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## Economics of Veterinary Services Delivery among Commercial Poultry Farmers in a Market-Driven Economy: Evidence from Delta State, Nigeria

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**Abstract:** The economics of veterinary services delivery among commercial poultry farmers was investigated using primary data collected from 60 respondents (50 commercial poultry farmers and 10 veterinary officers) with the aid of structured questionnaire. Data collected were analyzed using a combination of descriptive statistics (i.e. mean, percentage, standard deviation, table) and inferential statistics (i.e. multiple regression model). The results of the study showed that though the veterinary services delivery was structured into public and private sectors majority (60.9%) of the commercial poultry farmers demanded and obtained veterinary services from the public sector. The estimated cost function of commercial poultry farm in the study area revealed that the cost of veterinary services significantly affected the total cost of poultry output ( $p = 0.01$ ). The estimated demand function for veterinary services indicated that the scale of production and distance to the nearest veterinary office were the significant determinants of the demand for veterinary services in the study area. The finding of the study further revealed that the propensity to supply veterinary services was mainly influenced by demand of poultry farmers (0.8) and effective price that they are willing to pay (0.8). It was recommended among others that private individuals should be encouraged by policy to participate in veterinary services delivery. The issue of veterinary services should be considered important in any development programme in the poultry industry in Delta State, Nigeria.

**Key words:** Veterinary services, commercial poultry farmer, market-driven economy

### INTRODUCTION

The poultry industry has recorded tremendous growth in Nigeria, in terms of production and marketing of its inputs and outputs in recent times. The expansion of Nigeria's commercial poultry industry holds the greatest promise for bridging the gap of animal protein consumption in the country (Achoja *et al.*, 2005). Hence research in the commercial poultry production capacity in Nigeria must receive a boost so as to keep pace with the ever increasing demand for poultry products in the country. The research attempts so far made by various stakeholders to develop the commercial poultry sub sector left much works to be done in Nigeria. Prominent among these are diseases outbreaks and rising cost of veterinary services (Okunaiya, 1986).

Umali *et al.* (1994) classified veterinary services according to their economic properties viz: public and private sector delivery. They investigated the possibility of transferring the responsibility of veterinary services delivery from the state to the private sector. Their findings suggest that the state has played an excessively dominant role in this regard in many developing countries and that there are opportunities for transferring some veterinary services from the public to the private sector in a market-oriented system. The veterinary services serve as a source of employment in the nation's economy. The success of poultry industry is

highly dependent on an effective veterinary service in terms of availability and quality.

The cost of disease treatment and control tends to increase production cost and hence reduced profit earned by commercial poultry farmers in Nigeria. There is therefore the need to evaluate the cost effectiveness of disease challenges in the poultry industry in Nigeria. The widening gap between veterinary service demand and supply is indicative of a weak public sector-operated-veterinary services system.

Intensification of poultry sub-sector with no adequate accessibility to veterinary services is a major source of worry in the world that may warrant some critical investigation. There is a short fall in the traditional government driven veterinary system since it is unable to provide adequate and comprehensive animal health services needed by the ever increasing number of commercial poultry farmers in Nigeria. Yet, the demand for veterinary services will continue to grow as greater a number of diseases are discovered (e.g. Avian flu) and more commercial poultry farms are established in Delta State, Nigeria. The potential of developing countries, including Nigeria, to maintain effective surveillance and control measures is manifested through the poor linkage that exist between commercial poultry farmers and veterinary personnel. The resultant effect is inadequate supply of veterinary services.

The underlying policy should therefore be to strengthen the veterinary services delivery system so that it can translate to advances in the poultry industry in Nigeria. One of the policy strategies should be to identify and analyze the factors that may influence the supply and demand nexus of veterinary service system. Another is to make it more responsive to the realities in the industry. These strategies may have their different implications in a market-oriented economy.

**Objective of the study:** The broad objective of the study is to investigate veterinary services delivery in a market-oriented-system with evidence from Delta State, Nigeria. The specific objectives of the study are to:

- Identify and analyze the structure of veterinary service system among poultry farmers in Delta State, Nigeria.
- Ascertain the effect of cost of veterinary services on the total cost of poultry production in the study area.
- Estimate the demand function for veterinary service delivery among poultry farmers in the study area.
- Determine the propensity to supply veterinary services among poultry farmers in the study area.

#### Research Hypothesis

Ho<sub>1</sub>: The cost of veterinary services does not significantly affect the total cost of poultry production.

Ho<sub>2</sub>: The selected factors do not have significant joint effect on the demand for veterinary services among commercial poultry farmers in the study area.

**Theoretical framework:** In the study three theories were identified and considered applicable, viz; public sector theory, private sector theory and public-private sector partnership theory (Idire, 2007). Drawing from these theories, we defined public sector oriented veterinary services to mean that which is controlled by the government, while the privately owned is operated by private veterinary personnel for maximum profit. Privatization, entails paying the appropriate (full) price for the services (Idire, 2007). Closely allied to this is the theory of commercialization which entails operating public services as profit-market ventures.

Economic theory has commonly been used to rationalize the role of the public and private sector in the supply structure of veterinary services (Umali *et al.*, 1994; Leonard, 1993). It has been variously applied to secure opportunities for privatization (Umali *et al.*, 1994) or as in the report of Leonard (1993), to provide greater insight into the organizational features required to supply those services that will not otherwise be supplied by the private sector.

The economic theory that has implicitly guided the structural reform of veterinary services delivery is that of public-private sector partnership. The theory

emphasizes competition and more efficient ways of providing services with the state playing regulatory role (McLeod and Wilsmore, 2002; Sasidhar and Chandel, 2003).

#### MATERIALS AND METHODS

This study was carried out in Delta State of Nigeria in 2008. The state is made up of 25 Local Government Areas. The study was focused on the economics of veterinary services among commercial poultry farmers with the view to evaluating the effects of cost of disease prevention and investigating the supply and demand nexus of veterinary services delivery among poultry farmers in the study area.

A two stage sampling procedure which involved the use of purposive sampling technique was applied in this study. In the first stage, 50 farmers were selected from the state being farmers that employ the services of veterinary officers. At the second stage, five private and five public veterinary officers were selected from the study area.

The data that were used in this study were collected through the use of questionnaires. The questionnaires were designed in such a way as to elicit the desired information from the farmers and veterinary officers. It consisted of both open and closed ended questions. The assistance of field personnel from the Delta State Agricultural Development Programme (DADP) was solicited in the administration of the questionnaire.

Data collected were analyzed using simple descriptive statistics and multiple regression equation models. Cost function was estimated to determine the effect of cost of veterinary services on the total cost of poultry production while descriptive statistics was used to analyze the structure of veterinary services system among poultry farmers in the state. Demand model was fitted to estimate the demand function for veterinary service delivery among the farmers.

**Estimation of cost function:** The cost function for both private and public veterinary service delivery was formulated and compared to determine the effect of cost of veterinary services delivery on the total cost of poultry production.

$$\text{Total Cost (TC)} = \sum_{i=1}^n P_{xi} + F$$

Where:

P<sub>xi</sub> = Price of ith variable input, X = Quantity of Variable input,

F = Fixed Cost.

The cost function is expressed explicitly as explained below:

$$TC = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \mu$$

Where; TC = Total Cost of Production,  $\beta_1$ - $\beta_6$  = Parameter

Estimates;  $\beta_0$  = Intercept Term;  $X_1$  = Cost of day old chicks (N),  $X_2$  = Cost of Labour,  $X_3$  = Cost of Light and heating,  $X_4$  = Cost of Water,  $X_5$  = Cost of veterinary service,  $X_6$  = Depreciation of Fixed Input and  $\mu$  = Stochastic error term.

**Estimation of the demand function for veterinary services delivery:** The demand function for veterinary service among poultry farmers is as explicitly presented:

$$Dvs = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_4 + \alpha_5 X_5 + \mu$$

Where; Dvs = Frequency of demand for veterinary services (number);  $\alpha_0$  = Intercept Term,  $X_1$  = Number of infested stock (Number),  $X_2$  = Scale of production (Number),  $X_3$  = Distance to veterinary office (km),  $X_4$  = Farmers' income,  $X_5$  = Cost of communication with veterinary officer,  $\alpha_1 - \alpha_5$  = Parameter estimates and  $\mu$  is the Stochastic error term.

## RESULTS AND DISCUSSION

**Socioeconomic characteristics of poultry farmers in the study area:** The data generated on the various socioeconomic characteristics of the poultry farmers in the study area is as presented in Table 1. About 13.0% of the respondents were aged less than 26 years. 30.4% fall within the age of 26-35 and 14.8% of the respondents fall within the age bracket of 36-45 while 8.7% fall on 45 and above. This implies that more than 78% of the sampled respondents were within the active productive age of 26-45 years.

Table 1: Socioeconomic characteristics of poultry farmers

Variables	Frequency	Percentages
<b>Age (in years)</b>		
Less than 25	4	13.0
26-35	15	30.4
36-45	24	47.8
45 and above	7	8.7
<b>Gender</b>		
Male	37	73.9
Female	13	26.1
<b>Educational level</b>		
Primary	2	4.3
Secondary	13	26.1
Post secondary (Cert/Dip)	9	17.4
Bachelors degree	17	34.8
Higher degree	9	17.4
<b>Marital status</b>		
Single	20	39.1
Married	30	60.9
<b>Scale of poultry enterprise</b>		
< 500 (Small)	24	47.8
500-1500 (Medium)	19	43.3
> 1500 (Large)	7	8.7
<b>Family size</b>		
1-3	9	17.4
4-6	35	69.4
7-10	4	8.7
11 and above	2	4.3

Sources: Computed from Field Data, 2008

73.9% of the respondents were males and 26.1% were female. This shows that a greater proportion of the commercial poultry farmers were males.

The number of years spent in acquiring formal education was expected to influence the farmer's level of awareness on the importance of veterinary services and would want to take advantage of it. This would ultimately influence the farmer's demand for veterinary services. In the study area, 4.3% of the poultry farmers had primary education, 21.1% had secondary education and 17.4% had post-secondary education (Certificate/Diploma). Furthermore, 34.8% of the respondents had Bachelors degree while 17.4% had high degree in Agriculture. The high level of literacy in the area may be due to the closeness of the study area to educational institutions such as numerous secondary schools, Delta State Polytechnic and the Delta State University.

About 47.8% of the commercial poultry farmers in the survey operated on a small scale, 43.4% were medium scale farmers while 8.7% of the farmers operated on large scale. It can be deduced from the result that majority of the farmers were mainly small scale (47.8%) and medium scale producers (43.4%).

The existence of very few large scale producers (8.7%) in the survey could be attributed to the fact that large scale poultry production is capital intensive and very few poultry farmers have the financial capability to operate at the level.

About 17.4% of the respondents have a family size of 1-3 while 69.6% of them have a family size of 4-6, 8.7% of the respondents fall within the family size of 7-10 while 4.3% fall within 11 and above. The majority of the commercial poultry farmers maintain fairly large families. Maintaining large families in a developing economy like Nigeria could be sources of labour. However, it could serve to drain the capital accumulated by the farmers such that very little would be left for farm expansion.

### Structure of veterinary services rendered to commercial poultry farmers in the study area:

Privatization has been widely advocated as a means of improving the quality and supply of veterinary services (Leonard, 1993; de Jaan and Bekure, 1991). The research findings show that 39.1% of the respondents obtain veterinary services from the private sector while 60.9% get services from the public sector. This implies that the private sector is not yet active in the supply of veterinary services. The result of this analysis is as presented in Table 2.

Table 2: Structure of Veterinary Services Rendered to Commercial Poultry Farmers in the Study Area

Structure of veterinary services	No. of Respondents	Percentage
Private	20	39.1
Public	30	60.9
Total	50	100

Sources: Computed from Field Data, 2008

**Estimation of cost function of commercial poultry farms:** As elucidated in the methodology, the cost function of commercial poultry farmers was estimated so as to isolate the effect of cost of veterinary services delivery on the total cost of production. It was based on the assumption that the total cost of production is a function of cost of veterinary services while other factors are held constant. The essence was to investigate whether the cost of veterinary services delivery provides a statically significant contribution to the total cost of production. The result of the Ordinary Least Square (OLS) of multiple regression was estimated using three different forms of the model, namely: linear, semi-log and double log. The linear form of the model was adopted as the lead equation based on the  $R^2$  value and the number of significant variables in the model. The significance of the parameter estimates of the model was evaluated by means of t-test at 1% and 5% levels of significance. The estimated cost function is presented in Table 3.

Table 3: Total Cost Function of Poultry Farms

Variables	Coefficient	SE	t-cal	Sig. t
Cost of day old chicks	0.814	0.258	3.162	0.006
Cost of Labour	0.654	0.457	1.431	0.173
Cost of Light and heating	1.117	0.340	3.496	0.003
Cost of Water	0.448	16.554	0.27	0.979
Cost of veterinary services	1.106	0.203	5.45	0.001
Depreciation of Fixed Input	3.458	2.708	1.28	0.221
Constant	41501.57	29116.8	1.43	0.175
$R^2 = 0.97$				
$R^2$ (adj.) = 0.95				
F-ratio 72.5				

Three of the six parameters included in the model were significant at 1% level of significance. These parameters relate to cost of day old chicks ( $X_1$ ), cost of light and heating ( $X_3$ ) and cost of veterinary services ( $X_5$ ). The cost of veterinary service delivery was the major parameter of interest in the study.

The  $R^2$  is the coefficient of multiple determination, which reveals the proportion of the changes in the dependent variable that were explained by the independent variables in the model. The F-statistic measures the joint impact of the regressors on the regressand, thus testing the point significance of the model. The  $R^2$  shows that 97% of the changes of the dependent variables (Total cost of poultry production) were significantly explained by the independent variables captured in the model.

Using a one-tail test at 1% level of significance, the F-computed is 72.5 and the theoretical F is equal to 4.32. Since the calculated F is greater than the corresponding table value, we reject the null hypothesis and conclude that the variable have a significant point effect on total cost of poultry production.

The regression result shows that the cost of veterinary services has a significant and positive relationship with

the total cost of poultry production. This implies that veterinary service is an important issue to be considered in any development programme in the poultry industry. This finding agrees with the earlier report of Okunaiya (1986) who asserted that the various attempts made by organizations to improve commercial poultry production were with different problems such as the rising cost of veterinary services.

**Estimation of the demand function for veterinary services:** The demand function for veterinary services was estimated to determine the factors that affect the demand for veterinary services among commercial poultry farmers in the study area. The estimate demand function is presented in Table 4.

Table 4: Demand Function for Veterinary Service

Variables	Coefficient	SE	t-cal	Sig. t
Constant	14.23	3.64	3.911	0.001
Number of infested stock	0.0297	0.0345	0.860	0.402
Scale of production	0.0083	0.0028	2.925	0.009
Distance of veterinary office	-0.001	0.0003	-3.633	0.009
Farmer's Income	-8.958	5.82	-1.539	0.143
Cost of communication with veterinary officer	0.0009	0.0014	0.686	0.502
Stochastic error term	9.900			
$R^2$	0.67			
$R^2$ (adj.)	0.57			
F-ratio	6.57			

Three of the five parameters included in the model were significant at 1% level. These parameters are the scale of production ( $X_2$ ) and the distance to veterinary officer ( $X_3$ ). The  $R^2$  of 67% indicates that 67% of the changes in the frequency of demand for veterinary services were explained by the changes in the independent variables. Using a one tail test at 1% level of significance, the F-computed is 6.57 and the theoretical F is equal to 4.44. Since the calculated F is greater than the corresponding table value, we reject the null hypothesis and conclude that the selected factors have a significant joint effect on the demand for veterinary services by commercial poultry farmers in Delta State, of Nigeria.

The results of the statistical significance of the individual explanatory variables in the model are discussed as follows:

**Number of infested stocks ( $X_1$ ):** The result shows that the number of infested stock is not a significant determinant of the demand for veterinary services by commercial poultry farmers. This implies that a rational poultry farmer would alert veterinary personnel as soon as there are symptoms of ailment in the farm irrespective of the number of infested birds. However, the positive relationship between the number of infested stock and the frequency of demand for veterinary services in the model shows that as the number of infested stock increases, the tendency of demand for veterinary services may also increase.

Table 5: Factors that influenced the tendency to supply veterinary services

Supply factors	Frequency (N = 10)	Relative Frequency	Percentage
Group demand	5	0.5	50
Farmer's willingness to pay	8	0.8	80
Distance to poultry farm	6	0.6	60
Infrastructure status	3	0.3	30
Effective price that farmers can pay	8	0.8	80

**Scale of production (X<sub>2</sub>):** The result of the study show that the scale of production is a significant factor that determines the demand for veterinary services at ( $p \leq 0.05$ ) level of significance. This implies that the scale of production (the total number of birds in the farms) is a major determinant of the demand for veterinary services. The number of birds on the farm gives the picture of the degree of potential loss to the farmer should an outbreak of disease occur. Frequent demand for veterinary services is therefore an art of insurance against huge losses. Further more, as the poultry industry grows in Nigeria, demand for veterinary services is expected to grow over time. The policy issue now should be to encourage the participation of private sector to complement the public sector in veterinary services delivery in Nigeria.

**Distance to veterinary office (X<sub>3</sub>):** The result of the study revealed that the distance to the nearest veterinary office is significant in influencing the demand for veterinary services among poultry farmers in the study area. Negative relationship between distance traveled by poultry farmer and demand for veterinary services was evident in the study. This implies that, as the distance increase, the associated cost of transport will also increase. Accordingly, the farmers will become more reluctant in placing demand for the services of veterinary officers. This could result in self medication by the poultry farmers as the last resort.

**Farmer's income (X<sub>4</sub>):** The findings of the study revealed that the income of the commercial poultry farmer bears positive though not significant relationship with the demand for veterinary services in the study area. This shows that the higher the income of the poultry farmer, the higher the tendency to patronize a veterinary officer when there is disease outbreak. The reverse may be the case with small poultry farms with lean income. Such farmers may be reluctant to demand the services of veterinary officer and may resort to self administration of treatment when the need arises. This phenomenon is in conformity with rational economic principle. This principle supports a higher demand for purchased input with increasing farm income. In a market driven economy, veterinary services assumes the status of purchase input.

**Supply of veterinary services:** The multiple responses recorded show that veterinary personnel affirmed that the identified factors influenced their tendency to supply their services to poultry farmers (Table 5).

However, farmers' willingness to pay agreed price (0.80 and the effective price they can pay (i.e. their ability to pay) (0.8) greatly influenced the veterinary services supply tendency. The probability of supplying veterinary services based on the price is (i.e. 80%). This implies that in a market oriented system, cash plays an important role in motivating services providers. This is in line with basic economic principles. The study revealed further that the probability to supply veterinary services due to group demand is 0.5 in the study. Group demand for veterinary services will only occur if there were cases of disease outbreak in the farms of cooperating poultry farmers at the same time within the same area. This was rarely the case. The result of the investigation shows that distance to the poultry farm could influence veterinary services delivery at a probability of 0.6. In a market driven veterinary system, distance may not be a big problem provided poultry farmers are willing and able to pay a fee that adequately covers transports cost of the veterinary personnel plus a margin.

**Conclusion:** The commercial poultry farmers have many purchased inputs to combine. The demand and supply of veterinary services is of major concern to the advancement of the poultry industry. The cost of veterinary services is significant in the cost structure of commercial poultry farmers in Delta State, Nigeria. In a market-driven system, veterinary services demand and supply revolve mainly around competitive pricing. This keeps both the farmer and veterinary officer in business. Getting veterinary services to commercial poultry farmers at reasonable and affordable prices is a source of encouragement to them. Also a cash oriented veterinary system is expected to give hope of livelihood to numerous graduates of veterinary medicine who could not join the public sector in Delta State, Nigeria (Shannmagasudaram, 1997).

It is therefore recommended that the private sector should be encouraged to participate in veterinary services delivery to complement the public sector and that Veterinary services delivery should be considered as a crucial issue in any development programme in the poultry industry in Delta state, Nigeria.

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