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SOCIOLOGY | RESEARCH ARTICLE

Risk perceptions and risk management strategies among poultry farmers in south-west Nigeria

Abigail Gbemisola Adeyonu[1]*, Abiodun O. Otunaiya[2], Enoch O. Oyawoye[3] and Funmilayo A. Okeniyi[3]

Abstract: The poultry industry contributes significantly to the development of Nigeria's economy. Unfortunately, poultry farmers like other farmers are faced with a variety of income fluctuations arising from risks associated with the enterprise. Hence, this study investigated risk perceptions and risk management strategies among poultry farmers. Respondents were selected using multi-stage sampling techniques. The techniques resulted to selection of 263 commercial poultry farmers who provided us with relevant information with the aid of pre-tested questionnaire. The information gathered was analysed using descriptive statistics, factor analysis and linear regression models. Results showed that production risk, financial risk and human risk were perceived by farmers as most important in poultry business. Farmers have adopted disease prevention and financial management strategies to mitigate the effects of various risks. The analysis further showed that years of experience in poultry business, value of poultry and production risk are important determinants of disease prevention and financial management strategies adopted by the respondents. Factors that determine only disease prevention strategy are

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PUBLIC INTEREST STATEMENT

The risk factors in poultry enterprises are numerous and poultry farmers have adopted several strategies to mitigate the effects of these on their means of livelihood. The knowledge of the various risk factors, risk management strategies, and the relationship between them is important in promoting poultry enterprise in both developed and developing countries. Hence, this study focused on what poultry farmers perceived as risk factors, risk management strategies, and the relationship between the two. The study shows that poultry farmers are confronted with production risk, financial risk as well as human risk. Farmers have adopted disease prevention and financial management strategies to mitigate the effects of various risks. Furthermore, production, financial and human risks influenced the choice of farmers' risk management strategies. Existing and new entrants into poultry production will find this study useful as firsthand information about various risks in poultry production and how they can be managed.

years of schooling, household size and human risk, while respondents' sex and financial risk are the determinants of financial strategy. Policies on risk management in poultry should be targeted at farmers' socio-economic characteristics and risk perceptions so as to enhance the growth potentials of poultry farmers and prevent collapse of the poultry industry.

Subjects: Economic Psychology; Economics; Business, Management and Accounting

Keywords: Poultry farmers; risk perceptions; risk management; factor analysis; Nigeria

1. Introduction

The poultry enterprise in Nigeria constitutes over 50% of the total livestock population in 2010, showing its prominence in livestock sub-sector of the nation's agricultural sector (Nasiru et al., 2012). The industry has emerged as the most dynamic, developed, commercialized and fastest growing livestock sub-sector in the country. The poultry industry contributes significantly to the development of Nigeria's economy. It provides job opportunities for the inhabitants, thereby providing income for the people. It serves as a good source of animal protein, thereby contributing to food security and poverty alleviation (Nasiru et al., 2012). According to United States Department of Agriculture (USDA) (2013) and Heise et al. (2015), the demand for poultry meat and eggs will rise by 200% between 2010 and 2020 in developing countries including Nigeria.

Notwithstanding its contribution to food security, poverty reduction and growth of Nigeria economy, the industry is cumbered with numerous constraints which include competition between food and feed, dependence on the importation of exotic breed, drought, outbreak of diseases, high cost of inputs, low-quality chicks, inadequate market, etc. (Alabi & Isah, 2002; Banjoko et al., 2014; Baruwa & Adesuyi, 2018; Salau et al., 2010). In poultry production, like any other type of agricultural enterprise, decision is made under risks and uncertainties which are pervasive and complex (Hardaker et al., 2004; Kahan, 2013). Risk is an inherent feature of modern poultry production and it is a major concern among poultry farmers in Nigeria that have asymmetric information to predict accurately things such as input prices, outputs and their prices, government policies and climate (Nyikal & Kosura, 2005). The Nigerian poultry sector experiences many problems such as rise in the price of feed and feed ingredients, avian influenza and other virulent diseases, floods, poor outputs, fluctuation of output prices, the global financial crisis, inadequate credit and low level of production specialization Food and Agricultural Organization (FAO), 2006. These had led to fluctuation in farm income arising from unpredictable farm profitability from season to season. Adeyemo and Onikoyi (2012) stated that a number of periods of price uncertainty and movement (volatility) have caused the enterprise to fall into bankruptcy due to colossal loss in monetary value, farmers leaving the business and consumers facing ever increasing costs of food (chickens and eggs), consequently resulting in decline in the growth of the poultry sector. The danger created by risk and uncertainties is huge: it results in impressive loss of money, psychological displacement, complete business failure, etc.; thus, risk management becomes imperative.

Legesse and Drake (2005) have defined risk as the influence of an undesirable result which occurs due to natural or human action. According to Kahan (2013), risks in livestock farming can be classified into: production (drought, heavy rainfall and diseases and pests); marketing (supply/cost of inputs, demand for a product/price and cost of production); financial risk (loan and its cost); institutional (change in policy at the local, national and international levels) and personal/human (accidents, illness, civil unrest and death). However, the various types of risks are interrelated as they can occur simultaneously in a farm. Risk perception refers to how the business owners see potential influence of the risk source on the business (Pennings et al., 2002). Appropriate risk perception remains a key factor in the choice of effective risk management strategy. The reason being that for a farmer to be able to manage risk effectively, awareness of the various prevailing

risk factors faced becomes relevant. There is the need for the farmers to be knowledgeable about risk and acquire risk management skills that will help to identify problems and mitigate outcomes.

The risk management strategies utilized by farmers could be influenced by their personal characteristics, such as socio-economic variables and risk perceptions. Report by Organization for Economic Cooperation and Development (OECD) (2011) has revealed that effective risk management in agriculture requires coordination of actions at the state, markets and farms of which most important are the farm and farmers' characteristics. Therefore, investigations of farmers' risk perceptions are of great importance in farm risk management. The farmer is in the best position to know the aspect, attributes and extent of the risks that affect his farm business. He is also saddled with the responsibility of evaluating the management strategies available to deal with risks. It is the responsibility of the farmer to take the appropriate decisions to manage the risks associated with agricultural enterprise.

Legesse and Drake (2005) and Hayran and Gül (2015) have shown that to appreciate the decision-making attitudes of farmers under different economic and institutional situations, an investigation of risk perceptions and responses to risks is important. The recognition by the Nigerian government of the need for supportive measure to address farming risks led to the establishment of the National Agricultural Insurance Scheme (NAIS) in 1987. In fact, the fundamental theory justifying the establishment of NAIS is that risks mitigation in the agricultural sector will inspire its performance. Over 3 decades after its establishment, the scheme appears non-functional as indicated by low level of poultry farmers' awareness of the scheme A.G. Adeyonu et al. (2016) as well as participation in the scheme (Akintunde, 2015). Hence, poultry farmers in the country are left with the option of managing farm risks associated with little or no institutional support. Failure to manage risk effectively by farmers may lead to instability of farmers' income, poverty and food insecurity (Claire, 2010).

Studies have been conducted on risk perception and risk management strategies adopted by poultry farmers in Nigeria. In a study by Akinbile et al. (2013), vaccination failure, scarcity of water and feeds were the three most important climate-related risks poultry farmers in Oyo State were faced with. Vaccination, mixed farming and purchase of resistant breeds were viewed as important management strategies by farmers. The study further shows that there was a positive correlation between farmers' risk perception of climate change and management strategies adopted. Salman et al. (2014) reported that poultry egg farmers in Oyo State were most concerned about fluctuation of input and output prices as well as incidence of diseases and pests risk sources. According to the report, relaxation of pen and timely administration of drugs and vaccines were the chief management strategies adopted by poultry egg farmers. Poultry farmers in Akwa Ibom State perceived climate and high mortality rate of birds as the most important risk factors (Effiong et al., 2014). The major risk sources among poultry farmers in Ogun State were fluctuation of input and output prices, climate and outbreak of diseases. The most popular risk management strategies among them were increase in staff working hours, seeking cooperative support and diversification (Babalola, 2014).

Studies of livestock farmers' risk perceptions and management strategies in other developing and developed nations were mainly on cattle farmers with little specific attention paid to poultry farmers. Report from Norway has revealed that organic cattle farmers perceived farm support payment as the most important risk source, while their conventional counterparts perceived cost of inputs and animal welfare policy as the most important. The most popular perceived risk management strategies adopted by the farmers were: financial measures, disease prevention and insurance (Flaten et al., 2005). Farmers in Ethiopia perceived high price of fodder, limited farm income and shortage of family labour as the most important risks confronting their farming activities (Bishu et al., 2016). Farmers were more concerned with loan utilization, control of parasite and use of veterinary services in managing risks on their farms. Waweru (2017) opined that dairy cattle farmers in Kenya perceived insurance, financial measures and disease prevention as important ways to manage risk. All the

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researchers have shown that cattle farmers' socio-economic characteristics and their risk perceptions significantly determined their risk management strategies.

It is evident from literature that risk sources and risk management strategies adopted by farmers vary according to location and types of livestock enterprise. Ullah et al. (2016) reported that geographical location and types of agricultural enterprises, among others, may influence the relative significance of risk factors, while farm and farm household characteristics, farmers' risk perceptions and access to publicly provided services determined their risk management strategies. To the best of researchers' knowledge, little is known about the relationship between poultry farmers' socio-economic characteristics, risk perceptions and risk management strategies in Nigeria. Therefore, the main objective of this study is to examine the relationship between poultry farmers' risk perceptions and management strategies in the study area. Specifically, this study examined: (i) what poultry farmers perceived as risk factors associated with their enterprise in the study area. (ii) the various risk management strategies adopted by the respondents and (iii) the effect of the perceived risk factors on the choice of risk management strategies adopted by the respondents in the study area. Given the focus of this study, it is hypothesized that there will be no significant relationship between respondents' socio-economic characteristics as well as risk perception variables and their risk management strategies.

2. Materials and methods

2.1. Study area
This study was conducted in Nigeria. The country is divided into six geopolitical zones which are: north-central, north-east, north-west, south-east, south-south and south-west. South-west geopolitical zone was purposefully selected as a result of concentration of commercial poultry farms in the zone according to (Omodele & Okere, 2014). The zone is bounded in the east by Edo and Delta states, in the North by Kogi and Kwara states, in the south by Atlantic Ocean and in the west by the Republic of Benin. South-west zone is predominantly agrarian and characterized by a tropical climate with distinct dry season between November and March and a wet season between April and October.

2.2. Sampling techniques
The respondents used for this study were selected using multi-stage sampling techniques. The first stage involved a purposive selection of south-west geopolitical zone from the six zones the country is divided into. The zone is made up of six states which are: Ekiti, Lagos, Ogun, Ondo, Osun, and Oyo, out of which Ogun and Oyo were purposely selected at the second stage of the sampling techniques. The selection of the zone and the two states was due to the predominance of poultry farms in the area (Omodele & Okere, 2014). At the third stage, two local government areas (LGAs) known for their popularity in poultry farming from each of the selected states were purposely selected. We obtained the lists of poultry farmers in each of the selected LGAs from the states' Poultry Association of Nigeria's (PAN) headquarters. However, we could not make use of the lists because most of the farms on the lists were not operating as at the time of the survey as a result of the economic recession the country was into. Hence, a snow-ball method was used to select the respondents at the fourth and last stage of the techniques. The procedure led to the selection of 340 poultry farmers but only 263 questionnaires had useful information.

Information were obtained through the use of a semi-structured pre-tested questionnaire on household socio-economic/demographic characteristics, risk perceptions and choice of risk management strategies. Information on risk perceptions and risk management strategies were gathered using a 5-point Likert-type scale. Regarding farmers' risk perceptions, 16 questions on risk sources were generated. Each respondent was required to rate the level at which he/she perceives each of them as a risk factor on a 5-point Likert-type scale (1 = not at all risky; 5 = extremely risky). To ascertain the importance of risk management strategies, again, a 5-point Likert-type scale was used (1 = not at all important, 5 = extremely important). Also, a total of 16 questions were listed. All the variables (questions) were included in the factor analysis.

2.3. Analytical techniques

Descriptive statistics, factor analysis and multiple regression (ordinary least square) models were employed to analyse the data using STATA 11 statistical package. Descriptive statistics were used to examine poultry farmers' socio-economic characteristics, risk perception and risk management strategies that are important to them. Exploratory factor analysis (a variable reduction technique) was used to reduce the number of variables belonging to risk perception and risk management strategies (Aditto et al., 2012, 2014; Almadani, 2014). This was done to reduce the number of responses from the Likert-type scale questions (original variables) into a manageable smaller group of new correlation measurements (factors), which are linear combinations of the original variables. The latent root criterion (eigen values) was derived to know the number of factors in each data set to obtain. Factors with latent root criterion greater than 1 were considered in this study, which means that such factors contribute for a greater variance than had been possible by any one of its variables. After this, orthogonal (varimax) technique was employed to minimize the number of variables with high loadings on each factor and to ensure the independency of the factors which were consequently used in multiple regressions. A factor loading of ≥0.3 was adopted in this study as a cut-off mark to examine the inter relationship among the original variables following (Waweru, 2017).

Multiple regression models were used to analyse the effect of farm characteristic, farmers' socio-economic characteristics and risk perceptions on choice of risk management strategies. Flaten et al. (2005) and Aditto et al. (2014) also used similar methods. The model is specified as follows:

$$Y_{im} = \alpha_i + \beta_i X_i + \beta_n X_n + \varepsilon_i \qquad (1)$$

Where:

Y = management strategy adopted, α = intercept or constant, X = vector of explanatory variables (farmers' characteristics, farm characteristic and risk perceptions (the factor loadings for the three risk factors that were obtained from the factor analysis), β= parameter coefficient, ε_i = error term, i = individual poultry farmer, i.e. i = 1, 2, … … ., 263 and m = 1 and 2 for disease prevention and financial management strategies, respectively. Models for disease prevention strategy and financial strategy were estimated using the empirical specification in Equation 1.

The explanatory variables are defined as follows:

Farmers' characteristics:

X_1 = Age (years)

X_2 = Sex (male = 1, 0 otherwise)

X_3 = Years of formal education

X_4 = Household size

X_5 = Years of experience

X_6 = Other household income (₦)

X_7 = Credit access (Yes = 1, 0 otherwise)

X_8 = Extension service access (Yes = 1, 0 otherwise)

X_9 = Agricultural Insurance (Yes = 1, 0 otherwise)

Farm characteristic:

X_{10} = Value of poultry (₦)

Risk perception from factor analysis:

X_{11} = Production risk

X_{12} = Financial risk

X_{13} = Human risk

Diagnostic tests were conducted on the models to check for the presence of multicollinearity and heteroscedasticity among the variables using appropriate tools following (Flaten et al., 2005). These were done to ensure that the assumptions of multiple regression were not violated. Presence of multicollinearity was assessed using Variance Inflation Factor (VIF). The VIF test for each explanatory variable (X_i) was applied based on the following formula:

$$VIF = \left(1 - R_i^2\right)^{-1} \qquad (2)$$

where R_i^2 is the coefficient of determination when X_i is regressed on the remaining explanatory variables of the model. According to Gujarati (2006), if VIF exceeds 10, then, there is presence of severe multicollinearity. All the explanatory variables had a VIF of less than 5.62 ruling out the existence of multicollinearity. However, the White test that was conducted revealed the presence of heteroscedasticity. To correct for this, heteroscedasticity consistent standard error (robust estimation) was estimated.

3. Results

3.1. Descriptive statistics of the respondents

Table 1 shows the descriptive statistics for poultry farmers which are part of the independent variables included in the regression models. As shown in the table, the mean age of the farmers was about 43 years which is an indication that respondents were relatively young. Most of the farmers were males (about 77%) and this signifies that about three-quarter of the poultry farmers

Table 1. General characteristics of the poultry farmers					
Variables (n = 263)	**Percent**	**Mean**	**Std. dev.**	**Min.**	**Max.**
Age (years)		43.41	9.358	24	83
Sex (male)	76.81				
Years of schooling		13.63	3.393	6	22
Household size		4.79	1.895	3	10
PAN membership (yes)	38.02				
Cooperative membership (yes)	41.44				
Poultry experience (years)		19.48	6.736	8	30
Poultry value (₦)		3,891,871	303,502	599,685	4.15e+07
Credit access (yes)	35.36				
Extension access (yes)	15.97				
Veterinary access (yes)	81.37				
Agricultural insurance certificate (yes)	35.74				

Note: 1 $ is equal to ₦503 market rate as at the time of the survey.

Source: Authors' estimates.

were males. In the study area, the mean years of schooling was about 14 with average household size of 4.8 and this is expected to influence the type of risk management strategy adopted by the respondents. A majority of the farmers did not belong to Poultry Association of Nigeria (PAN) (62%) or any Cooperative Society (59%). Membership of associations is expected to influence the risk management strategy adopted. The mean years of farming experience stood at 19, while mean value of poultry kept was ₦3,891,871. About 65%, 84% and 60% of the farmers did not have access to credit, extension services and training in poultry, respectively, while over 60% of them did not have agricultural insurance certificate. Well above three-quarter of them had access to veterinary services.

3.2. Risk perception of poultry farmers

The farmers were given a list of 16 sources of risks and were asked to state how risky they considered each source on income realized from the business. The results are presented in Table 2. The results show that outbreak of diseases with a mean value of 4.243 and fluctuation of output prices with mean value of about 4 rated highest and second highest, respectively. The mean values of stampeding and flooding, respectively, were 2.101 and 1.959 and rated as the second lowest and lowest. Data were examined for suitability for factor analysis using

Table 2. Mean, standard deviation and varimax rotated factor loadings of relevant risk perceptions by Poultry Farmers					
Sources of risk	**Mean**	**Std. dev.**	**Important factors** **1 2 3**		
Outbreak of disease	4.243	0.905	0.705		
Fluctuation of output prices	4.082	0.498		0.599	
Credit availability	3.936	0.990		0.671	
Fluctuation of input prices	3.818	0.501		0.468	
Drug and Vaccine failure	3.561	0.888	0.602		
Pilfering/Theft	3.538	0.986			0.698
Unavailability of input	3.335	1.094		0.422	
Unpredictable poultry output	3.229	0.817	0.691		
Policy changes	3.220	1.139			
Changes in income from other sources	3.175	0.995		0.507	
Contaminated feed	3.003	0.911			0.542
Contaminated water	2.961	0.849			
Inefficient workers	2.789	0.955			0.453
Heat stress	2.562	1.001	0.569		
Stampeding	2.103	0.327			
Flooding	1.959	0.524	0.407		

Note: Blank implies variable loading of <0.3.

Factors 1, 2 and 3 stand for production risk, financial risk and human risk, respectively.

Source: Authors' estimates.

Kaiser-Meyer-Ohlin (KMO) measure of sample adequacy and Barlett's test of sphericity. The KMO value which stood at 0.76 and the value of Barlett's test which was significant at P <0.01 were considered suitable as opined by (Anthony & Rao, 2007). The variables were reduced to three factors based on the eigen value of each of them (>1) and accounted for 59.7% of the total variance. The values (eigen and variance) were considered suitable in social science (Waweru, 2017). The three retained factors were named production risk, financial risk and human risk. The various risk sources that loaded significantly on production risk (factor 1) are outbreak of diseases, drug and vaccine failure, unpredictable poultry outputs, heat stress and flooding. Fluctuation of output prices, credit availability, fluctuation of input prices, unavailability of inputs and changes in income from other sources had significant loadings on financial risk (factor 2). Human risk (factor 3) had large loadings on pilfering, contaminated feed and inefficient workers. The three factors were then used as independent variables in the multiple regression models as they are expected to have effect on the risk management strategies adopted by the respondents.

3.3. Risk management strategies used by poultry farmers

The farmers were given a list of 16 risk management strategies and were asked to state how important they considered each strategy on farm income. Two of the strategies were deleted due to a lot of missing values. The strategies deleted are: (i) use of modern production techniques and (ii) re-allocation of labour. The results of descriptive statistics and factor analysis of management strategies adopted are presented in Table 3. The table shows that the mean values of proper and timely medication/vaccination and biosecurity strategies stood at 4.527 and 4.302. The mean values of selling of assets and agricultural insurance were about 2.7 and 2.6. Data were examined for suitability for factor analysis using KMO measure of sample adequacy and Barlett's test of sphericity. The KMO value was 0.69, while the Barlett's test was significant at P <0.01, suggesting the data were suitable for factor analysis. The data were later subjected to exploratory factor analysis to diminish the number of risk management strategies. Two factors with eigen values (>1) which were responsible for 68% of the total variance were identified. The two retained risk management strategies are disease prevention (factor 1) and financial (factor 2). Disease prevention had high loadings on proper and timely medication/vaccination, biosecurity, buying birds from reputable sources, relaxation of pens before re-stocking and proper feed and water management. Financial management had high loadings on mixed farming, diversification, non-farm income, credit borrowing, pre-purchase of inputs, selling of assets and agricultural insurance.

3.4. Determinants of risk management strategies among poultry farmers

Farmers' socio-economic characteristics and risk perceptions are important factors in their risk management decision. Table 4 shows the results of ordinary least square regression which indicate that the adjusted R-squared was 0.687 for disease prevention risk management strategy and 0.710 for financial risk management strategy. The two models are significant at 1% level. The estimated values for years of schooling, household size, years of experience in poultry, production and human risks stood at 0.070, −0.134, 0.076, 0.093, 0.307 and 0.221, respectively, for disease prevention management strategy. We found the coefficients of sex, years of experience in poultry, value of poultry, production risk and financial risk to be −0.142, 0.011, 0.101, 0.055 and 0.442, respectively, for financial risk management strategy.

4. Discussion

4.1. Descriptive statistics of the respondents

The mean age of the respondents is an indication that they belong to an active labour force and should be able to manage their farms effectively. Farmers' age are expected to be associated with their risk-bearing abilities and innovativeness. As it is with other farm enterprises in the study area, poultry farming is male dominated. Sex of the respondents is important in their risk attitudes. Our result was in consonance with Iheke and Igbelina (2016) who revealed that a majority of poultry farmers in Imo State were males. With the fairly high level of education, the farmers are expected

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Table 3. Mean, standard deviation and varimax rotated factor loadings for risk management strategies used by poultry farmers				
Risk management strategies	**Mean**	**Std. dev.**	**Important factors 1 2**	
Proper and timely medication/vaccination	4.527	1.020	0.768	
Biosecurity measures	4.302	1.059		
Buying birds from reputable sources	4.242	1.059	0.586	
Relaxation of pen	4.053	1.125	0.628	
Proper feed and water management	3.985	0.998	0.522	
Mixed farming	3.843	1.231		0.640
Diversification	3.592	0.050		0.794
Non-farm income	3.374	1.037		0.568
Purchase of disease resistant breeds	3.176	0.060	0.342	
Contractual agreement with input suppliers	3.009	1.103		0.436
Credit borrowing	2.984	1.146		0.881
Pre-purchase of inputs	2.775	1.152		0.392
Selling of assets	2.684	1.209		0.332
Agricultural insurance	2.563	1.135		0.305

Note: Blank implies variable loading of <0.3.

Factors 1 and 2 stand for disease prevention risk management and financial risk management strategies, respectively.

Source: Authors' estimates.

to have technical knowledge of the enterprise for enhanced productivity. This observation concurred with those of Iheke and Igbelina (2016) and Obayelu et al. (2017) who opined that the majority of the poultry farmers in Nigeria are literates. The level of participation of respondents in associations such as PAN and cooperative society is rather low. The two organizations are important for the purpose of information about risks associated with poultry farming. The high level of experience in poultry farming should assist farmers in managing various risks associated with the enterprise adequately.

The mean value of poultry kept implies that a majority of the farmers were small-scale farmers and should ordinarily be able to manage their farms adequately. A majority of the respondents that did not have access to credit, extension services, training in poultry and agricultural insurance is an indication that these services are not readily available to them. Access to the aforementioned services should be a boost in risk attitudes and management by the farmers. A. Adeyonu et al. (2017) and Baruwa and Adesuyi (2018) revealed that a majority of the poultry farmers in Nigeria did not have access to credit, while Akintunde (2015) showed that a majority of poultry farmers did not participate in livestock insurance scheme in Nigeria. Well above three-quarter of them had access to veterinary services. That a high percentage of the farmers were able to access veterinary services may be because one of the important identified risks in poultry farming is outbreak of

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Table 4. Results of multiple regressions for risk management strategies				
Independent variables	Disease prevention strategy Coefficient P>|t|		Financial strategy Coefficient P>|t|	
Age	0.838	0.404	0.406	0.651
Sex	−0.005	0.987	−0.142*	0.097
Years of schooling	0.070*	0.078	0.016	0.140
Household size	−0.134**	0.042	−0.019	0.456
Years of experience in poultry	0.076***	0.000	0.011**	0.044
Value of poultry	0.093***	0.000	0.101***	0.007
Other household income	−3.67e-07	0.357	−3.32e-08	0.754
Credit access	0.066	0.838	0.003	0.971
Extension services access	0.058	0.859	0.019	0.831
Agricultural Insurance	−0.016	0.909	0.053	0.172
Production risk	0.307***	0.004	0.055*	0.052
Financial risk	0.059	0.412	0.442***	0.000
Human risk	0.221**	0.027	−0.017	0.526
Constant	1.437	0.192	16.054***	0.000
R^2 adj. Prob > F =	0.687*** 0.000		0.710*** 0.008	

Note: *, ** and *** represent 10%, 5% and 1% level of significance, respectively

Source: Authors' estimates.

diseases and pests, hence, the need for veterinary services. Adepoju et al. (2013) revealed that majority of poultry farmers in the country had access to veterinary services.

4.2. Risk perceptions of poultry farmers

We found that outbreak of diseases and fluctuation of output prices were the two most worrisome risks faced by poultry farmers in the study area. It may be because the two sources of risks are not within farmers' control but have direct effect on their incomes. The poultry industry in the country is not regulated and this has led to importation of low disease-resistant breeds by desperate individuals at the expense of the farmers. Also, the prices of eggs and chickens are determined by the forces of demand and supply. Banjoko et al. (2014), Baruwa and Adesuyi (2018), and Kabira et al. (2020) showed that disease outbreak was the most worrisome of the risks faced by livestock farmers in. Also, fluctuations of input and output prices were among the most popular risk sources faced by poultry farmers in Nigeria (Effiong et al., 2014; Salman et al., 2014). Factor analysis shows that the three retained factors are production risk, financial risk and human risk. These risks if not well managed could adversely affect farmers' income which could lead to eventual closure of the farms. The results are in consonance with the submission of Salman et al. (2014) who revealed that the poultry farmers in the country are faced mainly with production, financial and social risks.

4.3. Risk management strategies used by poultry farmers

Our analysis revealed that that proper and timely medication/vaccination and biosecurity strategies were the most popular risk management strategies among the farmers. This may not be unconnected with the high level of losses that farmers may experience in terms of mortality as a result of not giving the risks the attention required. Study by Iheke and Igbelina (2016) showed that poultry farmers rated the strategies very important. Farmers attached low

importance to agricultural insurance as important management strategies to mitigate losses on poultry farms. This may perhaps be linked to farmers' low level of awareness about insurance, high insurance premium and difficulties in getting indemnity paid to those who bought insurance. The results of factor analysis revealed that all the identified management strategies were reduced to disease prevention and financial. Disease prevention strategy such as proper and timely medication/vaccination, biosecurity and relaxation of pens before re-stocking are key factors in minimizing risks linked with high morbidity and mortality in poultry enterprise. Financial management strategy is also important for timely purchase of inputs in bulk at reduced costs to increase profitability.

4.4. Determinants of risk management strategies among poultry farmers

Farmers' socio-economic characteristics and risk perceptions are important factors in their risk management decisions. The results of multiple regression indicate that the models are significant at 1% level as revealed by probability values and a high proportion of the variation in the risk management strategies were explained by the independent variables. This is an indication that at least one of the regression coefficients is not equal to zero, implying that the models had strong explanatory power. It also shows that the models have good fit to the data. All the independent variables with the exception of household size and agricultural insurance had the expected sign. It is on the basis of all these that we fail to accept the stated hypothesis.

Our analysis shows that years of experience in poultry, value of poultry and production risk have significant effects on both disease prevention strategy and financial strategy. Years of experience positively determine disease prevention, signifying that a unit increase in years of experience will lead to increase in farmers' choice of disease prevention and financial strategy. The effect of years of experience in poultry is stronger on the disease prevention strategy than financial strategy. This may be because farmers utilized the experience gather over the years to minimize disease outbreak and to also be prudent in spending while managing their farm enterprises. Value of poultry has direct association with both disease prevention strategy and financial strategy. As value of poultry increases, the choice of disease prevention strategy and financial strategy increases. This is understandable because farmers with high level of investment in poultry will not want to lose it. A unit increase in production risk resulted in an increase in disease prevention strategy and financial strategy. Again, the influence is much stronger on disease prevention strategy than financial strategy. This may not be unconnected with high loss of farmers' income associated with production risk. However, it is an indication that such farmers focus on poultry disease prevention so as to mitigate their financial risks. Akinbile et al. (2013) reported a direct correlation between production risk and management strategies.

Furthermore, disease prevention strategy was found to be explained by years of schooling, household size and human risk. There was positive association between years of schooling and disease prevention strategy, showing that a unit increase in years of schooling will result to an increase in disease prevention strategy. Perhaps, educated farmers had access to more information about disease prevention strategies available in the poultry enterprise. There was a direct correlation between human risk and disease prevention strategy, meaning that a unit increase in human risk will lead to an increase in disease prevention strategy. This may be due to farmers' ability to monitor and control their workers, which effactually aided their adoption of disease prevention strategy. Nonetheless, indirect relationship exists between household size and disease prevention strategy, implying that as household size increases by 1 unit, disease prevention strategy will decrease. This may be due to inability of the farmers with large household size to purchase some of the items required in biosecurity measures as well as afford resting of the pens before stocking.

In addition, sex of the respondents had negative influence on financial strategy, signifying that male respondents compared with their female counterparts will not choose financial strategy. The only explanation for this may be due to the fact that females are more prudent with money. Financial risk and financial strategy are positively correlated, meaning that as financial risk increases, the

financial strategy increases. This is not surprising because the knowledge of farmers about the reality of financial risk will encourage them to adopt financial management strategy to mitigate its effects on their income. According to Akinbile et al. (2013), financial risk is an important determinant of choice of management strategies adopted in mitigating threats to source of livelihood of poultry farmers. Finally, there was direct association between human risk and disease prevention strategy, signifying that a unit increase in human risk will lead to increase in the adoption of disease prevention strategy. This may be because farmers are still capable of controlling human risk.

5. Conclusion

This study has examined risk perceptions and risk management strategies among poultry farmers in the south-west, Nigeria. The study shows that poultry farmers belong to an active labour force and a majority of them are males. Despite the relatively high level of education among the respondents, their level of participation in associations were low and most of them can best be described as small-scale farmers who had low access to credit, extension services and training in modern agricultural practices.

Poultry farmers perceive production risk, financial risk, and human risk as important threat to their incomes. The results indicate that the farmers adopt disease prevention and financial management strategies to mitigate the effects of various risks associated with their businesses. Years of experience in poultry, the value of poultry, and production risk are important determinants of choice of disease prevention and financial management strategies adopted by the respondents. Factors that determine only disease prevention management strategy are years of schooling, household size, and human risk, while respondent's sex and financial risk remain the only determinants of financial risk management strategies. The study therefore recommends that policies on risk management in poultry enterprise should be targeted at farmers' socio-economic characteristics and risk perceptions so as to enhance the growth potentials of poultry farmers and prevent the collapse of the poultry industry. Also, future study on this matter should examine: the relationship between farms' and farmers' socioeconomic variables on risk perception; the effect of farms' and farmers' socioeconomic variables on risk management strategies; the influence of risk perception on risk management strategies using structural equation model.

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References
Adepoju, O. A., Timothy, O. A., & Oyekale, A. S. (2013). Risk coping behaviour of small scale poultry farmers in Ogun State, Nigeria. *Asian Journal of Animal and Veterinary Advances*, 8(6), 786–795. doi: 10.3923/ajava.2013.786.795

Adeyemo, A. A., & Onikoyi, M. P. (2012). Prospects and challenges of large scale commercial poultry production in Nigeria. *Agricultural Journal*, 7(6), 388–393. https://doi.org/10.3923/aj.2012.388.393

Adeyonu, A., Ajiboye, B., Isitor, S., & Faseyi, S. (2017). An analysis of the factors influencing access to credit by poultry farmers in Abuja, Nigeria. *Agriculturae Conspectus Scientificus*, 82(1), 55–62. https://acs.agr.hr/acs/index.php/acs/article/view/1175

Adeyonu, A. G., Oyawoye, E. O., Otunaiya, A. O., & Akinlade, R. J. (2016). Poultry farmers' willingness to participate in national agricultural insurance scheme in Oyo state. *Applied Tropical Agriculture*, 21(3), 55–62. https://www.futa.edu.ng/journal/home/journald/11

Aditto, S., Gan, C., & Nartea, G. (2012). Sources of risk and risk management strategies: The case of smallholder farmers in a developing economy. *IntechOpen*, 449–474. on 15/01/19. https://doi.org/10.5772/50392

Aditto, S., Gan, C., & Nartea, G. (2014). Economic risk analysis of alternatives farming systems for smallholder farmers in central and North-East Thailand. *International Journal of Social Economics*, 41(4), 294–320. https://doi.org/10.1108/IJSE-11-2012-0223

Akinbile, L. A., Akinpelu, O. M., & Akwiwu, U. N. (2013). Risk management strategies utilized by small scale poultry farmers in Oyo State, Nigeria. Implications for agricultural transformation. *Journal of Agricultural Extension*, 17(1), 35–48. https://doi.org/10.4314/jae.v17i1.4

Akintunde, O. K. (2015). Determinants of poultry farmers' participation in livestock insurance in Southwest Nigeria. Determinants of poultry farmers' participation in livestock insurance in Southwest Nigeria. *Asian Journal of Poultry Science*, 9(4), 233–241. https://doi.org/10.3923/ajpsaj.2015.233.241

Alabi, R. A., & Isah, A. O. (2002). Poultry production constraints. The case of Esan West local government area of Edo State, Nigeria. *African Journal of Livestock Extension*, 1(1), 58–61.

Almadani, M. I. N. (2014). *Risk attitude, risk perceptions and risk management strategies: An empirical analysis of Syrian wheat-cotton and pistachio farmers* [A published Ph.D thesis in the International Ph.D Program for Agricultural Sciences in Göttingen (IPAG) at the Faculty of Agricultural Sciences]. Georg-August-University Göttingen, Germany. 191. Retrieved January 15, 2019, from. https://ediss.uni-goettingen.de/handle

Anthony, G. M., & Rao, K. V. (2007). A composite index to explain variations in poverty, health, nutritional status and standard of living: Use of multivariate statistical methods. *Public Health*, 121(8), 578–587. https://doi.org/10.1016/j.puhe.2006.10.018

Babalola, D. A. (2014). Risk preferences and coping strategies among poultry farmers in Abeokuta Metropolis, Nigeria. *Global Journal of Science Frontier Research*, 14(5), 22–29.

Banjoko, I. K., Falola, A., Babatunde, F. B., & Atolagbe, R. (2014). Assessment of risks and uncertainties in poultry farming in Kwara State, Nigeria. *Science, Technology and Arts Research Journal*, 3(4), 64–70. https://doi.org/10.4314/star.v3i4.9

Baruwa, O. I., & Adesuyi, A. Z. (2018). Managing farm risk: Issues and strategies in small scale poultry farmers in Osun State, Nigeria. *J Fisheries Livest Prod*, 6(3), 278. DOI:10.4172/2332-2608.1000278

Bishu, K., O'Reilly, S., Lahi, E., & Steiner, B. (2016). Cattle farmers' perceptions of risk and risk management strategies. *Munich Personal RePEc*. Retrieved May 1, 2018, from. http://www.mpra.ub.un-muenchen.de/74954

Claire, S. (2010). *Risk management in agriculture: Towards market solutions in the EU*. Deutsche Bank Research. http://www.dbresearch.com/PROD/DBR_INTERNET_EN-PROD/PROD0000000000262553.PDF

Effiong, E. O., Enyenihi, E. A., & George, A. A. (2014). Analysis of farming risk among small scale poultry farmers in Etim Ekpo local government area of Akwa Ibom State, Nigeria. *Nigerian Journal of Agriculture, Food and Environment*, 10(1), 59–64.

Flaten, O., Lien, G., Koesling, M., Valle, P. S., & Ebbesvik, M. (2005). Comparing risk perceptions and risk management in organic and conventional dairy farming. *Livestock Production Science*, 95(1–2), 11–25. https://doi.org/10.1016/j.livprodsci.2004.10.014

Food and Agricultural Organization (FAO). (2006). *Estimate, world Facebook*. Retrieved August 21, 2017, from. http://www.fao.org

Gujarati, D. M. (2006). *Basic econometrics* (2nd ed.). Tata McGraw-Hill Publishing Co. Ltd.

Hardaker, J. B., Huirne, R., Anderson, J. R. (2004). *Coping with risk in agriculture. Wallingford* (2nd ed.). CABI.

Hayran, S., & Gül, A. (2015). Risk perception and management strategies in dairy farming: A case of Adana Province of Turkey. *Turkish Journal of Agriculture - Food Science and Technology*, 3(12), 952–961. https://doi.org/10.24925/turjaf.v3i12.952-961.583

Heise, H., Crisanb, A., & Theuvsenc, L. (2015). The poultry market in Nigeria: Market structures and potential for investment in the market. *International Food and Agribusiness Management Review*, 18(Special Issue A), 197–222. DOI:10.22004/ag.econ.207011

Iheke, O. R., & Igbelina, C. A. (2016). Risks management in poultry production in Ikeduru local government area of Imo State, Nigeria. *Nigerian Journal of Agriculture, Food and Environment*, 12(1), 67–74.

Kabira, J., Cramb, R., Alauddin, M., Gaydon, D. S., & Roth, C. H. (2020). Farmers' perceptions and management of risk in rice/shrimp farming systems in South-West Coastal Bangladesh. *Land Use Policy*, 95(2020), 104577. https://doi.org/10.1016/j.landusepol.2020.104577

Kahan, D. (2013). *Managing risk in farming*. FAO. http://www.fao.org/3/a-i3229e.pdf

Legesse, B., & Drake, L. (2005). Determinants of smallholder farmers' perceptions of risk in the eastern highlands of Ethiopia. *Journal of Risk Research*, 8(5), 383–416. https://doi.org/10.1080/1366987042000192426

Nasiru, M., Haruna, U., Garba, A., & Tafawa, A. (2012). Economics of livestock marketing in Gamawa local government area, Bauchi State, Nigeria. In: *Eighth African Farm Management Association Congress*, November 25-29, 2012, Nairobi, Kenya (No. 159412). 15.

Nyikal, R. A., & Kosura, W. O. (2005). Risk preference and optimal enterprise combinations in Kahuro division of Murang'a district, Kenya. *Agricultural Economics*, 32 (2), 131–140. https://doi.org/10.1111/j.0169-5150.2005.00012.x

Obayelu, O. A., Olowe, A. A., & Faleye, T. G. (2017). Do social networks have effects on the risk attitude of commercial poultry farmers? Evidence from Southwest Nigeria. *Rural Sustainability Research*, 38(333), 1–13. https://doi.org/10.1515/plua-2017-0007

Omodele, T., & Okere, I. A. (2014). GIS application in poultry production: Identification of layers as the major commercial product of the poultry sector in Nigeria. *Livestock Research for Rural Development*, 26(5), Article No.97. Retrieved May 1, 2018, from. http://www.lrrd.org/lrrd26/5/omod26097.html

Organization for Economic Cooperation and Development (OECD). (2011). *Risk management in agriculture: What role for governments?* Retrieved August 24, 2017, from. http://www.oecd.org/agriculture

Pennings, J. M. E., Wansink, B., & Meulenberg, M. T. G. (2002). A note on modeling consumer reactions to a crisis: The case of the mad cow disease. *International Journal of Research in Marketing*, 19 (1), 91–100. https://doi.org/10.1016/S0167-8116(02)00050-2

Salau, M. A., Eniola, P. O., & Siyanbola, M. F. (2010). Risks and management strategies in poultry production in Oke – Ogun area of Oyo State, Nigeria. *Journal of Sustainable Development*, 7(1), 30–36.

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Salman, K. K., Ashagidigbi, W. M., & Jabar, K. T. (2014). Correlates of risk-aversion among poultry egg farmers in Ibadan, Nigeria. *Journal of Rural Economics and Development*, 19(1), 46–60.

Ullah, R., Shivakoti, G. P., Zulfiqar, F., & Kamran, M. A. (2016). Farm risks and uncertainties: Sources, impacts and management. *Outlook on Agriculture*, 45 (3), 199–205. https://doi.org/10.1177/0030727016665440

United States Department of Agriculture (USDA). (2013). International Egg and Poultry Report. https://the-meatsite.com

Waweru, C. W. (2017). *An analysis of risk attitudes and risk management strategies among dairy farmers in MuranG'A County, Kenya* [A published MSc thesis in Agricultural and Applied Economics]. University of Nairobi, Kenya, 109. Retrieved June 20, 2018, from. erepository.unonbi.ac.ke

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