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Economic Implication of Avian Influenza on Poultry Farmers in Ogun State, Nigeria

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Abstract: The outbreak of Avian Influenza in Nigeria creates a serious concern for poultry farms, vertinary doctors and the government as a whole. The fall in sales of poultry products and income generated from the enterprise inform the need to study the economic implication of the disease on poultry farmers in Ogun State Nigeria. A multi-stage sampling technique was used. The farmers in the selected zones were stratified into those with affected and non-affected farms. Forty of the affected farms are purposively selected, while forty unaffected farms are randomly selected across the zones making a total of 80 sample used for the study. Data collected by the use of structured questionnaire were subjected to descriptive, budgetary and inferential statistics. The results revealed that majority of the farmers are male for the two categories and falls within the age range of 41-50 years. Some (5%) of the farmers of the affected farms still have no primary education, while all the farmers of the unaffected farm sampled have at least a primary education. The Ordinary Least Square (OLS) results show that for the unaffected farms, age of the farmers is significant at 10% level and positively related to their income, while for the affected farms cost of medication is significant at 1% and positively related to income of the farmers. For the pooled data, the result indicated that years of experience and bird populations are positive and statistically significant at 5 and 1% level, respectively. From the F-test result it was concluded that there is significant different between the socio-economic characteristics and level of income of the affected and unaffected poultry farms. The encouragement of younger people into poultry business as well as education of poultry farmers particularly farmers of the affected farms are strongly recommended.

Key words: Economics, avian influenza, poultry farmers, inferential statistics, Ogun State, Nigeria

INTRODUCTION

Poultry are domesticated birds that are bred specifically to provide meat and eggs for human consumption. There are two categories of fowls, they are broilers and layers. Broilers are bred for poultry meat production, while Layers are bred for both meat and egg production. There are some diseases that affect poultry production such as salmonella, fowl pox, cocciodiosis, Newcastle disease, Marek, Gomboro, Chronic respiratory disease, fowl cholera etc and there comes Avian influenza.

Avian influenza, which is also known as bird flu, is a disease caused by flu viruses in birds and it is highly contagious. It affect all types of birds e.g., Chicken, Ducks, Turkeys, Guinea Fowls etc. These viruses occur naturally among wild birds (birds in the bush), which fly from country to country spreading the disease to domestic birds (birds in our homes and farms). Avian flu spreads very fast among birds, which makes them very sick and kills them within a day. It also affect human being and can kill them.

The incubation period is hours to days, depending on age, sex and species affected, concurrent infections and pathogenecity of virus. Multiple pathotypes can occur, which is a drop in egg production and shell quality, watery eyes, excessive lacrimation, Oedema of head and face and cyanosis may be observed. Antigenic change is common by antigenic shift (reassortment of segments).

Lesions include mucus in trachea, air sacculities, swollen head or wattles, egg peritonitis, sinusitis, necrosis of skin and Gastro intestinal tract, haemorrhages on wattles, coms and legs necrotic foci on liver, spleen, kidney and lungs and haemorrhages at junction of proventriculus and gizzard can be seen with this diseases.

The influenza viruses are divided into three categories A-C, based on 2 proteins found in their inners cores (Spencer, 2000). Influenza B and C virus infect human only. The influenza A is further divided according to the surface characteristics in particular two different molecules called haemagglutinin (16 different kinds of this molecules exist) and Neuraminidase (9 different kinds of this molecules exist). Therefore, each of them has a designation H#N# (Horomtz, 2005).

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As the name indicates, birds are the carrier of this disease. The infected birds continue to move around and as they fly overhead, spread plenty of virus in their manner of indiscrete defection.

The H_5N_1 strain has proven to be particularly worrisome, with more 200 human infection each of which has been associated with contact with poultry (Timothy, 2008).

In poultry morbidity and mortality with HPAI are both very high. Once within the body, the virus replicates in endothelium in many organs, often spilling over to affect parenchyma cells as well. Death occurs due to multi-organ failure within 2-3 days of infection post-mortem. Lesions include edema in the subcutaneous tissues anywhere, but especially neck and foci of haemorrhage in many locations most prominently trachea and shanks.

Most people, who have developed the symptoms have had close contact with sick birds, though the exact incubation period for Avian flu in humans is not clear, the illness seems to develop within 1-5 days of exposure to the virus. Health officials are concerned that a major bird flu outbreak could occur in humans, if the virus (H_5N_1) mutates into a form that can spread more easily from person to person (Timothy, 2008).

Outbreak of HPAI are usually approached through a stamping out policy. Poultry mortality with strains of HPAI approaches 100%, Bryan (2007). It is important to eliminate all infected birds and their contacts in order to keep disease from spreading.

A vaccine exists for avian influenza and is used in some areas to help with control. Unfortunately, a vaccinated bird could still infect with the virulent form of HPAI, might not appear sick but could still shed virus. Consequently, any poultry vaccination campaign needs to be accompanied by strict surveillance and continued biosecurity.

Most scientists believe that it will be difficult to avoid an incursion of the H_5N_1 virus. Either through illegal movement of poultry or through migratory birds, the virus will undoubtedly hitch like ride to enter the state. The greater concern about the occurrence of a pandemic, there is a possibility that the bird flu virus may mutate so that it becomes capable of human to human spread.

There is little doubt that any country will be able to escape incursion of this virus. If there is a mutation to allow for easy transmission among people, every country in the world will definitely be affected.

This Avian influenza (H_5N_1) virus was first confirmed in the Northern Nigerian on February 8, 2006, although the birds had been dying for weeks. The virus was found at a commercial chicken farm in Jaji, near the city of Kaduna. The outbreak of bird flu, a zoonotic diseases and the possibility of affecting population in these regions has sent shock waves to the society.

As a result of this disease, the economic value of the poultry product decline thereby causing loss or shortage for the poultry farmers, although, Lee (2006) said that poultry through cooking kills the virus.

The causative agent, orthomyxovirus is a single stranded RNA virus containing 8 segments and 35 serotypes. Type A viruses are divided into subtype according to the antigenic nature of Haemagglutinin (HA) and Neuranunidase (N). The HA is a viral protein, which can attach to the cell viruses. Type B and C does not affect domestic animals as observed by Bryan (2007).

Avian influenza can be classified into Low Pathogenecity (LPAI) and High Pathogenecity (HPAI) forms on the severity of the illness they caused. Most Avian influenza virus strains are low pathogenecity, which typically cause little or no clinical sign in infected birds. LPAI also, poses no known threat to human health, while HPAI can be severe illness and high mortality in birds and as in the outbreak caused in human disease.

Banks, Government and Non-Governmental Organizations (NGOs) have been showing great concern about eradication of the disease. The bank assistance include technical and financial support to farmers and veterinary and health service in order to tackle the virus at its animal source and to help reduce opportunities for direct transmission to humans. Therefore, in other to exert more effort academically, study on the economic implication of avian influenza on poultry farmers in Ogun State, Nigeria. The study aims at answering the following questions:

- What are the socio-economic characteristics of the poultry farmers?
- What are the other determining factors that affect farmers' income?
- Is there any structural difference between the affected and the unaffected farm?

The research will go along way in enlightening the poultry farmers on the economic implication of avian influenza. Likewise, consultants and the extension agents will be provided with useful information on the consequences of this disease.

Finally, the policy maker will be provided with veritable information on the impact of the disease.

The broad objective of this study is to examine the economic implications of avian influenza on poultry farmers in Ogun State.

The specific objectives are to:

- Identify the socio-economic characteristics of farmers who are in the area
- Highlight the factors that affect farmers' income in the affected and unaffected farms
- Examine if there is structural differences between the affected and the unaffected farm

Hypothesis of the study: There is no productivity differential between the affected and non-affected farms.

MATERIALS AND METHODS

The study was carried out in Ogun State, which is situated in South western zone of Nigeria. Ogun State came into existence in February 1976 from the former western state. There are three zones in Ogun state; they are Ogun West, Ogun East and Ogun Central.

A multistage sampling techniques was used to select poultry farmers. In stage 1, simple random sampling technique was used to select one zone out of the three zones. In stage 2, stratified sampling techniques was used to stratify the farms involved into the affected and the non-affected farms. In stage 3, purposive sampling techniques was used to select all poultry farmers whose farms are affected (40 farms) by avian influenza and equal number of the non-affected farms were randomly sampled to make a total of eighty poultry farms for the study.

The method of data collections was with the aid of structured questionnaires, participatory observations as well as personal interviews with the respondents.

The analytical techniques used were:

- Descriptive statistics, which include frequency table, percentage etc.
- Multiple regression analysis
- Chow test analysis

RESULTS AND DISCUSSION

Socio-economic characteristics of respondents: Table 1 revealed that majority of the respondents for the affected and non-affected farms falls within the age range of 41-50 years. About 37.5 and 17.5% of the respondents were female, while 62.5 and 82.5% were male from affected and non-affected poultry farmers, respectively. Likewise, for the education distribution, 35% each have N.D/N.C.E and B.Sc/H.N.D education and 7.5% of them have primary education for the non-affected poultry farmers, while for the affected poultry farmers, 5.0% have no formal education and 35.0% have only B.Sc/H.N.D education.

Table 1: Socio-economic characteristics

	Affected		Non-affected	
Age group in years	No. of respondent	Percentage	No. of respondent	Percentage
10-20	1	2.5	2	5.0
21-30	4	10.5	7	17.5
31-40	9	22.0	10	25.5
41-50	13	32.5	12	30.0
51-60	5	12.5	5	12.0
>60	8	20.0	4	10.0
Total	40	100.0	40	100.0
Sex				
Male	15	37.5	7	17.5
Female	25	62.5	33	82.5
Total	40	100.0	40	100.0
Educational level				
No education	2	5.0	0	0.0
Primary education	4	10.0	3	7.5
Secondary education	10	25.0	7	17.5
Adult education	2	5.0	2	5.0
N.D/N.C.E	8	20.0	14	35.0
B.Sc/H.N.D	14	35.0	14	35.0
Total	40	100.0	40	100.0
Marital status				
Single	2	5.0	2	5.0
Married	38	95.0	38	95.0
Total	40	100.0	40	100.0
Mode of farm operation				
Part-time	9	22.5	6	15.0
Full-time	31	77.5	34	85.0
Total	40	100.0	40	100.0

Field Survey (2008)

About 95% of the respondents are married for both the affected and non-affected poultry farmers, while only 5.0% are singled for the affected and the non-affected poultry farmers, respectively. About 15.0 and 22.5% of the non-affected and the affected poultry farmers, respectively are part-time farmers, while 77.5 and 85.0% of the affected and the non-affected poultry farmers are full time farmers, respectively.

From Table 2-4 the inferential statistics indicate that the age of the respondents and the medication cost ahs a positive and negative relationship with the income for the affected and the non-affected poultry farms at 10% levels, respectively. For the pooled data, the year of experience of the poultry farmers and the numbers of birds in the poultry farms have positive effect at 5 and 1% level on the income.

Chow analysis and interpretation:

$$Fcal = \frac{S_5/k}{S_4/(n_1+n_2-2k)}$$

S_1 = Residual sum of squares for pooled = 5.6×10^{10}

S_2 = Residual sum of squares for affected farms = 2.8×10^{10}

S_3 = Residual sum of squares for non affected farms = 5.6×10^{9}

Table 2: Table showing all the functional forms fitted for the affected poultry farms

Variables	Linear	Exponential	Semi-log	Double-log
Constant	-93551.710 (56910.551)	7.619 (1.293)	-1175386 (0.000)	-7.940 (0.000)
Age	1086.778 (588.384)	3.444E-02 (0.013)	261692.66 (0.000)	-0.350 (0.000)
Education	1766.444 (1931.944)	5.229E-02 (0.038)	52961.598 (0.000)	-0.36 (0.000)
Experience	1890.750 (1152.529)	5.267E-03 (0.024)	-6355.807 (0.000)	0.623 (0.000)
Full time	-16078.899 (19311.412)	-	36346.425 (0.000)	0.369 (0.000)
Poultry system	-1415.571 (14779.112)	9.969E-02 (0.283)	-71887.495 (0.000)	-0.052 (0.000)
Bird population	0.594 (0.841)	9.275E-06 (0.000)	52438.737 (0.000)	2.086 (0.000)
Medication cost	0.466 (0.296)	5.485E-06 (0.000)	34045.531 (0.000)	-0.315 (0.000)
Variable cost	1.033E-02 (0.054)	-2.54E-007 (0.000)	-28833.281 (0.000)	-
Fixed cost	3.935E-02 (0.152)	9.697E-07 (0.000)	54158.792 (0.000)	-0.118 (0.000)
Mortality	8590.988 (13744.004)	0.130 (0.273)	32420.998 (0.000)	-0.145 (0.000)
Water bath	5423.686 (6110.490)	-0.084 (0.126)	-	-
Vaccination	-43.484 (11659.354)	-0.043 (0.245)	-	-

Table 3: Showing all the functional forms fitted for the non-affected poultry farms

Variables	Linear	Exponential
Constant	-50510.511** (23205.930)	7.398 (1.159)
Age	637.282 (494.238)	1.633E-02 (0.017)
Education	764.014 (622.238)	3.463E-02 (0.021)
Experience	-17713.764 (11848.390)	5.996E-02 (0.442)
Marital status	-1090.239 (778.355)	-0.016 (0.025)
Full time	29240.319 (7349.842)	1.251 (0.509)
Poultry system	5861.935 (4386.727)	0.208 (0.162)
Bird population	8.100 (0.825)	1.041E04 (0.000)
Medication cost	-0.151*** (0.078)	-2.62E-006 (0.000)
Variable cost	2.341E-02 (0.017)	3.174E-07 (0.000)
Fixed cost	5.177E-02 (0.057)	1.524E-06 (0.000)
Water bath	-1416.469 (4218.281)	-0.037 (0.184)
Vaccination	4451.562 (5657.833)	-0.086 (0.228)

Table 4: Pooled regression analysis results

Variables	Linear	Exponential	Semi-log	Double-log
Constant	-48599.203 (27581.316)	7.059 (1.059)	-1622198 (0.000)	-14.883 (0.000)
Age	224.425 (421.568)	1.894E-02 (0.010)	748568.60 (0.000)	0.340 (0.000)
Education	601.824 (918.527)	3.641E-02 (0.020)	219579.09 (0.000)	-0.191 (0.000)
Experience	1450.406 (673.494)	1.871E-02 (0.015)	-163634.1 (0.000)	0.372 (0.000)
Full time	7415.427 (9799.417)	1.056 (0.635)	- (No fulltime)	- (No fulltime)
Poultry system	78.561 (6645.969)	0.205 (0.152)	-367843.6 (0.000)	-1.066 (0.000)
Bird population	32.022 (0.619)	2.627E-05 (0.000)	-281452.2 (0.000)	4.943E-02 (0.000)
Medication cost	0.136 (0.099)	2.714E-05 (0.000)	109195.45 (0.000)	2.862 (0.000)
Variable cost	3.284E-02 (0.024)	2.901E-08 (0.000)	-9006.645 (0.000)	-0.570 (0.000)
Fixed cost	5.354E-02 (0.063)	4.583E-07 (0.000)	638042.07 (0.000)	- (No fixed lost)
Mortality	3273.222 (9668.615)	-2.949E-02 (0.193)	- (No mortality)	- (No mortality)
Water bath	1055.312 (4118.301)	-5.898E-02 (0.094)	284281.78 (0.000)	-0.389 (0.000)
Vaccination	3089.830 (7058.039	1.972E-02 (0.156)	151734.35 (0.000)	-0.174 (0.000)

Field Survey (2008)

$$Df = (n_1 + n_2 - 2k)$$

Where,

n_1 = Number of affected poultry farmers = 40

n_2 = Number of non-affected poultry farmers = 40

K = Number of variables + constant = 13

$S_4 = S_2 + S_3$

$S_5 = S_1 - S_4$

$S_4 = 2.8\times10^{10} + 5.6\times10^{9}$

$= 3.36\times10^{10}$

$S_5 = 5.6\times10^{10} - 3.36\times10^{10}$

$S_5 = 2.24\times10^{10}$

$Df = (40 + 40–2\times13) = (40 + 40–26) = (80–26) = 54$

S_5 is the value derived by subtracting the summation of the Residual Sum of Square (RSS) for the affected poultry farms (S_2) and non-affected poultry farms (S_3), from the Residual S um of Squares (RSS) for the pooled (S_1). S_4 is the summation of the residual sum of squares for both the affected and non-affected poultry farms (S_2 and S_3).

$Ftab = (k,df)$

$Ftab = (13,54)$

$$Fcal = \frac{S_1 - S_4 / k}{S_4 / df}$$

$$Fcal = \frac{S_5/k}{S_4/df} = \left[\frac{2.2\times10^{10}}{13}\right] \div \left[\frac{3.36\times10^{10}}{54}\right]$$

$$= \frac{2.2\times10^{10}}{13} \times \frac{54}{3.36\times10^{10}}$$

$$= \frac{120.96}{43.68} = 2.769$$

Fcal = 2.769

Ftab = (13, 54) = 2.43

Fcal>Ftab

Therefore, H_0 is rejected. This implies that there is a significant difference in the level of production between the affected and the non affected poultry farms.

CONCLUSION

The study focuses on the economic implication of avian influenza on poultry farmers in Ogun State, which is one of the poultry diseases also known as Bird Flu. The study made use of descriptive and inferential statistics. Using primary data collected from the poultry farmers in the selected state. The farm, which is the most important is owned by men (58%) and they operate business because it is an activity that is mostly suited for men. Most of the farmers are within the age of 41-50 (both the affected and non-affected poultry farm) indicating that the poultry farmers in the study area is mostly done by the middle aged people and majorities are married. The major occupations of the farmers are farming business, which indicate that almost all the poultry farmers are full time farmers.

From the result of the linear regression, the age of the farmers and the medication cost has a positive and negative effect on income for affected and the non affected poultry farms. The year of experience of the poultry farmers and the numbers of birds in the poultry farm have the positive effect on the income. The age of the poultry farmers and the medication cost are both significant at 10% level of significance for the affected and non-affected poultry farmers. Also, both the year of experience and the number of birds are significant at 5% and 1% level of significance.

Based on the test of significance of the estimate, there is significant differences in the level of production between the affected and non-affected poultry farms.

Poultry farmers in the area are of middle age class and some of them still have no primary level of education and the spread of the virus are minimal among farmers with intensive system of poultry keeping.

The cost incurred on medication against the spread of the disease have a negative and statistically significant impact on the income of farmers of the affected farms.

RECOMMENDATIONS

Younger people should be encouraged to go into farming as majority of the poultry farmers are in their middle age.

Education of the poultry farmers particularly among the affected farmers should be given utmost priority this will enhance the eradication of the disease from the farm.

Extension agents should encourage intensive system of poultry keeping as this reduces the spread of the virus. Finally, this can be achieved if the government would encourage youth farmers by subsidizing the cost in the treatment of this disease; thereby she makes the poultry farming more attractive.

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