W., J. J. Okello and J. Nzuma (2012).Impact of contract farming on smallholder poultry farmers' Income in Kenya. Selected Paper prepared for presentation at the *International Association of Agricultural Economists (IAAE) Triennial Conference, Foz do Iguaçu, Brazil, 18-24 August, 2012.*