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Full Length Research

Factors affecting risk attitudes of small scale poultry farmers in Kogi State, Nigeria

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ABSTRACT: Small-scale farmers are risk averse in order to avoid any discomfort in their livelihoods. Hence, this study analyzed the risk attitudes and their determinants among poultry farmers in Kogi State, Nigeria. A multi stage sampling technique was used to select a total of 192 respondents in the study area on which semi-structured questionnaires were administered to extract relevant information. Data collected were analyzed using both descriptive and inferential statistics such as safety first model, ordered logit regression as well as Ordinary Least Square (OLS) regression model. The results showed that the major risks associated with poultry production were disease outbreak, lack of medication and lack of vaccination health programmes. Majority (57%) were risk averse with aggregate frequency score of 109. Furthermore, the factors influencing farmers' risk attitude in poultry production were educational level, primary occupation, cooperative membership, marital status, labour in man days and investments. It was therefore recommended that poultry farmers need to strengthen their membership of cooperative societies so that they can have more access to veterinary services and risk sharing opportunities. The farmers need to be involved in other income generating enterprises in order to cushion the effect of production shocks inherent in poultry production.

Keywords: Averse, poultry, risk attitudes, safety first model.

INTRODUCTION

Risk is a probability or threat of damage, injury, liability, loss, or any other negative occurrence that is caused by external or internal vulnerabilities, and that may be avoided through preemptive action (Ermakov *et al.,* 2014). In another word, it a situation which exists when the future can be predicted with a specified degree of probability (Castle *et al*., 1972). On the other hand, uncertainty is a potential, unpredictable, and uncontrollable outcome, a situation in which the outcome is not known (Carleton, 2016). That is the probability of occurrence cannot be predicted.

Abimbola *et al*. (2013) enumerated risk factors in agricultural production to include climate variability, input price variability, technology change, theft, insecurity, incidence of pests and diseases, equipment breakdown, high cost of veterinary services, change in government policy, borrowing money with sudden change in interest rates, scarcity of labour at peak time and change in health and wellbeing of the farmers. All of these changes are examples of the risks and uncertainties that farmers face in managing their farms as a business. These factors make small-scale farmers inadequately equipped against risks and uncertainties (Egwuma *et al.*, 2018).

Risk is an inherent feature of modern poultry production. The environment parameters changes during the year such as temperature and relative humidity has also significant risk impart in poultry production systems and business net return. Researchers such as Effiong *et al.* (2014) identified risk and uncertainties as a major problem of the poultry industry in Nigeria. It should be emphasized that many poultry farmers in Nigeria are less equipped to manage risks associated with production, consumption, income, assets and their health. Such risks are diseases outbreak, high cost of medication and vaccines, insufficient fund and inadequate quality feed. This could lead to eventual collapse of poultry industry if intensive and

collaborative efforts are not made by government and stakeholders to salvage the situation (Abimbola *et al.*, 2013). In particular, the failure to rise up to this challenge to saving the industry could lead to a serious reduction in poultry production and protein intake of people most especially the rural duelers which could results to malnutrition and ill health, lower productivity and output (Iheke *et al*., 2016).

According to Rajan *et al.* (2017), the vicious circle of poverty takes many forms, but the key element in many versions of the spiral in most of the production environments is an aversion to risk. If the weaker section of the society is averse to risk, to an extent that they are not willing to invest in the acquisition of modern agricultural inputs because of the risks involved, they will surely remain poor.

According to Oladeji and Oyesola (2011), attitude is defined as the degree to which a person has a favourable or unfavourable evaluation of the behavior in question. It is the predisposition to respond to a giving question or innovation either positively or negatively. Attitude has been identified as a cause of intention (Buitenhuis *et al.,* 2004).

The sector holds a lot of potentials to actualize the desire for the state to be protein secure and economically stable. Many authors (Effiong *et al*., 2014, Abimbola *et al*., 2013; Iheke *et al*., 2016) researches were on risk sources and management strategies among poultry farmers. However, little or no study have been carried out on determinants of risk attitudes among them in the study area**.** To this end, this study will focus mainly on analysis of risk attitudes and factors influencing poultry farmers in Kogi State, Nigeria.

MATERIALS AND METHODS

Study area

Kogi is a state in the central region of Nigeria, popularly called the confluence state, because of the confluence of River Niger and River Benue at its capital. Lokoja, Kogi State consists of twenty-one (21) Local Government Areas, with total land area of 28,313.53 square kilometers and population of 3,595,789 (National Population Census, 2006). The projected population of Kogi State in 2018 using an annual growth rate of 3.3% is, therefore, 5,308,821. The state is situated between Latitudes 60°26'N and 80°45'N and Longitudes 60°E and 80°E. It is bordered by ten (10) states and Abuja, the Federal Capital. Specifically, the boundaries are Abuja to the North, Nassarawa to the North-East, Benue and Anambra to the East, Enugu to the South-East, Edo to the South-West, Ekiti and Ondo to the West and Niger to the North. The State has two seasons which are wet and dry season. The wet season begins in March and ends in October while the dry season spans November and early March. The annual rainfall is between 1016 mm and 1524 mm while mean temperature ranges between 24 and 27°C (Kogi Agricultural Development Project, 2014). Farming is the the major occupation in the study area. Both sole and mixed cropping ere practiced. The major crops grown are yam, cassava, maize, cowpea, melon, bambara, beniseed (sesame), oil palm, castor, cashew and citrus. Cropping pattern is more of mixed cropping than sole cropping. In addition to crops, livestock such as goats, sheep and poultry are also kept (KADP, 2014).

Sampling procedure

A multi-stage sampling procedure was used to select the poultry farmers in the study area. The first stage involved the selection of the four Zones in Kogi State which are Zones A, B, C, and D. The second stage involved random selection of two local government areas from Zone A, B, C, and D while the third stage involves the selection of 192 respondents from the study areas using the Yamanne formula as used by Eboh (2009) to determine the sample size.

$$n = \frac{N}{1+N(e)2} \quad (1)$$

Where: n = sample size, N = population size, and e = Level of precision (5%).

Method of data collection

Primary data was used for the study, the primary data was collected by researcher and trained enumerators during the year 2019, using semi-structured questionnaire that was administer to the selected poultry farmers by interviewing the respondents. The data that were generated includes types of risk in poultry faming, inputs and output variables; socio-economic and demographic characteristics.

Analytical techniques

Descriptive and econometric analysis were used. Descriptive statistics were used for risk sources and attitudes of poultry farmers. Safety first model and ordered logit regression were used to identify risk attitudes and factors affecting them.

Safety first model

Following Ajetunmobi and Binuomote (2006), the safety first model of determining risk attitude coefficient was used to identify the risk attitudes of poultry farmers. Safety principle model involves the use of OLS regression analysis. Here, the Cob-Douglas function was estimated due to its efficiency in production function. The explicit form of the model is given as:

$\ln Y = \alpha + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \ldots + \beta_n \ln X_n + e_i$ (2)

Where: Y = Average quantity of output (₦), X_1 = Average cost of housing (₦), X_2 = Average cost of stock (₦), X_3 = Average cost of feed (₦), X_4 = Average cost of labour (₦), X_5 = Average cost of drugs and veterinary (₦), α = Intercept/constant, β's = Coefficient to be estimated

The coefficient of variation is given as:

$$\gamma = \frac{Sy}{\mu y} \quad (3)$$

The risk attitude coefficient was then computed thus:

$$K = \frac{1}{\gamma}\ (PiXi/PF1\mu y) \quad (4)$$

Where: K= coefficient of risks in category, γ = Coefficient of variation of output, S γ = Standard deviation of output, μy = Mean of output, Xi = Coefficient of the most significant variable from the regression model, Pi = Input price (ma), P = Market price of output, and F1 = Elasticity of production of input.

The computed risk attitude coefficient was used to classify the respondents into groups; risk averse, risk neutral and risk preference.

Ordered logit regression model

Behavioral response models involving more than two possible outcomes are either multinomial or multivariate. An ordered logit model is appropriate when individuals can choose only one outcome from among the set of mutually exclusive, collectively exhaustive alternatives. Therefore, in order to determine the factors influencing farmers risk attitudes, the ordered logistic regression model was used. The choice of this method is based on the fact that the risk behavior (dependent variable) is a categorical variable which can take three (3) levels (1, 2, and 3) (Ayinde *et al.,* 2012). The probability that the i^{th} farmer belongs to the jth risk behavior group reduces to:

$Y = \beta_i (X_i) + e$ (5)

The likelihood of being in either of the risk categories is described by ordered logit model expressed as follows:

$Pr (Y = c/X_i) = F (X_i \beta)$ (6)

Where: Y = the outcome response for dependent variable (coded as 1, 2, and 3), F = the standard logistic cumulative link function, X = the set of predictor variables, and C = categories for the *i*-th subject.

The empirical specification of equation 6 above is presented as:

$Y_i = \beta_0 + \beta_i X_i + \varepsilon_i$ (5)

The explicit form of the function is specified as follows:

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X \ldots\ldots\ldots\ldots\ldots\ldots + \beta_n X_n + e_i$ (6)

The dependent variable (Y) in this case is an ordered variable indicating the choice of risk pattern by the various farmers.

Where: Y= Risk attitudes. (3= risk averse, 2=risk neutral, 1=risk taker/ preference), X_1= Age (years), X_2= Gender (1 if male, 0 otherwise), X_3= Household size (number), X_4= Educational status (years of former education), X_5= Access to extension contacts (1 if yes, 0 if no), X_6= Primary occupation (1 if full time farmer, 0 otherwise), X_7= Membership of cooperative societies (1, if member, 0 otherwise), X_8= Marital Status (1 if married, 0 otherwise), X_9= Access to credit (1 if yes, 0 if no), X_{10}= Years of farming experience (years), X_{11}= Cost of feed (₦), X_{12}= Farming income (₦), X_{13}= Farm size (No of birds), X_{14}= Method of land acquire (1 if by inheritance, 0 otherwise), X_{15}= Total labour employed (man days), X_{16}= Total investment capital (₦), β_0 = Constant, $\beta_1 - \beta_{16}$ = Coefficient of the independent variables, $X_1 - X_{16}$ = independent variables, and ε_i = error term.

RESULTS AND DISCUSSION

Major risk sources to poultry enterprise

The result of the risk associated with poultry production in the study area is as presented in Table 1. The results show that major risk of the poultry farmers in the study area were disease outbreak ($\bar{X}$ = 4.72), inadequate animal vaccination ($\bar{X}$ = 4.37), inadequate medication and vaccination health programmes ($\bar{X}$ = 4.19), inadequate technical know-how ($\bar{X}$ = 4.14), rise in cost of inputs ($\bar{X}$ = 4.12), low market demand ($\bar{X}$ = 4.02), inadequate brooding technical knowhow ($\bar{X}$ = 4.02) ranked 1st, 2nd, 3rd, 4th, 5th and 6th respectively. This result is expected given the prevalence of diseases (especially, *coccidiosis, Gumboro*) in poultry production (Terfa *et al*., 2015). The problem of diseases due to weather condition was indicated by all the farmers. During the rainy season, most common problems experienced by farmers include chronic respiratory diseases and *Coccidiosis* while too much heat during dry season also causes heat stress. Endemic diseases such as New Castle and *Gumboro* are problems of poultry farmers. Rise in costs of inputs in the study area was indicated to be 96.92% of the farmers and 35.58% of the poultry farmers indicated inadequate credit as risk source.

Risk attitude of poultry farmers

The regression result for the risk attitudes of poultry farmers in the study area using the safety first model is as

Table 1. Identified risks to poultry enterprise in the study area.

Risk to poultry production	WS	WM	Rank	Decision
Disease outbreak	893	4.72	1st	Agree
Inadequate animal vaccination	831	4.37	2nd	Agree
Inadequate medication and vaccination health programmes	796	4.19	3rd	Agree
Inadequate technical know-how	787	4.14	4th	Agree
Rise in cost of inputs	783	4.12	5th	Agree
Low market demand	764	4.02	6th	Agree
Inadequate brooding technical knowhow	763	4.02	6th	Agree
Proper record keeping	752	3.96	8th	Agree
Pest attack	749	3.94	9th	Agree
Health status of poultry farmer	744	3.92	10th	Agree
Unfavourable weather	741	3.90	11th	Agree
Theft and pilfering	739	3.89	12th	Agree
Stampede in poultry	736	3.83	13th	Agree
Low quality feeds	722	3.80	14th	Agree
Inadequate information to upgrade meat and egg	714	3.73	15th	Agree
Change in poultry output prices (eggs and meat)	706	3.72	16th	Agree
Inadequate storage facilities	695	3.66	17th	Agree
Inadequate credit facilities	695	3.66	17th	Agree
Conflict within the community	696	3.66	17th	Agree
High interest rate	696	3.66	17th	Agree
Inadequate stocks	693	3.65	21st	Agree
rise in cost of exotic breed	672	3.54	22nd	Agree
Death of the farmer	652	3.43	23th	Agree
Inadequate electricity power supply	641	3.37	24th	Agree
Government policy	598	3.15	25th	Agree
Inadequate family labour	578	3.04	26th	Agree

Note: WS= Weight sum, WM= Weight mean (**Source:** Field Survey, 2019).

presented in Table 2. The result shows a coefficient of determination (R^2) of 0.6997 which implies that approximately 70% of the risk attitudes of the poultry farmers was explained by the independent variables in the model while the remaining 30% was explained by the error term and other unidentified variables. The result also, shows that cost of stock, cost of feed, cost of medication and cost of labour were positive and statistically significant at 1%. This implies that cost of stock, cost of feed, cost of medication and cost of labour had a statistically significant influence on the risk attitudes of the poultry farmers in the study area.

The extent of risk attitudes of the poultry farmers was then made the basis for categorizing the farmers into three groups of risk-averse, risk-neutral and risk-preferring as presented in Table 3. The risk attitudinal ranking of poultry farmers in the study area as presented using safety first model revealed that risk-averse behavior ranked first with aggregate frequency score of 109. This was followed by risk-neutral and risk-preferring behaviors of 51 and 30 frequency scores, respectively. The results showed that most of the farmers did not like taking risks probably due to low income of the farmers which is generally applicable to small scale farmers in Nigeria. This result is in line with the findings of Abimbola *et al*. (2013), who studied risk coping behavior of small scale poultry farmers in Ogun State of Nigeria and found out that majority of farmers were risk averse.

Factors influencing farmers risk attitudes in poultry production

The factors influencing farmers risk attitudes in poultry production was analyzed using the ordered logit regression model and the result is presented in Table 4. The result shows that the pseudo R-squared was 0.2526 which shows a relatively good fit for the ordered logit model while the chi-square results shows that the likelihood ratio statistics was statistically significant at 1% level of significance, suggesting that the ordered logit model has strong explanatory power of the variables included in the model.

The result also shows that educational level, primary occupation, cooperative membership, marital status, labour in man days and investments were negatively

Table 2. Safety first model of poultry farmers risk attitudes.

Variables	Linear	Exponential	Double-log	Semi-log
Constant	-8.05***	-1.28***	-12.14***	11.88***
	(-11.38)	(-10.44)	(-5.18)	(60.87)
Building	-417.44***	-1997	-0.0004	-2.32
	(-4.70)	(-0.66)	(-1.01)	(-0.95)
Stocks	12.22	2327	0.4838***	3.21***
	(0.33)	(0.49)	(5.37)	(3.11)
Feed	-109.05***	-6657	0.4280***	2.61
	(-3.30)	(-1.18)	(3.96)	(0.29)
Medication	5183***	1.37***	0.3508***	0.00***
	(7.54)	(2.60)	(3.48)	(5.86)
Labour	2022***	1.17***	1.2107***	0.00***
	(10.87)	(9.05)	(4.88)	(4.21)
R-square	0.6124	0.4121	0.6997	0.5900
Adj. R-square	0.6019	0.3961	0.6916	0.5789
F-value	58.15***	25.79***	85.75***	52.97***

Note: Numbers in parenthesis are T-values. *** = 1% significant level, ** = 5% significant level (**Source:** field survey, 2019).

Table 3. The risk attitudinal ranking of poultry farmers in the study area.

Item	Risk-preferring	Risk-averse	Risk-neutral	Total
risk-preferring	-	47	21	68
risk-averse	16	-	30	46
risk-neutral	14	62	-	76
Aggregate preference Score (APS)	30	109	51	190
Mean Preference Score (MPS)	0.16	0.57	0.27	
Mean Preference Score (MPS)	0.16	0.57	0.27	

Source: Field survey, 2019.

related to the farmer's risk attitude in poultry production and statistically significant at 1%, 5%, 10%, 5%, 5% and 1% level of significance respectively. This is an inverse relationship and it implies that an increase in the educational level, primary occupation, cooperative membership, marital status, labour in man days and investment of poultry farmers will decrease the likelihood of the farmers' risk attitudes. This could be attributed to the fact that education level has an indirect relationship to risk attitude and significant at 1% probability level, implying that risk aversion decreases with higher education level. Natural risk associated with the poultry enterprise is spontaneous and can be highly devastating, this shows how much the farmers leave poultry production for white collar job. Having higher education would permit the farmers not to bear higher risks. This agreed with *a priori* expectation. Also, primary occupation has an indirect relationship to risk attitude and negatively significant at 5% probability level, implying that risk aversion decreases with increase in farmers taking poultry production as their main source of livelihood. This is because the aged pensioners and the low income earners are the once practicing poultry farming in the study area and most of them are small scale farmers. The result from the table also shows that cooperative membership and marriage status were negative, having cooperative membership and marital status were found to reduce risk aversion, similar result was also found by Iheke *et al.* (2016) and Egwuma *et al.* (2018). Access to labour as when due tend to feel reluctant about adopting new technology as they are always comfortable with their old ways of doing things while the higher the investment of a particular technology the more reluctant for farmer to adopt it.

Furthermore, household size, cost of feed and farm size were positively related to farmers' risk attitudes and were statistically significant at 5%, 1% and 1% level of significance respectively. This means that household size was a significant determinant of risk attitude. There are two opposing interpretations as to the nature of the relationship between household size and risk attitude. The larger the household size, the greater will be the total consumption needs of the farm family and thus, the less willingness to bear risk. However, to the extent that larger household size also augments the total labour supply of the farm

Table 4. Factors influencing farmers risk attitude in poultry production.

Variables	Coefficient	Standard Error	z – value
Age	-0.0016	0.0241	-0.06
Gender	0.1050	0.4746	0.22
Household size	0.1977	0.9415	2.10**
Educational level	-0.2873	0.9375	-2.91***
Access to Extension contact	0.4144	0.4805	0.86
Primary occupation	-1.2203	0.5086	-2.40**
Cooperative membership	-1.0279	0.6061	-1.70*
Marital status	-1.2873	0.6408	-2.01**
Access to credit	-0.9086	0.4736	0.19
Farming experience	-0.0382	0.4509	-0.85
Cost of feed	0.3107	0.6648	3.12***
Farm income	1.63e-08	1.79e-08	0.91
Farm size	0.0061	0.0023	2.70***
Ownership of land	0.0176	0.1281	0.14
Labour in man days	-0.0147	0.0064	-2.29**
Investment	-0.0000	7.86e-06	-3.36***
Constant	9.0379	2.9049	3.11***
Pseudo R squared	0.2526		
Log Likelihood	-150.40		
LR Chi squared	101.65***		

*, **, and *** implies significant at 10%, 5% and 1% respectively (Source: Field Survey, 2019).

household and thereby enhances its income generating potentials, the effect of a larger household size on risk attitude maybe neutralized. This study shows a positive relationship between household size and risk attitude. Larger house hold size implies greater capacity to assume risks. The coefficient of family size was positive and significantly related to level of aversion. The average of the household size was found to be 5 members. In addition, the result reveals that farm size has a direct relationship to risk attitude, implying that risk aversion increases with large stock size. Natural risk associated with the poultry enterprise is spontaneous and can be highly devastating, so farmers are normally apprehensive of the risk of this nature. Having more birds would permit the farmers to bear higher risks. Of all the variables, the coefficient of number of flocks was significant at 1% probability level and agreed with *a priori* expectation, using stock size as a proxy for assets shows that farmers who have more assets are more risk averse because of their level of investment (Ajetomobi and Binuomote 2006).

The result from the Table 4 also showed that cooperative membership and marital status were negative, having cooperative membership and marital status were found to reduce risk attitude, similar result was also found by Ayinde *et al*. (2008) and Picazo-Tadeo and Wall (2011). Cost of feed was positively significant at 1% which implies that as the feed increase, the more risk averse the farmer becomes. Ogoke (2009) observed that the more feed is supply to stock, the more efficient the farmer becomes because of cost of the feed spent in the farming business may clearly give an indication of the practical knowledge he has acquired. This is an advantage to reduce farming risk which will help to boost production in any predetermined period in farming business respectively. The result of the ordered logit regression model further shows that educational level, primary occupation, cooperative membership, marital status, labour in man days and investments were negatively related to the farmers' risk attitude in poultry production and statistically significant at 1%, 5%, 10%, 5%, 5% and 1% level of significance respectively.

Conclusion and Recommendations

This study concludes that poultry farmers were exposed to various forms of risk such as disease outbreak, lack of animal vaccination, lack of medication and vaccination health programmes, lack of technical know-how, rise in cost of inputs, low market demand and lack of brooding technical knowhow. In the study area, poultry farmers were moderately risk averse. Educational level, primary occupation, cooperative membership, marital status, labour in man days, investments, household size, cost of feed and farm size were factors influencing farmers risk attitudes in the study area while the risk management strategies adopted were price adjustment, feeding (feed and water), production strategies, vaccination, enterprise diversification, and financial strategies. Therefore, the following recommendations were made:

1. Poultry farmers needs to strengthen their membership of cooperative societies so that they can have more access to veterinary services and risk sharing opportunities.
2. Farmers need to be involved in other income generating enterprises in order to cushion the effect of production shocks inherent in poultry production.
3. The government, non-governmental organisations and development partners need to organize regular trainings, seminars and workshops on modern production technologies.

Limitation of the study

Kogi State is made up of 21 Local Government Areas, in this study only, respondents were only from eight (8) LGAs. Further study could be done to cover all poultry farmers in the state.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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