RISK MANAGEMENT AND CHOICE OF COPING STRATEGIES BY BROILER FARMERS IN ANAMBRA STATE, NIGERIA

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ABSTRACT

The study examined risk management strategies among smallholder broiler farmers in Anambra State, Nigeria. The specific objectives were to describe the socio-economic characteristics of the farmers, identify the risks and uncertainties in broiler production, identify the adaptation and risk-coping strategies employed by the respondents, and determine the factors influencing the choice of these strategies. Eighty respondents were randomly selected using a multi-stage random sampling procedure. Primary data for the study was collected using a well-structured questionnaire and interview schedule. Percentage responses and multinomial logit model analyses were used to analyze the study's objectives. The results showed that the risks and uncertainties identified by the respondents included high costs of feed and feeding materials, stunted growth, poor access to credit, policy changes by the government, and labour shortages. Additionally, the multinomial logit model analysis revealed that the choice of adaptation and risk-coping strategies in broiler production was influenced by rearing experience, membership in cooperatives, household size, and access to credit and extension services. Among the recommendations were the need to enhance farmers' access to extension services and educational programs, encourage farmers to engage in off-farm activities, and provide productive inputs to farmers to encourage them to remain in the business.

Keywords: Risk Management, Choice, Coping Strategies, Broiler Farmers, MNL

INTRODUCTION

Broiler production is important not only in terms of economic activities but also as the fastest means of bridging the protein gap in most sub-Saharan African countries (Asresie & Zemedu, 2015). The nutritional contribution of broilers has been declining recently due to various risks and uncertainties (Claire, 2010). According to Oluwatayo and Omowunmi (2015), the risk is the possibility of negative outcomes or expected losses resulting from interactions between natural or human-induced hazards and vulnerable conditions, whose likelihood and outcome can be expected and measured in quantitative terms, hence it can be insured (Ayinde, 2018). Uncertainty, which is often interrelated with risk and used interchangeably, refers to situations where there are multiple possible outcomes to a course of action, and the form of each possible outcome is not known (Ayinde, Omotesho, & Adewumi, 2018). Indeed, there is no risk without some level of uncertainty, and most uncertainties imply some level of risk (Hardaker, 2014).

Risks limiting farmers, particularly in achieving their goals, can be categorized into financial, asset, human factor, institutional, market or price, and production risks (Mishra & El-Osta, 2002). The major consequences of risk in broiler production include low production and marketing, reduced profit, limited access to credit, and low savings (Claire, 2010; Hamid & Chiaman, 2010). Therefore, the need for risk management becomes imperative to keep farmers afloat in the business, especially now that animal protein is scarce and expensive for resource-poor people (Bettencourt et al., 2013).

Risk management, according to Ayinde et al. (2018), includes identifying potentially risky elements, anticipating the likelihood of possible outcomes and their consequences, taking actions to obtain a preferred combination of risk and expected returns, and enhancing the farm's capacity to implement future risk planning strategies when distress conditions have passed (Ayinde, 2016).

Common risk management practices used by farmers to minimize losses associated with risk include enterprise diversification, insurance, production contracting, vertical integration, marketing contracts, hedging in futures, futures option contracts (Hamid & Chiaman, 2010), maintaining financial reserves and leveraging, liquidity, leasing inputs and hiring custom work, off-farm employment, and other types of off-farm income (Amaefula, Okezie, & Mejeha, 2012). However, literature (Amaefula et al., 2012; Okezie & Mejeha, 2012; Nto, Mbanasor, & Nwaru, 2011; Andres & Picazo-Tadeo) shows that socioeconomic factors influence the choice of coping risk management strategies among livestock farmers, including broiler entrepreneurs. These socioeconomic factors include age of household, income, education, rearing experience, flock size, and household size.

In the study area, there is no documented information on the socioeconomic factors that influence the choice of coping strategies for risk management by farmers, to the best knowledge of the researchers. Therefore, addressing this research gap is paramount. The study is justified in many ways: it would serve as a source of research information for scholars for further studies in related subjects and provide useful information for agricultural extension agents for effective dissemination of information to farmers. Additionally, the findings of this research will guide farm managers, including prospective farmers and potential investors, in defining their production strategies under prevailing risks and uncertainties.

The specific objectives are to:

1. describe the socio-economic characteristics of the farmers.
2. identify the risks and uncertainties in broiler production.
3. identify the adaptation and risk-coping strategies employed by the respondents.
4. determine the factors influencing the choice of adaptation and risk-coping strategies by the respondents.

METHODOLOGY

The study area was Anambra State, located between longitudes 6°36´-7°21´E and latitudes 5°38´N – 6°47´N. Anambra State consists of 21 Local Government Areas with a total population of 3.261 million people (NPC, 2006) and a land mass of 4,415.54 km². The State is bounded to the west by Delta State, to the east by Enugu State, to the north by Kogi State, and to the south and east by Imo and Enugu States, respectively. The major crops grown in the state include rice, cocoyam, yam, cassava, and vegetables. Additionally, sheep, goats, pigs, and poultry are common livestock reared in the State. The off-farm income activities engaged in by the farmers include hair salons, auto mechanics, and petty trading, among others.

A structured questionnaire was used to collect information on farmers' socio-economic characteristics, constraints to rice production, and input and output prices. Purposive and multi-stage sampling procedures were used to select the Local Government Areas, towns, and respondents. In the first stage, two out of four agricultural zones of the State were purposively selected due to the intensity of broiler production in these areas. The selected zones were Onitsha and Aguata. In the second stage, two Local Government Areas (LGAs) were randomly selected from each zone, resulting in a total of four LGAs. In the third stage, two towns were randomly selected from each LGA, resulting in a total of eight towns. Finally, ten farmers were randomly selected from each town from the lists of broiler farmers compiled by the extension agents of the Anambra State Agricultural Development Program (ADP) and local leaders in the communities, resulting in a total of eighty broiler farmers for the study.

Primary data was obtained through the use of structured questionnaires and informal or oral interviews with respondents. Descriptive statistics such as frequency distribution tables and percentage responses, along with multinomial logit model analysis, were used to address the objectives of the study.

Model Specification

Likert Scale

Risks and uncertainties in broiler production were identified based on their severity using a 3-point Likert-type scale rating with a decision point of 2.0 which means that the risks that give a mean score of 2.0 and above were accepted while the ones below 2.0 were rejected.

Multinomial Logit Model (MNLM)

This was used to analyze the factors influencing households' choice of adoption risk coping strategies for broiler production in the study area. According to Magombo, *et al*., (2011), the MNL model for choice of adoption practices specifies the relationship between the probability of choosing an adoption option and the set of explanatory variables. The adoption practices are (diversification, off-farm income, reduction in flock size, rearing resistant breed, good hygiene, ventilation and good housing)

The MNL Model is stated as follows:

$$P(y=j/x) = \frac{\exp(x\beta j)}{[1+\sum^{j}_{h=1} \exp.(x\beta_h), j=1,\ldots,j]} \quad \ldots\ldots(1)$$

Let x be a 1 x k vector with first element unity.

Where βj is k x1, j=1,...,j

implicit

$$Y_i = \text{In}\,(P_i, P_1) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + ei \quad \ldots\ldots(2)$$

Where;

Y_i= adoption practices ((diversification, off-farm income, reduction in flock size, rearing resistant breed, good hygiene, ventilation and good housing)

$X_{i,}$ where I = 1,2,….10 are explanatory variables, X_1 = Age of the farmer (Years), X_2 = Educational attainment (Years), X_3 = Household size (Number.), X_4 = Rearing experience(Years), X_5 = Flock size (Number.), X_6 = Member of farmers organization (Yes=1 and 0; Otherwise), X_7 = Extension contact (Yes=1 and 0 Otherwise), X_9 = Residential distance to broiler farmers home (km), X_{10} = Access to credit (Yes =1 and 0 Otherwise).

RESULTS AND DISCUSSION

Socio-Economic Characteristics of the Respondents

The socio-economic characteristics of the sampled farmers are discussed herein in Table 1. Table 1 shows that the majority (33.8%) of the respondents were within the age bracket of 30-49 years, whereas the least (12.5%) were above 69 years. This implies that most broiler farmers in the study area were youths. Studies suggest that youths are often agile, strong, and more receptive to risk management innovative ideas, which could make their business very lucrative and profitable (Ayinde et al., 2018). This assertion contrasts with Kouame (2011), who opined that older people acquire more risk managerial ability through years of observation and experimentation, hence are more likely to make rational managerial risk choices in their production processes than younger ones.

Additionally, 48.8% of the respondents had a household size of 1-5 persons, followed by those with a household size of 6-10 (36.2%), and the least (15.0%) were those with more than 10 persons. Emmanuel (2013) reported high household sizes, positing that household size is often a proxy for labor, especially among resource-poor households in many developing countries, thus solving labor input risk problems, particularly during peak farming periods.

Table 1: Socio-Economic Characteristics of the Respondents

Variable	Frequency	Percentage	Mean
Age			
Age(years)			
Less than 30	20	21	
30- 49	27	33.8	
50 – 69	22	27.5	34.7
Above 60	10	12.5	
Household Size			
1 – 5	39	48.8	
6 – 10	29	36.2	4.2
Above 10	12	15	
Educational status			
No formal education	14	17.5	
Primary education	16	20	
Secondary education	22	27.5	
Tertiary education	28	35.	
Membership of cooperatives			
Yes	30	37.5	
No	50	62.5	
Farm Distance from Household.			
Less than 1	18	22.5	
1 -2	19	23.8	2.1
2 -3	8	10	
3 – 4	18	22.5	
Above 4	17	21.2	
Flock Size			
Less than 40	14	17.5	
41 – 0	15	18.8	25.4
Rearing Experience	51	63.7	
0 -4	22	27.5	
5 – 9	29	36.2	6.4
Above 9	29	36.2	
Extension Services			
Yes	59	73.8	
No	21	26.2	
Access to Credit			
Yes	51	63.8	
No	29	36.2	

Source; Field Survey; 2024.

Table 1 also shows that the majority (82.5%) of the respondents had formal education, while 17.5% had no formal education. This implies that most respondents were educated and could be more eager to take risks than the uneducated. The findings of Adress et al. (2010) support this, as they opined that educated people often have easy access to information, which could help in effectively managing risks associated with their vocations.

Furthermore, the majority (62.5%) of the respondents were members of cooperative societies, while only 37.5% were not. Cooperative societies often provide training to members on how best to overcome risks associated with their farming (Okereke, 2012). However, Ume et al. (2018) had a negative view, observing that many agricultural cooperatives have deserted their primary aim of formation and instead engage in serious partisan politics.

Moreover, the majority of the respondents (23.8%) located their broiler farms at a distance of 1-2 km from their homes, while the least (10%) located theirs at a distance of 2-3 km. Distance to the farm from the household, particularly where the household is not mobile, could delay the implementation of certain time-bound farm activities, thus exposing the animals to varied risks and uncertainties, leading to high mortality or total annihilation of the farm (Ayinde, 2018).

Also, 63.8% of the respondents had a flock size of more than 60 birds on their farms, while only 17.5% had fewer than 40 birds. This implies that most respondents were small-scale broiler farmers. This farming class is often resource-poor and could be limited in access to improved productive inputs to mitigate production risks, which could threaten their production frontier (Hardaker, 2014; Okereke, 2012). However, Emmanuel (2013) had a divergent view, suggesting that small-scale farmers are more prudent in overcoming risks related to resource management, which could affect their farm productivity more than large-scale farmers.

Table 1 further shows that the majority of the respondents (72.4%) had rearing experience of 5-9 years, while the remaining 27.6% had been in farming for 1-4 years. Years of rearing experience make farmers more prudent in curtailing risks associated with the over-utilization and under-utilization of farm inputs or resources, which can affect farm production (Fakayode et al., 2012; Emma-Ajah, Emerole, Ezeh, & Ume, 2021). However, Jetumobi and Binuomote (2016) found that many experienced farmers often deride innovations disseminated by extension services aimed at risk management, as they tend to stick to old practices.

Additionally, 73.8% of the respondents had access to extension services, while only 26.2% did not. This implies that the respondents had good extension outreach, enabling them to adopt risk management information on broiler production as disseminated by extension agents for improved living standards (Kouame, 2011). However, the reluctance of many extension agents to be diligent in their duties and the bottlenecks to effective and efficient extension services could undermine this function (Anozie et al., 2014).

Moreover, 63.8% of the respondents had access to credit, while only 36.2% did not. Farmers' access to credit facilitates timely input purchases, thereby guarding against the risk of price fluctuations of farm inputs, especially during the farming season (Jetumobi & Binuomote, 2016). However, Anozie et al. (2014) reported that most farmers are unaware of loan facilities as most credit lending agencies are located in urban areas, far from the farmers' rural abodes.

Risks and Uncertainties in Broiler Production

The risks and uncertainties in broiler production are presented in Table 2.

Table 2 Risks and Uncertainties in Broiler Production

Risks and Uncertainty	Mean score	Decision
Labour shortage	2.4	Accepted
Government policy	2.3	Accepted
High cost of feed and feeding	2.1	Accepted
Poor access to credit	2.2	Accepted
Stunted growth	2.3	Accept
Rainfall shock	1.6	Reject
Death due to thunder and lightning	1.4	Rejected

Source; Field Survey, 2024

Poor access to credit (mean = 2.2) among farmers is due to ignorance about the existence of loan facilities in banks and the repayment modalities set by lending agencies (Oluwatayo & Omowunmi, 2015; Anozie et al., 2014). The high cost of feed and feeding materials (mean = 2.1) has led to the closure of many poultry houses in the country, as feeding materials such as grains are scarce and expensive due to competition with other livestock and human consumption (Ayinde, 2018).

Stunted growth (mean = 2.3) may be related to poor breeds of broiler chicks, which are characterized by low performance and are typically uneconomical due to wastage of space, labour, and finance, resulting in low profit for the owner (Ume et al., 2018). Furthermore, the shortage of labour (mean = 2.3) is a result of the urban drift of able-bodied youths and their aversion to farming, leading to a low production frontier, especially in labour-intensive broiler production (Ume et al., 2018).

Additionally, government policy changes (mean = 2.3) were reported as a major type of pure covariate risk. Government policies on the importation of chicken, vaccines, drugs, and related equipment can significantly affect local production and the prices of these products (Nto et al., 2013).

Risk Coping Strategies Adopted by Farmers

Table 3 shows the multiple responses on the risk coping strategies adopted by the broiler farmers.

Table 3: Risk Coping Strategies Adopted by Farmers

Strategies	Frequency	Percentages
Provision of ventilation	72	90
Diversification	60	75
Use of improved breed	58	72.6
Destocking	60	75
Access to credit	56	70
Provision of good housing	56	70
Re-stocking	15	18.8
Rearing of resistant breed	25	31.3
Market	40	50.1

***Multiple Responses.** Source: Field Survey, 2024.

Among the risk coping strategies adopted by the broiler farmers in the study area, the provision of ventilation (90%) was the highest. Ventilation, as reported by Okereke (2012), helps control indoor air quality to ensure suitable environmental conditions that meet the birds' metabolic requirements and dilute and eradicate pollutants released within a space. Additionally, 70% of the respondents considered access to credit necessary for coping with risks in broiler production. Credit helps farmers procure productive inputs and pay for labor, thus mitigating risks (Alderman, 2018).

Moreover, 70% of the respondents used adequate housing to guard against risks linked to climate change, theft, flooding, and predators (Emma-Ajah, 2021; Ume et al., 2018). Destocking was reported as a risk coping strategy by 75% of the respondents. Destocking, as a management practice, mitigates the risks of heat stress on livestock by ensuring excellent airflow between the animals (Ayinde, 2018).

Additionally, 70% of the respondents used diversification as a risk management strategy in broiler production. Diversification is a self-insurance mechanism, advising farmers to broaden their horizons to different types of livestock rearing to cope with risks and shocks, thereby reducing their vulnerability to poverty (Jetumobi & Binuomote, 2016). Furthermore, 50.1% of the sampled farmers employed market strategies as a means of coping with risks in broiler production. Markets provide an avenue for exchanging information with other farmers and sharing experiences on risk coping strategies (Alderman, 2018; Emma-Ajah et al., 2021).

Moreover, 72.6% of the respondents used improved breeds as a risk coping strategy in broiler production. The use of improved breeds of broilers can help overcome the risks of stunted growth and ensure that birds meet market size at the appropriate time (Donye & Ani, 2012).

Result of Multinomial logit model

The result of multinomial logit model is shown in Table 4

Table 4 : Result of Multinomial logit model

Variables	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8
Age	0.788 (2.98) **	0.378 (-1.46)*	1.195 (1.92)*	0.273 (0.32)	-1.850 (-1.47)*	1.012 (1.22)*		
Education	0.356 (-0.47)	2.302 (2.54)**	1.975 (2.16)**	1.455 (-1.71)**	3.226 (2.63)**	0.079 (-0.10)		
Household size	1.403 (1.09)	0.524 (2.42)**	2.720 (-1.23)*	1.241 (1.03)*	1.849 (1.16)*	1.832 (-1.13)*		
Experience	2.686 (1.89)*	5.157 (2.31)**	5.165 (2.44)**	2.626 (-1.62)*	8.052 (3.16)**	1.045 (0.62)	5.152 (2.68)***	0.187 (0.12)
Flock size	0.950 (0.66)	3.959 (2.24)**	3.533 (1.85)*	0.007 (-0.01)	4.682 (2.36)**	0.377 (-0.31)	1.429 (0.75)	1.833 (-1.11)*
Cooperative membership	2.476 (1.77)*	0.905 (0.56)	-1.433 (-0.79)	0.428 (-0.26)	-5.156 (-1.65)*	0.147 (0.10)	0.433 (0.25)	2.596 (1.71)*
Extension access	2.486 (3.39)***	2.868 (1.46)*	3.159 (2.56)**	0.439 (0.23)	4.486 (2.01)**	2.066 (2.01)**	1.998 (-1.07)*	0.320 (-0.16)
Distance	1.863 (2.47)**	-1.127 (1.66)*	-2.654 (-2.98)**	-1.941 (2.72)**	-3.047 (-3.16)**	0.079 (-0.11)	3.848 (1.60)*	1.101 (-1.39)
Credit	3.402 (1.95)*	1.770 (1.12)	2.778 (1.55)*	3.526 (1.95)*	0.473 (0.24)	0.346 (1.89)*	2.051 (1.08)	3.695 (1.61)*
Constant	9.902 (1.59)*	7.273 (1.09)	14.182 (1.95)*	10.906 (1.71)*	11.809 (1.62)*	0.692 (0.009)	12.084 (1.84)*	6.565 (0.96)

Source: Field Survey, 2024. LRchi-square (80) = 108.55, Log Likelihood = -120.40104, Pseudo-R^2 = 0.3107. ***, ** and * shows the significant at 1%,5% and 10% levels respectively. Values in brackets represent z-values.
Options 1 = Diversification, Option 2 = Off-farm income, Option 3 = Farm reduction in flock size, Option 4 = Hygiene practice, Option 5 = Rearing resistant breed, Option 6 = Formal borrowing, Option 7 =, Good housing Option 8 = Good ventilation.
Base category = Insurance, Number of Observations = 80,

The table above shows that the choice of adaptation options put into the Multinomial Logit (MNL) model included diversification, off-farm activities, reduction in flock size, good hygiene practices, rearing of resistant breeds, formal borrowing, provision of good ventilation, provision of good housing, and insurance policy. The LR chi-square of 108.55 was highly significant, suggesting that the model has strong explanatory power. The coefficients of age had a negative and significant impact on the choice of risk-coping strategies in broiler production. This implies that as farmers advance in age, they are more likely to adopt risk-coping strategies such as diversification, off-farm activities, reduction in flock size, rearing of resistant breeds, and good housing management. Studies show that older people gain risk management ability through experimentation and knowledge, thus adopting the best risk-coping strategy options from among alternatives (Donye and Ani, 2012).

The coefficient of educational status had a negative and significant relationship with the choice of risk management strategies such as off-farm activities, reduction in flock size, and rearing of resistant breeds. This may be because farmers rely more on years of farming or rearing experience than on educational attainments in farming (Ayinde, 2018). This finding contrasts with Nmadu, Eze, and Jirgi (2012).

The coefficient of rearing experience in years had a positive and significant impact on the choice of risk-coping strategies in broiler production. This implies that as farmers gain more experience, they are more likely to adopt strategies such as diversification, off-farm activities, reduction in flock size, rearing of resistant breeds, and good housing management. Years of farming experience enrich farmers with sufficient knowledge to evaluate hazards and manage risks, prompting them to seek alternatives (Ghartey, Dadzie, and Weittey, 2014). Furthermore, experienced farmers can set realistic plans and implement the best risk-coping strategies (Ume et al., 2018).

The coefficient of membership in cooperatives had a direct relationship with risk-coping strategies in broiler production and was significant at the 5% alpha level. This indicates that farmers who are members of cooperatives are more likely to employ strategies such as diversification, off-farm activities, rearing resistant breeds, and providing good ventilation. Cooperative societies enhance interaction and the exchange of ideas among members, which can lead to better risk management strategies and reduce risks that may significantly hamper farmers' output (Ghartey et al., 2014). Donye and Ani (2012) found a positive relationship between cooperative societies and risk management strategies, noting that cooperatives enhance members' creditworthiness, allowing bulk purchases of farm inputs to mitigate future price changes and reduce production costs. However, Dadzie and Acquah (2012) and Emma-Ajah (2021) reported a negative relationship, observing that cooperative activities can sometimes detract from farming.

The coefficient of access to extension services had a positive relationship with the dependent variable and significantly influenced the choice of risk-coping strategies such as diversification, use of resistant breeds, good housing, and reduction in flock size. Extension services help disseminate information and services on risk management, guiding farmers in building technical, organizational, and management skills, which can improve their standard of living (Fakayode, Rahji, and Adeniyi, 2012). Conversely, Emma-Ajah (2021) linked the negative sign of the variable to the wide ratio of farmers to extension agents in many sub-Saharan African regions and the "lukewarm" attitude of some change agents.

Moreover, the coefficient of access to credit was positive and significantly affected the choice of risk-coping strategies through diversification, hygiene practices, and formal borrowing. Studies show that access to credit can help farmers offset production, marketing, and personal risks (Dadzie and Acquah, 2012).

However, high interest rates and collateral requirements from lending institutions often prevent resource-poor farmers from accessing this important resource. This scenario may explain why Fakayode et al. (2012) found a negative sign for this variable in their study.

The coefficient of household size was positive and had a significant effect on risk-coping strategies in broiler production. This implies that larger household sizes increase the likelihood of using adaptation measures such as diversification, use of resistant breeds, off-farm income, and good ventilation. Larger household sizes can provide cheap labour, especially during peak periods, complementing the farmer's major coping strategy of increasing labour input, which often determines the scale of production and its profitability (Fakayode et al., 2012).

CONCLUSION AND RECOMMENDATIONS

The results of the study indicate that the primary risk-coping strategies adopted by broiler farmers include the provision of ventilation, the use of improved breeds, destocking, diversification, and access to credit. The main risks and uncertainties identified by the respondents were the high cost of feed and feeding materials, stunted growth, poor access to credit, policy changes by the government, and labour shortages. Additionally, the Multinomial Logit model analysis revealed that the coefficients of rearing experience, membership in cooperatives, household size, access to credit, and extension services positively influenced the choice of risk-coping strategies in broiler production among the respondents in the study area.

Recommendations:

1. Extension agents should be encouraged and equipped to disseminate information to farmers on risk management and coping strategies.
2. The government should institute appropriate policies and programs to enhance farmers' participation in and utilization of cooperatives to alleviate production and marketing risks.
3. Access to credit through commercial banks, microfinance banks, and other lending institutions should be encouraged by both government and private organizations to help farmers mitigate marketing and production risks.
4. There is a need to encourage new entrants, especially young and educated individuals, into broiler production to absorb available labour and reduce poverty.
5. Farmers with large household sizes should be encouraged to adopt technologies for risk management in broiler production, as larger households can provide essential family labour, which is crucial for mitigating labour risks in the business.

REFERENCES

Ajetumobi, J. O., & Binuomote, S. O. (2016). Risk-aversion among poultry egg producers in South Western Nigeria. *International Journal of Poultry Science, 5*(6), 5662-565.

Alderman, H. (2018). Managing risks to increase efficiency and reduce poverty. *Background Paper for the World Development Report*. World Bank.

Amaefula, C., Okezie, C. A., & Mejeha, R. (2012). Risk attitude and insurance: A causal analysis. *American Journal of Economics, 2*(3), 26-32.

Andres, J. P., & Wall, A. (2010). Production risk, risk aversion and the determinant of risk attitudes among Spanish rice producers. *Agricultural Economics, 42*, 451-464.

Anozie, R. O., Ume, S. I., Okelola, O. E., Anozie, S. N., & Ubani, S. I. (2014). Determinant factors in loan disbursement to yam (*Dioscorea* spp) farmers in Ehime Mbano, Imo State: A case study of Nsu Microfinance Bank. *Taraba Journal of Agricultural Research, 3*, 14-18.

Asresie, A., & Zemedu, L. (2015). Contribution of livestock sector in Ethiopian economy: A review. *Advances in Life Science and Technology, 29*, 79-90.

Aye, G. C., & Oji, K. O. (2007). Effect of poverty on risk attitudes of farmers in Benue State, Nigeria. *American Journal of Agricultural Economics, 2*(2), 62-66.

Ayinde, O. E. (2016). Risk analysis in innovation system: A case study of production of Vitamin A cassava variety among farmers in Nigeria. *5th International Conference of African Association of Agricultural Economists*, September 23-26, 2016, Addis Ababa, Ethiopia.

Ayinde, O. E. (2018). Effect of socio-economic factors on risk behavior of farming households: An empirical evidence of small-scale crop producers in Kwara State, Nigeria. *Agricultural Journal, 3*, 447-453.

Ayinde, O. E., Omotesho, O. A., & Adewumi, M. O. (2018). Risk attitudes and management strategies of small-scale crop producers in Kwara State, Nigeria: A ranking approach. *African Journal of Business Management, 2*(12), 217-221.

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

Bettencourt, E. M. V., Tilman, V., Henriques, P. D. D. S., Narciso, V., & Carvalh, M. L. D. S. (2013). The economic and sociocultural role of livestock in the wellbeing of rural communities of Timor-Leste. *CEFAGE-UE, Universidade de Évora*.

Dadzie, S. K. N., & Acquah, H. (2012). Attitudes towards risk and coping responses: The case of food crop farmers at Agona Duakwa in Agona East District of Ghana. *International Journal of Agriculture and Forestry, 2*(2), 29-37.

Donye, A. O., & Ani, A. O. (2012). Risks and uncertainties in food production and their implications for extension work in Nigeria. *Agriculture and Biology Journal of North America, 3*(9), 345-353.

Emmanuel, S. (2013). Economic crises and natural disasters: Coping strategies and policy implications. *World Development, 31*(7), 1087–1102.

Emma-Ajah, J. A., Emerole, C. O., Ezeh, C. I., & Ume, S. I. (2021). Analysis of risk factors in yam production, Ebonyi State, Nigeria. *The International Journal of Agriculture, Management and Technology, 7*(1), 143-156.

Emma-Ajah, J. A. (2021). Analysis of productivity and risk factors in yam production in Ebonyi State, Nigeria. *Ph.D. Research Thesis, Department of Agricultural Economics and Extension, Abia State University, Uturu, Abia State, Nigeria*.

Fakayode, S. B., Rahji, M. A. Y., & Adeniyi, S. T. (2012). Economic analysis of risks in fruit and vegetable farming in Osun State, Nigeria. *Bangladesh Journal of Agricultural Research, 37*(3), 473-491.

Ghartey, W., Dadzie, S. K. N., & Weittey, M. (2014). Poverty and risk attitudes: The case of cassava farmers in Awutu-senya District of the Central Region of Ghana. *Asian Journal of Agricultural Extension, Economics and Sociology, 3*(2), 164-178.

Hardaker, J. B. (2014). Some issues in dealing with risk in agriculture. *Working Paper Series in Agriculture and Resource Economics, International Standard Serial Number (ISSN) 1442-1909*.

Hamid, M. Y., & Chiaman, E. S. (2010). Risk and uncertainty assessment of nomadic cattle pastoralists in Mubi-North Local Government Area of Adamawa State, Nigeria. In J. N. Nmadu et al. (Eds.), *Managing risk in farming: Concepts, research, and analysis*.

Kouame, E. (2011). Risk, risk-aversion, and choice of risk management strategies by cocoa farmers in Western Côte d'Ivoire. *Handbook of Agricultural Economics, 1*(1), Chapter 2.

Meuwiswen, M., Huirine, R., & Hardaker, J. B. (2001). Risk and risk management: An empirical analysis of Dutch livestock farmers. *Livestock Production Science, 69*, 43-53.

Mishra, A. K., & El-Osta, H. S. (2002). Managing risk in agriculture through hedging and crop insurance: What does a national survey reveal? *Agricultural Finance Review, 62*, 135-148.

National Population Commission. (2006). The Nigeria population census 2006. Retrieved from http://www.population.gov.ng/index.php?option=com_content&view=article&id=89

Nmadu, J. N., Eze, G. P., & Jirgi, A. J. (2012). Determinants of risk status of small-scale farmers in Niger State, Nigeria. *British Journal of Economics, Management & Trade, 2*(2), 92-108.

Nto, P. O. O., Mbanasor, J. A., & Nwaru, J. C. (2011). Analysis of risk among agribusiness enterprises investment in Abia State, Nigeria. *Journal of Economics and International Finance, 3*(3), 187-194.

Nto, P. O. O., Mbanasor, J. A., & Osuala, A. E. (2013). Evaluation of risk management practices in rice production in Abia State, Nigeria. *American Journal of Experimental Agriculture, 4*(3), 263-274.

Okereke, C. O. (2012). Challenges of risk management among smallholder farmers in Ebonyi State, Nigeria: Implications for national food security. *International Journal of Agricultural Economics & Rural Development, 5*(1), 37-48.

Oluwatayo, I. B., & Omowunmi, T. (2015). Risk attitudes among catfish farmers in Oyo State, Nigeria. *Investment Management and Financial Innovations, 12*(4), 90-97.

Ume, S. I., Ezeano, C. I., Dauda, E., & Edeh, O. N. (2018). Analysis of socio-economic determinants to broiler production by rural women in Imo State, Nigeria. *International Journal of Environment, Agriculture and Biotechnology*, *1*(4), 1046-1056.