Analysis of Poultry Farmers' use of Pests and Disease Control Strategies in Kwara State, Nigeria

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ABSTRACT

Pests and diseases are a major constraint to poultry production in Nigeria. The extent to which poultry farmers take advantage of the various management strategies recommended for pest and diseases control has implications for production efficiency. The study analyzed farmers' use of pest and disease control strategies. The specific objectives of the study were to; identify the prevalent pests and diseases of poultry in Kwara State, Nigeria, identify farmers' sources of information on pests and diseases control, assess farmers' use of control strategies and identify constraints to pest and diseases control. The study also investigated factors that influence farmers' use of control strategies.

A two-stage random sampling technique was used to select 129 respondents on whom a structured questionnaire was administered. Descriptive statistics and the Pearson's Product Moment Correlation were used for data analysis. Rodents, Newcastle disease, and coccidiosis were the most prevalent pest and diseases. Most farmers (75.8%) relied on other farmers for information. Farmers' level of use of control measures was low (Mean=2.6) and influenced by their educational level (0.591), extension contact, farm size, primary occupation (0.526) and source of information (0.550) at P<0.01. The major constraints to pest and diseases control were high cost and poor quality of drugs. Regularization of the poultry sub-sector and training of operators were some of the recommendations made.

(Keywords: poultry, pests, disease, management, control)

INTRODUCTION

The contribution of the poultry sub-sector in Nigeria cannot be overlooked. Accounting for 10 percent of the agricultural GDP, and providing means of livelihood directly or indirectly for about 20 million people, the sector is estimated at about ₦80b ($600M) (Odeh, 2010). Reported to have the second largest population of birds in Africa with about 192 million birds, Nigeria is Africa's largest egg producer averaging 650,000 MT per annum and second largest meat producer after South Africa (FAO, 2012). The poultry industry is important to achieving an adequate supply of the much needed animal protein to ensure nutrient security in the country particularly because of the efficiency with which poultry species transform nutrient into high quality animal protein. In addition, poultry has been associated with fast maturity and high fecundity (Isika et al., 2006).

Although a variety of birds including; turkey, ducks, geese, and guinea fowls are kept, chicken is the dominant form of poultry animal in Nigeria accounting for 90 percent of poultry production (Foundation for Partnership Initiatives in the Niger Delta, PIND, 2013).

Chicken production is highly fragmented in the country with most birds raised in backyard facilities or small poultry farms with less than 1,000 birds. Akinwumi et al., 2010 reported that only 40 percent of poultry production in Nigeria is commercialized. According to FAO (2012), the chicken population has been growing at a compound rate of 5 percent since 2000. However, the trio of the rapidly increasing population, per capita income and urbanization has continued to raise the demand for poultry products in the country (Anderson, & Gugerty, 2010; CIA, 2012).

In spite of the ban imposed by the Government of Nigeria on the importation of poultry products into the country, the Nigerian Customs Services (2012) affirmed that about 90 percent of poultry meat imported into the Benin Republic is re-exported illegally, primarily into Nigeria. The continued importation of poultry products despite the high production level suggests inadequacy of local supply or price differential arising possibly from the difference in production efficiencies. Mortality, reduced productivity and profitability arising from incidences of diseases are major constraints to poultry production in Nigeria. The risk of a disease outbreak among chicken is a constraint preventing increased investment in the enterprise. Prevention has been suggested to be very effective in mitigating the risk of diseases outbreak in poultry (USDA, 2007).

Biosecurity which according to USDA, 2014 is defined as practices undertaken to prevent or control the introduction and spread of disease agents such as bacteria, fungi, nematodes and viruses to a flock has been affirmed to be crucial to pest and diseases control in poultry. It entails all that is done to minimize the chances of infectious diseases being transmitted to the farm, poultry yard, aviary, and birds by people, animals, equipment or vehicles, either accidentally or on purpose. Segregation and traffic control, cleaning and disinfection have been identified as the three principal elements of any poultry biosecurity plan.

The cost of diseases which are loss of birds, poor productivity, financial loss to farmers, human infection and even death are the justification for a robust biosecurity plan in every poultry house. The need for such a plan is even more critical for backyard and small scale poultry houses because of the frequency of movement around them compared to large scale poultry outfits that are most often located away from residential areas.

There is paucity of empirical information on the use of biosecurity practices among poultry farmers in Kwara state. Knowledge of the level of use among the farmers will point agricultural extension efforts in the right direction. It is also important to identify poultry farmers' sources of information on these practices. Empirical data on the factors associated with farmers' use of biosecurity measures will assist policy decision on best methods to improve use. Finally, it is also possible that poultry farmers in the area are faced with challenges which limit their practice of biosecurity measures. The study, therefore, analyzed poultry farmers' use of pest and diseases management strategies in Kwara State, Nigeria. The specific objectives of the study were to:

1. Describe the socio-economic characteristic of poultry farmers in the study area;
2. Examine the prevalent pests and diseases;
3. Identify poultry farmers' information sources about pests and diseases in the study area;
4. Evaluate pest and diseases management practices carried out by poultry farmers; and
5. Identify the factors militating against pests and diseases control on poultry farms in the study area.

Hypotheses

The hypotheses of the study were stated in the null form as follows:

$H0_1$: There is no significant relationship between some selected socio-economic characteristic of poultry farmers and their level of use of poultry pests and diseases control strategies.

$H0_2$: There is no significant relationship between the respondents' sources of information and their level of use of pest and diseases control strategies**.**

METHODOLOGY

The Study Area

Kwara State is located within the North Central zone of Nigeria. It lies between latitudes 7^{o}45'N and 9^{o}30'N and longitudes 2^{o}30'E and 6^{o}25'E. The State shares boundaries with Oyo, Ondo, Osun, Kebbi, Niger and Kogi States as well as an international boundary with the Republic of Benin on the west side. With 16 Local Government Areas, four main ethnic groups namely, Yoruba, Nupe, Fulani and Baruba characterize the state. The average daily temperature ranges between 21^{o}C to 33^{o}C. The state has two distinct seasons

(the wet and dry seasons) and annual rainfall which ranges between 1,000 and1, 500mm. Kwara state has a total land area of 32,500 KM^2, with a population of about 2.59 million people and a population density of 42.5 per KM^2. The state has an estimated figure of 203,833 farm families majority of who live in the rural areas (Nigerian National Population Commission, 2006).

The state is primarily agrarian with a great expanse of arable land and rich fertile soils. The major crops cultivated in the state include yam, cassava, rice, maize, sorghum, cowpeas, groundnut, melon, okra, pepper, and some leafy vegetables. Poultry farming is increasingly becoming a major economic activity in the state with commercial farms poultry farms rapidly springing up virtually all over the state in addition to the backyard poultry keeping for family consumption.

Sampling Procedure and Sample Size

The population for the study comprised of all commercial poultry farmers in Kwara State. The list of members of the Poultry Farmers' Association of Nigeria (PFAN), Kwara State Chapter was the sampling frame. A two-stage random sampling technique was used. The first stage involved the random sampling of 50% of the 16 Local Government Areas (LGAs) in the state. Secondly, 25% of the 516 registered members of the PFAN in the eight selected LGAs were randomly selected to give a total sample size of 129. Nine of the copies of questionnaire administered were however not analysable hence a response rate of 93%.

Data Collection

The instrument for data collection was a structured questionnaire. The questionnaire was divided into five sections. The first section dealt with the socio-economic characteristics of the respondents. The second sections examined the pest and diseases management strategies carried out by poultry farmers. The third section sought to identify the respondent information source about pests and diseases management. The fourth sections asked about the prevalent pests and diseases invasion on the respondents' farms while the last section probed into the constraints faced by the defendant in controlling pests and diseases.

Measurement of Variables

The dependent variable for the study was the level of use of pest and disease control of the poultry farmers. This was measured with the use of a 4-point Likert scale. A list of the recommended pest and disease control strategies was drawn and respondents were asked to indicate the extent to which they practiced them. The scale was graduated as follows; Never (1), Rarely (2), Occasionally (3), Always (4). A score was generated for each respondent by aggregating their score for all the listed strategies. A mean score was thereafter derived by dividing the score by the total number of strategies listed.

The independent variables were the socio-economic characteristics of the respondents and their sources of information on pests and diseases control. They were measured as follows:

1. Age: measured in years.

2. Sex: measured as a dummy variable (1) to male and (2) to female.

3. Religion: measured as a dummy variable (1) to Islam (2) to Christianity and (3) to traditional religion.

4. Marital status: measured as a dummy variable (1) to single, (2) to married, (3) to a divorcee and (4) to widowed respondents

5. Educational attainment: measured as a dummy variable; (1) No formal education, (2) primary education, (3) secondary education, (4) tertiary education.

6. Primary occupation: measured as a dummy variable (1) Poultry farming (2) if otherwise

7. Poultry farming experience: this was measured in years.

8. Extension Contact: measured as the number of extension contact in the immediate past 6 months period

The respondents' use of the available sources of information, as well as the constraints to the use of the strategies was measured using a Likert scale.

Data Analysis

Data obtained from the field survey was subjected to both descriptive (frequency distribution, percentage, mean score and ranking order) and inferential (Pearson product moment correlation) statistics. The results of the objectives of the study were analyzed and presented using frequency distribution, percentages and means where appropriate. The Pearson's Product Moment Correlation was used to investigate the possible relationship between the respondents' socio-economic characteristics and their use of strategies for pests and diseases management as well as the correlations between the respondent sources of information and use of the management strategies.

Pearson's Product Moment Correlation (PPMC)

The Pearson product moment correlation is a measure of the strength of a linear association between two variables and is denoted by r. The Pearson product moment correlation coefficient r can take a range of values from +1 to -1. No association between the two variables means a value of zero. A value greater than 0 indicates a positive association that is, as the value of one variable increases the other value also increases. A value less than 0 indicates a negative association; that is, as the value of one variable increases, the other value decreases. Pearson's product moment correlation is the covariance of the two variables divided by the product of their standard deviations.

PPMC was used in testing the hypotheses because it offers a base to test the null hypotheses that the true correlation coefficient p is equal to 0, based on the value of the sample correlation coefficient r. Another reason is to derive a confidence interval that, on repeated sampling, will have a given probability of containing p. The formula for the calculation is derived as follows;

$$\rho X, Y = \frac{COV\ (X, Y)}{\sigma X \sigma Y}$$

Where:

- COV is the covariance
- σX is the standard deviation of X

The formula for ρ can be expressed in terms of mean and expectation. Since:

- COV (X, Y) = E[($(X - \mu X)$ ($Y - \mu Y$)
  Then the formula for ρ can also be written as
  $$\rho X, Y = \frac{E[\ (X - \mu X)\ (Y - \mu Y)}{\sigma X \sigma Y}$$
- COV and σX are defined as above
- μX is the mean of X
- E is the expectation.

The formula for ρ can be expressed in terms of uncentered moments.

Since:

- $\mu X = E\ [X]$
- $\mu Y = E\ [Y]$
- $\sigma^2 X = E[(X - E[X]^2)] = E[X^2] - E[X]^2$
- $\sigma^2 Y = E[(Y - E[Y]^2)] = E[Y^2] - E[Y]^2$
- $E[(X - \mu X)\,(Y - \mu Y)\,] = E[(X - E[X])(Y - E[Y])] = E[XY] - E[X]E[Y],$

The formula for ρ can also be written as:

$$\rho X, Y = \frac{E[XY] - E[X]E[Y]}{\sqrt{\sqrt{E[X^2]} - E[X]^2}\ \sqrt{E[Y^2]} - E[Y]^2}$$

RESULTS AND DISCUSSION

The findings of the study are presented in this section.

Socio-economic Characteristics of Respondents

The distribution of the respondents according to selected socio-economic characteristics of interest are summarized in Table 1.

Table 1: Socio-Economic Characteristics of Respondents.

Socio-economic Variables	Frequency	Percentages	Mean
Age			
≤30	19	15.8	
31-50	81	67.5	42
>50	20	16.7	
Sex			
Male	80	66.7	
Female	40	33.3	
Marital Status			
Single	24	20.0	
Married	96	80.0	
Farm Size			
≤1000 Birds	63	52.5	1,099
>1000 Birds	57	47.5	
Educational Level			
No formal education	11	9.1	
Primary education	5	4.2	
Secondary education	11	9.2	
Tertiary	93	77.5	
Primary Occupation			
Poultry farming	53	44.2	
Otherwise	67	55.8	
Poultry Farming Experience			
≤10 years	92	76.6	8.2
>10 years	28	23.4	
Extension Contact			
Nil	94	78.3	
≤6	21	17.5	
>6	5	4.2	

Source: Field Survey, 2016

As revealed in Table 1, majority of the respondents (83.3%) were not above 50 years of age. The mean age of 42 years suggests that poultry farmers in the study area were relatively young and hence fit for the physical challenges of management of poultry farms. Exactly two-thirds of the farmers were male confirming the dominance of the poultry sub-sector in the study area by males. Majority (80.0%) were married and the farmers possessed a high level of education with 77.5% of them having tertiary level of education. With the high level of education, it is expected that the farmers will be innovation-friendly. Only 44.2% of the farmers were primarily poultry farmers while the others only took poultry keeping as a secondary occupation. This may have implication on the level of commitment of the farmers as well as the amount of time available for the management of the poultry farm. The mean number of years of experience in poultry keeping was 8 years and most of the farmers (78.3%) had no extension contact in the immediate past six months period.

Prevalent Pests and Diseases on Poultry

This section presents the prevalent pests and diseases of poultry in the study area. Table 2 gives a summary of the result.

Based on the frequency of occurrence, Table 2 shows that the major pests of poultry in the study area were rodent (mean= 2.1) and lice (mean= 1.7). Newcastle disease and coccidiosis both with mean scores of 1.75 were the most frequently occurring diseases. Ameji et al., (2012) also reported Newcastle disease and coccidiosis as major diseases of poultry in Kogi State, Nigeria.

Table 2: Level of Occurrence of Prevalent Pests and Diseases

Pests and Diseases	N	R	O	A	Mean	Ranking
Pests						
Lice	18(15.0)	18(15.0)	64(53.3)	20(16.7)	1.7167	4th
Mite	27(22.5)	16(13.3)	55(45.8)	22(18.3)	1.6000	8th
Wild birds	18(15.0)	34(28.3)	33(27.5)	35 (29.2)	1.7083	6th
Rodents	7(5.80)	21(17.5)	44(36.7)	48(40.0)	2.1083	1st
Mosquitoes	27(22.5)	16(13.3)	55(45.8)	22(18.3)	1.5750	9th
Roundworm	22(18.3)	50(41.7)	34(28.3)	14(11.7)	1.3333	14th
Tapeworm	29(24.2)	45(37.5)	36(30.0)	10(8.3)	1.2250	17th
Gapeworm	69(57.5)	38(31.7)	9(7.50)	4(3.3)	0.5667	19th
Diseases						
Newcastle	12(10.0)	30(25.0)	54(45.0)	24(20.0)	1.7500	2nd
Avian influenza	30(25.0)	20(16.7)	45(37.5)	25(20.8)	1.5417	10th
CRD	11(9.20)	41(34.2)	39(32.5)	29(24.2)	1.7167	4th
Fowl pox	18(15.0)	49(40.8)	33(27.5)	20(16.7)	1.4583	12th
Infectious coryza	31(25.8)	47(39.2)	34(28.3)	8(6.7)	1.1583	18th
Aspergillosis	20(16.7)	28(23.3)	48(40.0)	24(20.0)	1.6333	7th
Coccidiosis	18(15.0)	18(15.0)	60(50.0)	24(20.0)	1.7500	2nd
Infectious bursal Diseases	22(18.3)	41(34.2)	37(30.8)	20(16.7)	1.4583	12th
Infectious bronchitis	26(21.7)	42(35.0)	38(31.7)	14(11.7)	1.3333	14th
Fowl cholera	33(27.5)	35(29.20	41(34.2)	11(9.2)	1.2500	16th
Egg drop syndrome	15(12.5)	45(37.5)	45(37.5)	15(12.5)	1.5000	11th

Source: Field Survey, 2016.
N= Never occurred R= rarely occurred O = occasionally occurred A= always occurring, CRD= chronic respiratory disease,(figures in bracket) = percentage of respondents

Respondents' Sources of Information on Management of Poultry Pests and Diseases

This section discusses the respondents' information sources on poultry pests and diseases management. Table 3 summarizes the results.

Table 3: Distribution of Respondents According to their Sources of Information.

Sources	Score	Mean	%	Ranking
Research Institutes	31.00	.2583	25.8	8th
Ministry of Agric.	35.00	.2917	29.2	6th
Newspaper	33.00	.2750	27.5	7th
Television	45.00	.3750	37.5	4th
Extension visits	28.00	.2333	23.3	8th
Internet	51.00	.4250	42.5	2nd
Radio	49.00	.4083	40.8	3rd
Fellow poultry farmers	91.00	.7583	75.8	1st
Customers	36.00	.3000	30.0	5th
Others such as flyers, books and publications etc.	20.00	.2469	16.7	9th

Source: Field Survey, 2016. *Multiple responses.

The most popular source of information on control of poultry pests and diseases as shown in Table 3 is information flow from fellow poultry farmers (75.8%). The heavy dependence on Information and Communication Technology such as the internet (42.5%) and Radio (40.8%) is justifiable given the high literacy level among the farmers.

It is, however, important to note the very low level of reliance on extension visits (23.3%). This may be due to the abysmally low extension worker to farmer ratio in the country which had resulted in very low achievement of extension agents (Matanmi et al., 2012). This finding collaborates the report of Msoffe and Ngulube (2016) that poultry farmers in selected rural areas of Tanzania relied more on informer farmer-to-farmer communication for information on poultry farming.

Level of Use of Pests and Diseases Management Strategies

The level of use of the different poultry pest and diseases control strategies is discussed in this section. The results are as presented in Table 4.

Table 4: Distribution of Respondent by their Use of Poultry Pest and Diseases Control Strategies.

Management practices	Never	Rarely	Occasionally	Always	Mean	Ranking
Provision of foot-dip	2(1.7)	6(5.0)	26(21.7)	86(71.7)	2.6333	13th
Restriction of movements into the farm	Nil	6(5.0)	15(12.5)	99(82.5)	2.7750	7th
Quarantine new birds	5(4.2)	3(2.5)	26(21.7)	86(71.7)	2.6083	14th
Sanitize all equipment	2(1.7)	1(0.8)	20(16.7)	97(80.0)	2.7667	9th
Vaccination	Nil	1(0.8)	20(16.7)	99(82.5)	2.8167	5th
Removal of dead birds	Nil	Nil	14(11.7)	106(88.3)	2.8833	2nd
Fumigate poultry house	Nil	12(10.0)	27(22.5)	81(67.5)	2.5750	16th
Add a mycotoxin binder to wet feed given to birds	6(5.0)	14(11.7)	31(25.8)	69(57.5)	2.3583	18th
Maintain clean, safe and healthy environment	Nil	1(0.8)	16(13.3)	103(85.8)	2.8500	4th
Provision of clean and pure water for birds	Nil	Nil	11(8.4)	119(91.6)	2.9160	1st
Provision of good and balanced feed for birds	Nil	Nil	14(11.7)	106(88.3)	2.8833	2nd
Administration of drugs and medication	Nil	Nil	27(22.5)	93(77.5)	2.7750	7th
Isolate sick birds	Nil	4(3.3)	33(27.5)	83(69.2)	2.6583	12th
De-worm birds	Nil	11(9.2)	27(22.5)	82(68.3)	2.5917	15th
Call veterinarian, animal health technician, or Extension agent for advice during outbreak	7(5.8)	8(6.7)	36(30.0)	69(57.5)	2.3917	17th
Observe the rest of the flock for signs of diseases	Nil	2(1.7)	24(20.0)	94(78.3)	2.7667	9th
Good space management (stocking density)	Nil	2(1.7)	19(15.8)	99(82.5)	2.8083	6th
Ventilation Mgt.	Nil	2(1.7)	25(20.8)	93(77.5)	2.7583	11th
Overall Mean					2.7110	

Source: Field Survey, 2016

Table 4 reveals that management strategies involving hygiene and cleanliness of the poultry house, feed and water were the most practised among the farmers.

This is evidenced by the fact that ensuring clean and pure supply of water, Good and balanced feed removal of dead birds ranked first and second. On the other hand, practices which involved investment in housing such as the provision of quarantine facilities, and the use of vaccines and other chemicals such as fumigation, use of mycotoxins etc were the least practised. The overall mean score of 2.7110 is an indication of low level of use of the strategies considering their importance to the efficiency, profitability and sustainability of poultry farming.

Constraints to the Use of Poultry Pests and Diseases Control Strategies among Respondents

The various constraints to use of poultry pests and diseases control strategies are ranked in order of severity as revealed by Table 5. According to Table 5, adulteration of vaccines and other drugs (mean=1.8) was the most severe constraints to the use of control measures for pest and diseases of poultry in the study area. This was followed by their high cost (mean=1.6).

Another severe constraint was the poor level of training among many of the poultry operators with a mean of 1.4. Other constraints indicated by the respondents included poor regulation of the poultry sub-sector (1.8), limited control over quality of feed (1.2), inadequate access to clean water (0.9) and difficulty in controlling movements in and out of the poultry houses (0.2)

Test of Hypotheses

Hypothesis 1: There is no significant relationship between some selected socio-economic characteristic of poultry farmers and their level of use of poultry pests and diseases control strategies.

Table 5: Constraints to the Use of Poultry Pests and Diseases Control Strategies.

Factor militating against Pests and diseases Management	NC	MS	S	VS	Mean±SD	Ranking
Limited control over quality of feed	30(25.0)	47(39.2)	29(24.2)	14(11.7)	1.2250±0.95673	5th
Difficulty in controlling movements in and out of the farms	31(25.8)	45(37.5)	34(28.3)	10(8.3)	0.1917±0.91941	7th
Inadequate access to pure and clean water	56(46.7)	29(24.2)	25(20.8)	10(8.3)	0.9083±1.00416	6th
Denatured vaccine and other drugs	20(16.7)	26(21.7)	31(25.8)	43(35.8)	1.8083±1.10230	1st
High cost of vaccine and drugs	23(19.2)	35(29.2)	24(20.0)	38(31.7)	1.6417±1.12119	2nd
Poor regulation of the poultry sub-sector	40(33.3)	29(24.2)	28(23.3)	23(19.2)	1.2833±1.12409	4th
Poor training among operators	26(21.7)	39(32.5)	36(30.0)	18(15.0)	1.3866±0.99242	3rd

Source: Field Survey, 2016.

NS= not a constraint MS= mildly severe S=severe VS= very severe SD= standard deviation

Table 6: Results of PPMC Analysis of the Relationship between some Selected Socioeconomic Characteristic of Respondents and their Use of Pests and Diseases Control Strategies.

Socio-economic characteristics	r	Sig. (p-value)	Remark
Age	0.494	0.075	Not significant
Sex	0.492	0.016	Significant
Poultry farming experience	0.607	0.000	Significant
Educational level	0.591	0.001	Significant
Primary occupation	0.526	0.006	Significant
Farm size	0.550	0.003	Significant
Extension contact	0.400	0.108	Not significant
Marital Status	0.882	0.130	Not Significant

Source: Field survey, 2016.

Table 7: Relationship between the Respondents Sources of Information and their Levels of Use of Poultry Pest and Diseases Control Strategies.

Sources of information	r	Sig. (p-value)	Remark
Radio	0.656	0.000	Significant
Television	0.732	0.116	Not significant
Newspaper	0.757	0.830	Not significant
Internet	0.609	0.001	Significant
Extension visits	0.464	0.330	Not significant
Ministry of Agric.	0.497	0.214	Not significant
Research Institute	0.547	0.104	Not significant
Fellow poultry farmers	0.613	0.000	Significant
Customers	0.350	0.237	Not significant

Source: Field survey, 2016

Sex (0.492), years of experience (0.607), level of education (0.591), primary occupation (0.526) and farms size (0.550) showed a positive relationship with level of the respondents' use of control strategies ($p<0.05$) The implication of this is that the level of use increased with increase in experience, educational level and farm size while male farmers and farmers whose primary occupation was poultry farming were likely to use more of the strategies.

Susilowati, et al., (2011) also reported that farm size positively influenced the adoption of biosecurity measures in poultry production in Indonesia. Similarly, the result collaborates the findings of Niemi and Heikkila (2014) on the positive relationship between farmers' educational level and their use of pest and disease control methods in Finland. However, their report that female farmers were more likely to use biosecurity measures more than the female farmers is contradicted by their findings of this study. This may be due to the fact that many female poultry farmers in the study area rely on hired laborers who are mostly male.

Hypothesis 2: There is no significant relationship between the respondents' sources of information and their level of use of pest and diseases control strategies.

Table 7 shows that at $p<0.01$, the use of radio ($r= 0.656$), internet ($r= 0.609$) and fellow poultry farmers ($r= 0.613$) as sources of information on pest and diseases control in poultry farming, was significantly related to the level of use of the strategies. The positive coefficient implies that use of pest and control strategies increased with the use of radio, the internet and fellow farmers as information sources.

CONCLUSION AND RECOMMENDATIONS

The study concluded that the level of use of pest and disease control strategies among poultry farmers in the study area was low and influenced by the farmers' sex, experience in poultry farming, primary occupation, educational level and farm size.

Based on the findings of the study, it is recommended that stakeholders in the sub-sector pursue the regulation of activities of the practitioners in the poultry industry. This should include the poultry farmers, feed millers, agro-chemical dillers, hatcheries, etc. This regularization should include the standardization of vaccines, drugs, and other chemicals used in poultry pest and diseases control. There is also the need to provide cheaper and smaller packages of drugs and vaccines for the farmers to make vaccines and drug available and affordable. Training workshops and seminars should be organized for poultry farm operators on strategies for pest and disease control.

REFERENCES

1. Akinwumi, J., I. Okike, and K.M. Rich. 2010. "Analyses of the Poultry Value Chain and its Linkages and Interactions with HPAI Risk Factors in Nigeria". DFID, FAO, RVC, Rural Development Research Consortium, International Food Policy Research Institute, International Livestock Research Institute.

2. Ameji, N.O., P.A. Abdu, and L. Sa'idu. 2011. "Sero-Prevalence of Avian Influenza, Newcastle and Gumboro Diseases in Chickens in Kogi State, Nigeria". *Bulletin of Animal Health and production in Africa*. 59(4):411-418.

3. Anderson, L. and M.K. Gugerty. 2010. "Poultry Market in West Africa: Nigeria". Evans School of Public Affairs, University of Washington.

4. CIA. 2012. "Nigeria". Retrieved November 13, 2012, from *The World Factbook*. https://www.cia.gov/library/publications/the-world-factbook/geos/ni.html

5. FAO. 2012: "Poultry Production versus Consumption in Nigeria". *FAOSTAT 2012*. FAO: Rome, Italy.

6. Matanmi, B.M., K.F. Omotesho, K.S. Obaniyi, R.S. Adisa, and J.D. Ogunsola. 2012. "Assessment of Veterinary Extension Rendered to Poultry Farmers by Agricultural Development Project in Kwara State, Nigeria". *Asian Journal of Agriculture and Rural Development*. 2(3):473-479.

7. Isika, M.A., E.A. Agiang, and B.I. Okon. 2006. "Dietary Energy and Crude Protein Requirements for Chicks of Nigeria Local Fowl and Crossbreeds". *International Journal of Poultry Science*. 5:271-274.

8. Msoffe, G.E.P. and P. Ngulube. 2016. "Information Sources Preference of Poultry Farmers in Selected Rural Areas in Tanzania". *Journal of Librarianship and Information Science*. 49(1): 82-90.

9. Niemi, J. and J. Heikkila. 2014. "Cost of Biosecurity and Food Contributing to Biosecurity in Finland". Nordic-Baltic Seminar on Biosecurity Experiences, Training, Motivation and Economic Aspects, Johannesburg Castle, Sweden. 6-8 May, 2014.

10. Nigeria Customs Service. Import Prohibition List. 2012. Retrieved November 13, 2012, from https://www.customs.gov.ng/ProhibitionList/import.php

11. Nigerian National Population Commission (NPC) .2006. "National Population Census Report 2006". NPC : Abuja, Nigeria.

12. Odeh, O. 2010. "Nigeria: Ban on Chicken Import Creates 20m Jobs". Retrieved November 13, 2012, from "All Africa". http://allafrica.com/stories/201011170218.html

13. PIND. 2013. "Catering Services and the Poultry Industry Value Chain in the Niger Delta". Foundation for Partnership Initiatives in the Niger Delta.

14. Susilowati, S.H., M. Iqbal, and P. Ian. 2011. "Factors Influencing the Adoption of Biosecurity Activities on Broiler and Layer Farms in Indonesia". Paper presented at the 55th Annual Australian Agricultural and Resources Economic Society National Conference, Melbourne, Australia. February 8th to 11th, 2011.

15. United States Department of Agriculture. 2007. "Biosecurity: Protecting Your Livestock and Poultry". Animal and Plant Health Inspection Service Fact Sheet. Washington, D.C.

16. United States Department of Agriculture. 2014, "Biosecurity Guide for Poultry and Bird Owners". Animal and Plant Health Inspection Service Program Aid No. 1885. Revised April 2014. Washington, D.C.

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