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Correlates of Risk-Aversion among Poultry Egg Farmers in Ibadan, Nigeria

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Abstract

Poultry production is largely faced with a number of risks. In this study, sources of risk, attitude of farmers towards risk, the determinants and risk management strategies adopted by farmers were examined. Primary data from 74 respondents were collected using cluster sampling method with the aid of a well-structured questionnaire. Descriptive statistics, composite analysis, safety first behavioral model and the censored Tobit model were the analytical tools employed. The most prevalent source of risk in the study area was fluctuation of input prices (75.3%) and the least encountered risk source was inefficiency of workers (12.2%). Average poultry egg farmer in the study area experienced at least one source of risk. The respondents were found to exhibit low risk aversion and risk-aversion was significantly increased by cost of labour, number of layers in battery cage system and number of layers in deep litter system. However, years in poultry farming and amount of credit received significantly reduced the risk aversion among the farmers. The most used risk management strategy was relaxation of pen before re-stocking them (97.3%). Farmers should be encouraged to insure their farms and extension services should be made readily available to farmers. Enabling policy environment towards an effective credit programme should be facilitated while attention should also be shifted towards protection of farmers against input price variations.

Keywords: *Risk aversion, Poultry egg farmers, Safety first model.*

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Introduction

Poultry is the second most widely eaten meat in the world accounting for 30% of meat production in the world, after pork, 38% (Wikipedia, 2012). It is a well-known fact that poultry is a very good converter of ingredients, especially those of plant origin, into animal protein. Generally poultry

production is about twice as effective as producing pork and three times more as producing beef due to its very short cycle. Hence poultry is a popular kind of meat in many places around the world (Ad Bal, 2011). In Nigeria, most poultry farmers operate on a small scale with little opportunity for

diversification and insurance (Adejoro, 2000). Most investors prefer investing their capital in other industrial enterprises to agriculture. The unwillingness to invest in agriculture is the inherent risky nature of the enterprise with uncertainties (Adegeye and Dittoh, 1985). Risk is a central issue that affects many different aspect of people's livelihood in the developing world. Risk is defined as a condition in which the result of any decision or course of action are not definitely known but will fall within a known range (Montana and Charnov, 1987). It affects ownership and maintenance of assets and endowment, transformation of these assets into income through economic activities into broader development (Kouame, 2011). However, farmers generally often face severe variations in output and prices, have difficulties in accessing loans due to lack of collaterals and have poor access to agricultural extension services (Salimonu, 2009^a). These problems have led to characteristic poverty; low income and vulnerability to risk in Nigeria as submitted by several studies (World Bank, 2000; 2001). Poor infrastructures such as roads, electricity, water and the exploitative activities of the middle men all constitute major impediment to production, distribution, marketing and storage of agricultural products in the country. Farmers face risk from a variety of sources, including price and production risk all of which cause uncertainty in profit and this will affect input choice decision (Andres and Wall, 2010).

Compared to its population, Africa is only playing a minor role in the global poultry industry. Africa's share of the global population is 14% in 2009 but her contribution to global chicken meat and egg production are 4.5% and 4.1% respectively (FAO, 2009) out of which Nigeria contributed 7.2% and 23% of the total chicken and egg production respectively in Africa. Till date

Africa countries have a high negative balance of trade in chicken meat; in 2008, 666,000 tones was imported to meet the domestic demand though the import volume for shell egg was much smaller, about 32,000 tones (Windhorst, 2011). The bulk of the food and fiber of Nigeria is produced by small scale farmers. The farming population constitutes over 60% of the country's population. Presently Nigeria agriculture is characterized by low productivity, low level of technological adoption, use of inefficient production techniques, etc. According to Adegeye and Dittoh (1985), most agricultural decisions are taken in the environment of risk and uncertainty. Farmers will usually have to make decisions now that will affect their production later. The farmers are not sure of weather, diseases, prices changes, input availability, government policies and new changes in technology - factors which make it difficult for them to predict the future with certainty. Farmers will have to take decisions in these uncertain situations and these decisions are dependent on their attitude towards risk. The present poor state of Nigeria agriculture is related to farmers' attitude towards risk in the adoption of new production techniques as well as the risk inherent in the production and socioeconomic environment. According to Andres and Wall (2010) farmers face risk from a variety of sources including input price risk and production risk all of which causes uncertainty in profit which will affect input choice decisions. The influence of risk preference on input choices in agricultural production has long been recognized. Risk-averse producers will not generally choose the same input combination as risk-neutral producers and this has implications on the effect of policies aimed at curtailing the use of certain input such as feed component and poisonous vaccines. Many studies such as

Olarinde and Manyong (2007); Metteet *al* (2004) and Salimonu and Falusi (2009^a) have been carried out on attitude of farmers toward risk and its determinants but majority of them focus on crops farmers. Existing literatures as regards determinants of risk attitudes among livestock farmers in Nigeria are therefore very scanty. Hence this study particularly focused on poultry egg production. In this study, poultry egg farmers' attitude towards risk was measured and the determinants were examined. Risk sources and the available management strategies employed by the farmers were also identified.

2. Literature review

Knight (1921) defined risk as a situation in which the decision maker knows both the alternatives outcomes and the probability associated with each outcome and uncertainty as a situation in which the decision maker does not know the probability of alternative outcome. Adegeye and Dittoh (1985) defined uncertainty as a situation in which an action has a set of possible outcomes the probability of which are unknown. They also defined risk as a situation in which each action leads to one or more possible outcomes, each outcome occurring with a known probability. Harwood *et al.*, (1999) also describe risk as uncertainty that "matters" and may involve the probability of losing money, possible harm to human health, repercussions that affect resources (irrigation, credit) and all other types of events that affect a person's welfare. Hardaker (2000) saw risk as the uncertainty of outcome. However less emphasis is usually placed on the difference between uncertainty and risk since the two lead to variation in the level of income (Kouame 2011). Boehlje and Vernon (1984) and Salimonu and Falusi (2009^b) classified managers attitude towards risk into three, they

are risk averse, risk preferring or seeking and risk neutral. Risk averters or avoiders are known to be very cautious individuals with preferences for less risky sources of income or investment. Generally this individual will sacrifice some level of expected return in order to reduce the possibility of a loss. Risk preferring individual will select the alternatives with some probability of a higher outcome. This individual likely has a great risk bearing ability and must also accept the probability of a lower outcome compared to the risk averter and therefore is less concerned with the increased probability of a lower outcome and primarily focuses on the higher outcome potential. The risk neutral person is the limiting case between the risk averse and the risk preferring individual. This individual would select the alternative with the highest expected outcome, regardless of the probability associated with potential gains or losses. This individual will have an acceptable level of risk bearing ability such that large losses are not of concern but at the same time, achieving the highest outcome is not the focus either.

A number of studies had been done in the area of attitude towards risk and its determinants in general with a few on poultry egg farmers in particular. Ajetumobi and Bimuomote (2006), in a study carried out in southwestern Nigeria on risk-aversion among poultry egg producers using safety first model revealed that the risk premium were low encouraging the use of feed under safety-first behaviour. The regression result showed that risk-bearing capacity of the poultry farmers was explained by their socioeconomic characteristics. Olarinde and Manyong (2007) also in a study on maize farmers which was carried out in Northern Nigeria using safety first behavioral model found that 8.91%, 42.53% and 48.56% of farmers exhibited low, intermediate and high risk attitude

respectively. Moderately old farmers prefer to take risk and the risk neutral farmers were found to occupy one or more leadership positions. Risk aversion reduced for large household size according to their findings. Source of risk to farmers differs from place to place. Meuwissen *et al.*, (2001) identified price and production risk as important sources of risk in an empirical analysis of Dutch livestock farmers risk perception and risk management decision. In Vietnamese catfish farming, Tru and Cheong (2009) perceived price and production risk as the most important sources of risk. Nam *et al.*, (2007) in a study on risk management strategies by Australian farmers (two case studies) found out in their first case that unpredictable weather condition, financial risk, marketing risk and personal risk were regarded as the major source of risk among farmers of the upper Eyre peninsula of south Australia. Among dry land cropping farmers in southwest Queensland on the other hand, they found weather uncertainty as the most important source of risk followed by financial risks, government policy and marketing risks respectively. Seidu (2012) in a study on rice farmers in the upper east region of Ghana identified erratic rain fall, crop disease infestation, worms, bush fires, birds and grasshoppers infestation as the six major kinds of production risk affecting rice farming in the region.

According to Salimonu and Falusi (2009^b) risk management can be defined as choosing among alternatives to reduce the effect of risk. Farmers with access to risk management information and the knowledge to use it have the key to profitable and competitive farm operations. Harwood *et al.*, (1999) saw risk management as choosing among alternatives to reduce the effect of risk. This may involve the prospect of losing money, possible harm to human health among

many others. Risk management strategies can be employed *ex ante* (as prevention or mitigating strategies before the occurrence of risk) and *ex post* (as coping strategies after the occurrence of risk). In a survey carried out by De Weerd and Dercon (2006), they found risk sharing has the most frequently mentioned coping strategy in Tanzania. They also discovered private gift, private loans and private labour transfers as the major ways through which risk sharing is achieved. However, risk sharing among individuals in the same village will not adequately insure them against locally covariate risk such as drought, hurricanes, flood or other negative shocks that have a positive covariate between household such as price shocks which will affect all households in the same area or villages at the same time. Therefore, nobody in the same area can help the other, assistance have to come from outside the affected area. Salimonu and Falusi (2009^b) in a study on sources of risk and management strategies among crop farmers carried out in Osun state, Nigeria, found cooperative society, borrowing and off farm work as major risk management strategies used by food crop farmers in Osun state, Nigeria. Risk management strategies available to the farmers were extension services, 67.3%; access to fertilizer, 41.2%; mixed cropping/farming, 79.3%; cooperative society, 54.5%; borrowing of money, 73.0%; and off farm work, 69.7%. The framework in this study hinge on the fact that socio economic characteristics of poultry egg farmers and the risk exposed to would indeed determine the extent of the farmers' risk-aversion.

3. Research methodology

3.1 Study area

The study area was Ibadan, the capital of Oyo state. Ibadan is the largest and oldest

city in West Africa and the second largest city in Africa. Ibadan is located along the forest zone of southern Nigeria. It lies between latitude 7°N and 4°E with average rainfall between 1125mm and 1800mm. the temperature of Ibadan ranges between 27°C and 32°C. The city is an important commercial centre comprising of diversified sects of people with different socioeconomic characteristics. This is so because of its structural composition of many rural villages and urban centres. The main hub of poultry production in the country is located within the south western states of the country (Oyo, Osun, Ogun and Lagos). Ibadan is a major central city in the south western hub. Thus, the city is important in the national production and distribution of most poultry commodities, ranging from chicks to point-of-lay, pullets, spent layers, commercial broilers and poultry inputs such as drugs, vaccines and feed ingredients. The city has 11 local government areas (LGAs). Five of these are in the main city and 6 are in the suburbs. Most poultry production activities take place in the suburb local government areas of Akinyele, Ido, Oluyole, Ona-Ara, Egbeda and Lagelu.

3.2 *Data collection*

A cluster sampling of three of eleven local government areas was done based on the availability of many poultry farmers who have formed themselves into an association. The local government areas selected were Lagelu, Egbeda and Ona-Ara. The name of the association is Poultry Association of Nigeria (PAN). The association provided a sampling frame that was used in selecting farmers for the study. Data from 74 poultry egg farmers collected with the aid of well structured questionnaire were used in the analysis.

3.3 *Method of analysis*

Analytical tools employed in the study were descriptive analysis, safety-first model, Tobit model and composite score analysis. The safety-first method is one of the approaches used by economist to capture decision making in risky situation. Following Moscardi and deJanvry(1977) the safety-first approach was used in this study to generate risk-aversion parameter (K_s) for every poultry farmer in the sample. The model is specified as:

$$K_s = \frac{1}{\theta} \left[1 - \frac{P_i W_i}{P_y B_i \mu_y} \right] \dots\dots\dots (1)$$

Where;

- θ = coefficient of variation of egg output
- P_i = market price of feed per kg
- W_i = feed used by respondent *i*
- P_y = market price of egg output per crate
- B_i = elasticity of production with respect to feed.
- μ_y = mean egg output.

Feed is the most consistent determinant of egg output in the area and it is also the largest component of variable cost (Bamidele, 1986 in Ajetumobi and Bimuomote, 2006). Hence, the elasticity of production with respect to feed (B_i) was obtained from the estimation of cob-Douglas equation ². The K values is determined if the respondents were low risk-averse, intermediate risk-averse and high risk-averse. If the value is equal to 0 or within 0 and 0.4 ($0 < k < 0.4$) the respondent is low

² The estimation was based on two major assumptions namely the randomness of net income and the relationship between input (vector W) and output (Q) as represented by a hybrid equation obtained from Cobb Douglas (log linear) production function as used by Ajetumobi and Bimuomote (2006); Olarinde and Manyong (2007).

risk-averse, if the value is equal to 0.4 or within 0.4 and 1.2 ($0.4 < k < 1.2$) the respondent is intermediate risk-averse and if the value is 1.2 or within 1.2 and 2.0 ($1.2 < k < 2$) the respondent is high risk-averse (Moscardi and deJanvry, 1977). The cob-Douglas equation is hereby expressed by:

$$\ln Q_i = \ln B_0 + \sum \ln B_i w_i + \varepsilon_i \dots\dots\dots (2)$$

Where;

- Q = total egg output in crates,
- $i = 1, 2, \dots\dots\dots 5$
- w_1 = average feed per day in kg
- w_2 = number of layer in battery cages
- w_3 = number of layers in deep litter system
- w_4 = labour in mandays
- w_5 = cost of drugs and veterinary in Naira
- ε_i = error term
- B_0 = constant term
- B_i = Estimated coefficient of explanatory variables.

To determine the effects of the explanatory variables (socioeconomic and demographic) on risk-aversion among the farmers, the censored Tobit regression a hybrid of the discrete and continuous dependent variables was used. Following Tobin (1958) and Fernandez-Cornejo *et al.*, (2001) in Salimonu and Falusi (2009^a), the model is expressed as:

$$Y_i^* = B'x_i + \varepsilon_i \dots\dots\dots (3)$$

$$Y_i^* = 0, \text{ if } Y_i \leq 0 \dots\dots\dots (4)$$

$$Y_i^* = Y_i, \text{ if } 0 < Y_i < 1 \dots\dots\dots (5)$$

$$Y_i^* = 1, \text{ if } Y_i \geq 1 \dots\dots\dots (6)$$

Where;

Y_i^* = the limited dependent variable, which represents the farmers attitude towards risk indices.

x_i = vector of independent variable

B = vector of unknown parameters

ε_i = is a disturbance term assumed to be independently and normally distributed with zero mean and constant variance and $i = 1, 2 \dots n$ (n is the number of possible observation).

The independent variable considered as determinant of the risk-aversion levels were defined as follows:

- x_1 = Age of farmers (years)
- x_2 = Gender of the farmer (D=0 if male, otherwise D=1).
- x_3 = Number of years of formal education received by the farmer.
- x_4 = Income diversification (D=1 if yes and if otherwise D=0)
- x_5 = Household size
- x_6 = Number of years in poultry egg farming.
- x_7 = Quantity of feed consumed per day (kg)
- x_8 = Cost of labor in naira
- x_9 = Access to credit assistance (naira)
- x_{10} = Number of birds in battery cage.
- x_{11} = Number of birds in deep litter.
- x_{12} = Use of modern production technique (D=1 if yes and 0 if no)

If Y_i^* is assumed to be normally distributed, then consistent estimates can be obtained by performing a Tobit estimation using an iterative maximum likelihood algorithm. The use of maximum logarithm estimation guarantees that the parameter estimates will be asymptotically efficient and the appropriate statistical test can be performed.

3.3.1 Decomposition of elasticities and

composite analysis

Following the Tobit decomposition framework, the elasticity of probability of risk-aversion and the probability of intensity of risk-aversion were obtained for the farmers in the study area. This was done by examining the effect of changes in socio-economic and demographic characteristics on risk attitude of farmers.

Following Salimonu and Falusi (2009^b) farmers were categorized into three based on the number of risk they were exposed to in 2012. This is achieved using a composite score obtained from ten different sources of risk. A respondent can score a maximum of ten points if he or she is exposed to all the sources of risk or a minimum of zero point if exposed to no risk. The respondents were then categorized into three namely: upper, medium and lower categories.

4. Results and discussions

4.1. *Categorization of farmers based on few household characteristics*

The socio economic characteristics of the respondents considered included age, sex, educational and marital status, household size and respondents' access to credit. The distributions of these household characteristics are given in Table 1. The result shows that the respondent's average age was 44.2 years with a standard deviation of 10.6years, about one third of the respondents were within the age range of 41-50 years. They therefore belong to the active labour force and are expected to manage their farms effectively.

Most (77.0 %) of the respondents were male, married (78.4%) with a few (22.6%) remaining single. Since more than two-third of the respondents were married this could facilitate opportunities of having

helping hands from their household members to carry out farming activities other than relying on hired labour and this could also reduce theft by workers, which is an important source of risk. Seventy-seven percent of the respondents had access to tertiary education and none of them was uneducated. The average household size of the respondents was approximately 5 with a standard deviation of 2.7; about 44.6% of the respondents had 5 to 10 household members. Three major source of credit identified in the study area included; supplier credit, bank loans, cooperatives among others. Only 52.7% of the respondents had access to these sources of credit, out of which 10% had access to combinations of the three sources.

4.2. *Sources of farmers' risk and their composite levels*

The various sources of risk in the study area in the last three years (2010, 2011, and 2012) can be categorized into three, namely; natural, social and economic sources of risk as indicated by the farmers. Natural risk source includes erratic rainfall, incidence of pest and disease, and mortality of birds, social risk source includes theft by workers, theft by non-workers, inefficiency of workers and lateness in drug and vaccines administration while economic risk source included fluctuation of input price, fluctuation of output price and unavailability of input. The three year analysis as revealed the trend of various sources of risks faced by farmers in order to establish the consistency or otherwise of the most debilitating source of risk. Table 2 shows the corresponding percentage of farmers affected by the various sources of risk. The table reveals that price risk had been the major problem over the three years under consideration base on the farmers' response. The trend in both input and output prices had been on increase hence most farmers were

faced with the price risk even in recent times. About 75% and 67% of the farmers indicated fluctuations in input and output price respectively in 2012.

Table 1: Distribution of poultry egg farmers by household characteristics and categories

| Household characteristics | Categories | | | | | Total |
|---------------------------|------------|--------------|-----------|--------------|----------|-------|
| Age | 0-30 | 31-40 | 41-50 | 51-60 | 61-70 | 74 |
| Frequency | 9 (12.2) | 20 (27.0) | 22 (29.7) | 20 (27.0) | 3 (4.1) | (100) |
| Mean | 44.2 | | | | | |
| Std Dev | 10.6 | | | | | |
| Sex | Male | Female | | | | 74 |
| Frequency | 57 (77) | 17 (23) | | | | (100) |
| Educational status | No | Pr | Sec. | Tertiary | | 74 |
| Frequency | Education | Education | Education | Education | | (100) |
| Marital status | - | 5 (6.8) | 12 (16.2) | 57 (77.0) | | |
| Frequency | Single | Married | | | | 74 |
| Household size | 16 (21.6) | 58 (78.4) | | | | (100) |
| Frequency | 0-4 | 5-10 | >10 | | | 74 |
| Mean | 39 (52.7) | 33 (44.6) | 2 (2.7) | | | (100) |
| Std Dev | 5 | | | | | |
| Credit source | 2.7 | | | | | |
| Frequency | Banks | Cooperatives | Suppliers | More than 10 | Others | 74 |
| | 4 (5.4) | 16(21.6) | 5 (6.8) | (13.5) | 4(5.4) | (100) |
| | | | | | None | |
| | | | | | 35(47.3) | |

Note Values in parenthesis represent the percentage responses. Others denote: family, friends, esusu and local creditors.

To assess intensity/level of risk the poultry egg farmers were exposed to, a composite score was generated using the ten different sources of risk in Table 2. Farmers were thereafter categorized into three broad levels (low, medium and high) based on risks they were exposed to in 2012 using the following categorization procedure.

Upper Category = (mean + standard deviation) to

10 = 5.42 to 10

Medium Category = between lower to upper category limit = 1.35 to 5.41

Lower Category = 0 to (mean - standard deviation) = 0 to 1.34.

The mean score was found to be 3.38 while the standard deviation was 2.04. Based on the data collected, Table 3 show that majority of the respondents (63.5%) were within the medium risk category (i.e. they experienced 1.35 to 5.41 sources of risk), 18.9% of them were within the low risk category (i.e. they experienced 0 to 1.34 sources of risk) and 17.6% were within the high risk category (i.e. they experienced 5.42 to 10 sources of risk).

Table 2: Sources of risk among poultry egg farmers

| Sources | 2010 Households Percentage | 2011 Households Percentage | 2012 Households Percentage |
|---|----------------------------------|----------------------------------|----------------------------------|
| Natural risk | | | |
| Erratic rainfall | 16.2 | 44.6 | 28.4 |
| Incidence of pest and disease | 45.2 | 34.2 | 37.0 |
| Mortality of birds | 45.8 | 38.4 | 34.2 |
| Social risk | | | |
| Theft by workers | 30.1 | 33.8 | 29.7 |
| Theft by non-workers | 13.7 | 8.1 | 12.2 |
| Inefficiency of workers | 41.1 | 37.8 | 37.8 |
| Lateness in drug and vaccine administration | 27.4 | 12.2 | 17.6 |
| Economic risk | | | |
| Fluctuation of input price | 61.6 | 63.5 | 75.3 |
| Fluctuation of output price | 52.1 | 63.0 | 67.6 |
| Unavailability of input | 17.8 | 12.3 | 17.6 |

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Table 3: Distribution of poultry egg farmers by level of risk

| Risk level | Frequency | Percentage |
|------------|-----------|------------|
| Low | 14 | 18.9 |
| Medium | 47 | 63.5 |
| high | 13 | 17.6 |
| Total | 74 | 100 |

4.3 Attitude towards risk and its determinants

Table 4 presents the computed risk aversion indices. The result reveals that the entire poultry farmers are risk averse with all having risk aversion values of less than 0.4. This result is in line with those of Ajetumobi and Binuomote (2006) and Salimonu (2009b) who also found that majority of the respondents they were assessing were risk averse. Estimates of the Tobit analysis on the determinants of attitude towards risk shown on Table 5 indicate five of the twelve variables had significant coefficient at different levels between one percent ($p < 0.01$) and ten percent ($p < 0.10$) levels of significance. The sigma (σ) value of 0.10829, with a t-value of 12.082 was significant at $p < 0.01$, depicting the fitness of the model. The intercept was 0.3721 representing the autonomous risk-aversion coefficient of the farmers in the study area. The results suggests

that whereas variables such as cost of labour, number of layers in battery cage system and number of layers in deep litter system which were positively significant would increased the risk-aversion status of the farmers, other variables such as years in poultry farming and amount of credit farmers have access would reduced risk aversion among the farmers. It should be recalled that the negative sign on the coefficient implies that as the particular variable increases the risk-aversion index of the farmers reduces. Similarly a positive sign indicate that an increase in the variable in question would lead to an increase in the risk-aversion index of the farmers. Credit assistance had been found to be significant and reduce risk-aversion in the study of Olarinde and Manyong (2007) and Salimonu and Falusi (2009^a). The foregoing results help us to conclude that the socioeconomic characteristics of the farmers had influence on the exhibited attitude towards risk.

Table 4: Distribution of poultry farmers by attitude towards risk

| Risk Aversion | Frequency | Percentage |
|----------------------------|-----------|------------|
| Low ($0 < k < 0.4$) | 74 | 100 |
| Medium ($0.4 < k < 1.2$) | 0 | 0 |
| High ($1.2 < k < 2$) | 0 | 0 |
| Total | 74 | 100 |

The elasticities result as shown in Table 6 reveals that changes in the socio-economic and demographic variables have greater effect on the elasticity of intensity of risk-aversion than its probability. Of all the six significant variables, cost of labour and credit assistance in naira were elastic while number of years in farming, number of layers in battery cage and numbers of layers in deep litter system were inelastic. The

variables that significantly increased the risk-aversion in other of importance were cost of labour, number of layers in battery cage system and number of layers in deep-litter system. Thus, farmers that incur hire labour cost and those that have greater number of layers tend to avoid taken unnecessary risks. Contrary to these, credit assistance in naira significantly reduces risk-aversion compared to number of years in

farming. This is based on the magnitude of the total elasticity.

Table 5: Estimates of determinant of attitude towards risk among poultry egg farmers

| Variables | Coefficient | Standard Error | t-value |
|------------------------------------|--------------|----------------|---------|
| Constant | 0.3721 | 0.0968 | 3.8433 |
| Age(year) | -0.0018 | 0.0015 | -1.2028 |
| Gender (male=1, female =0) | 0.0426 | 0.0323 | 1.3198 |
| Years of formal education | 0.0018 | 0.0048 | 0.3680 |
| Income diversification | 0.0028 | 0.0280 | 0.0995 |
| Household size | -0.0039 | 0.0051 | -0.7673 |
| Number of years in farming | -0.0044*** | 0.0023 | -1.9488 |
| Quantity of feed in kg | 2.21e-06 | 2.97e-06 | 0.7441 |
| Cost of labour in naira | 2.51e-07** | 1.23e-07 | 2.0407 |
| Credit assistance in naira | -2.19e-08*** | 1.13e-08 | -1.9381 |
| Number of layers in battery cage | 0.00004* | 7.08e-06 | 6.0311 |
| Number of layers in deep litter | 0.00007* | 5.81e-06 | 11.1704 |
| Use of modern production technique | 0.0287 | 0.0365 | 0.7856 |

$\Sigma = 0.108299^*$, $t\text{-value} = 12.08$,

*= significant at $p < 0.01$, **= significant at $p < 0.5$, ***= significant at $p < 0.1$

Table 4 further shows that a 10% increase in the cost of labour would lead to a 14% increase in the risk- aversion of the farmers while 5.4% and 5.2% increase would result in the case of number of layers in battery

cage and number of layers in deep-litter respectively. A 10% increase in credit assistance would lead to 13% reduction in risk- aversion while 2.6% would result in the case of number of years in farming.

Table 6: Estimates of probability and effects of marginal changes of determinants of risk-aversion status of the farmers

| Variables | Elasticity of probability risk-aversion | Elasticity of intensity of aversion | Total elasticity |
|----------------------------------|---|-------------------------------------|------------------|
| Number of years in farming | -0.0466*** | -0.2140*** | -0.2606*** |
| Cost of labour | 0.2506** | 1.1499** | 1.4005** |
| Credit assistance in naira | -0.2366*** | -1.0854*** | -1.3220*** |
| Number of layers in battery cage | 0.0967* | 0.4436* | 0.5403* |
| Number of layers in deep litter | 0.0936* | 0.4291* | 0.5227* |

*= significant at $p < 0.01$, **= significant at $p < 0.5$, ***= significant at $p < 0.1$.

4.4 *Risk management strategies employed by the farmers*

Risk management strategies employed by the respondents were grouped into three, namely; prevention strategies, mitigation strategies and coping strategies (following Okunmadewa, 2003). The corresponding percentage of each strategy is presented in Table 7. Preventive strategies available to the respondents included visit of extension agents, use of modern production technique, timely administration of drugs and vaccines and relaxation of pens before restocking them. Only 14.9% of the respondents had access to extension agent, 20.5% of the respondents made use of modern production techniques, 89.0% of the respondents administer drugs and vaccines timely and 97.3% of the respondents relax their pens before restocking them. Relaxation of pen and timely feeding and vaccination were the basic risk prevention strategies and this probably further explains why feed is the most important input in

poultry production. The mitigation strategies employed by the respondents included income diversification, contract farming and farm insurance. About 53.5% of the respondents diversified their income, 49.3% of the respondents had firms and individual paying or booking for their produce before time (contract farming) and only 8.3% of the respondents' farms were insured. The most frequently used mitigating strategies were income diversification and farm insurance was the least used. The coping strategies employed by the respondents included access to credit, joint production with other farmers, sales of asset, reallocation of labour. About 52.7% of the respondents had access to credit, 19.2% of the respondents jointly produce with other farmers, 23.3% of the respondents had sold their asset one time or the other for production purposes, and 31.0% of the respondents had reallocated their labour one time or the other.

Table 7: Distribution of poultry egg farmers by risk management strategies

| Strategies | Frequency | Percentage |
|---|-----------|------------|
| Preventive | | |
| Visit of extension agent | 11 | 14.9 |
| Use of modern production techniques | 15 | 20.5 |
| Timely administration of drugs and vaccines | 65 | 89.0 |
| Relaxation of pen | 72 | 97.3 |
| Mitigating | 40 | 53.5 |
| Income diversification | 36 | 49.3 |
| Contract farming | 6 | 8.3 |
| Farm insurance | | |
| Coping Strategies | 39 | 52.7 |
| Access to credit | 14 | 19.2 |
| Joint production with other farmers | 17 | 23.3 |
| Sale of assets | 23 | 31.0 |
| Reallocation of labour | | |

5. Conclusion

The study showed that the respondents exhibited low risk-aversion. Risk-aversion was significantly increased by cost of labour, number of layers in battery cage system and number of layers in deep litter system. It was significantly reduced by number of years in poultry farming and amount of credit farmers had access to. In 2012 incidence of pest and diseases, mortality of birds, lateness in drug and vaccine administration, fluctuation of input price and fluctuation of output prices were the major sources of risk with over 65% of the respondents faced both fluctuation in input price and fluctuation in output price and over 35% of the respondents faced incidence of pest and diseases, mortality of birds and lateness in drug and vaccine administration. The most used preventive strategy was timely

administration of drug and vaccines and the least used preventive strategy was visit of extension agent. The most used mitigating strategy was income diversification and the least used mitigating strategy was farm insurance. While 52.7% of the respondents had access to credit and the least used coping strategy was joint production with other farmers. In this regard, it is recommended that farmers should be encouraged to insure their farms, credit assistance should be made available to farmers Extension services should be made readily available to farmers. Price support programs geared towards the protection of farmers against price distortion or fluctuations should be put in place as these among others could impair the growth potential of farmers.

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