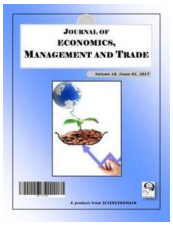

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Attitudes Towards Risk and Risk Combating Strategies among Maize and Cassava Farmers in Southwest, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author LOO designed the study, performed the statistical analysis and wrote the first draft of the manuscript. Author TTA wrote the protocol. Author OAA searched the literature. Author AGD supervised the work. All authors read and approved the final manuscript.

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ABSTRACT

Aims: This study examines maize and cassava farmers' attitudes towards risk and risk combating strategies in Southwest, Nigeria.
Place and Duration of Study: The study was conducted in Ondo State, Nigeria between February, 2015 and August, 2015.
Methodology: A multistage sampling procedure was employed to select 320 respondents for the study. The collected data were analysed using descriptive statistics and ordered probit regression model.
Results: The results show that 46.8% and 50.9% of cassava and maize farmers respectively were risk averse, while about 25.3% and 22.4% of cassava and maize farmers respectively were risk

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taker. The remaining 27.9% and 26.7% of the respondents in cassava and maize enterprise respectively were risk neutral. Also, findings from the study on cassava enterprise revealed that gender, age, farming experience, membership of association, non-farm income and extension agent visits had significant relationship with farmers' risk attitude. On maize enterprise, the study indicated that age, household size, educational status, membership of association, storage availability and farm size had significant relationship with farmers' risk attitude. The results of respondents' strategies at combating risks in cassava and maize production showed that majority of the farmers indicated multiple cropping, engagement in less risky enterprises and income diversification as strategies used at combating risks while the least strategy used was insurance. Therefore, the impact of Agricultural Insurance Industry still needs to be felt more in order to encourage farmers who are risk averse to be risk taker. The agricultural insurance industry in Nigeria should be further strengthened and empowered to service risky farm businesses.

Keywords: Risk; attitude; strategies; cassava; maize; probit.

1. INTRODUCTION

Risk is known to be inherent in agricultural production throughout the globe due to many reasons. Biotic and abiotic processes that are not totally known critically influence agricultural production. At times, some of the processes may be understood reasonably but there may be little or nothing to be done in order to control such processes (for instance rainfall and drought) [1]. This assertion is confirmed by [2] who stated that the most risky businesses in Nigeria are in agricultural enterprises. Accurate prediction of expected output and prices is prevented by the characteristic time-lag in agricultural production activities, thereby increasing risk and uncertainty issues. Economies of scale could be attained with little distortion in other enterprises. However, eventual outcome cannot be predicted using linear extrapolation in agriculture [3].

[4] stated that production risk in inputs should be given adequate consideration in the empirical analysis of productivity change since some inputs influence the level of production risk as explained by [5]. Direct consequences or close relation that majority of the key risks in agriculture have on food security make risk issues important [6].

Taking decisions that involve risk and uncertainty naturally varies from farmer to farmer and these variances are used to describe differences in risk attitude. Understanding the economic pattern displayed by individual farmers depends on getting individual risk preference [7]. Potential negative outcomes of risk are being given greater importance by farmers just like many other decision makers, which makes them to generally exhibit willingness to trade-off potential income for either risk or uncertainty avoidance [8,9].

Farmers are less willing to embrace activities and investments that come with higher expected outcomes than traditional technologies but with higher risk of failure. Farmers' less willingness is the reaction to risk [10,11]. [9] explained that choice of inputs will be influenced by the attitudes of producers toward risk since production risk is affected by the choice of inputs. This is further explained by [11] who noted that farmers use less production inputs such as fertilizer and improved seeds than the required level that can give expected maximum profit.

Peasant farmers are naturally keen to avoid taking risk which might threaten their livelihoods. One of the key factors that contribute to the vicious cycle of poverty in any environment is risk aversion. People will remain poor once they are risk-averse to the point of running away from investments that involve risk but are capable of increasing output [12].

Since risk cannot be totally separated from economic and social activities in agriculture, it is very important that such risk is managed in order to reduce food insecurity, protect livelihoods, open up investment opportunities and increase income [13]. Risk management strategies help in addressing issues that hinder success in agricultural management by systematically recognizing and coping with risk [14]. Risk management involves choosing among alternative strategies for the purpose of reducing the impact of risks [15].

Risk management strategies in agriculture vary from farm to farm. Farmers' decisions and actions are influenced by farmers' risk perceptions, risk attitudes and the available resource base. Farmers' choice of risk management strategies is determined by age,

farm size, risk aversion, innovativeness and source of risk [16].

There are various studies on risk attitudes and coping strategies among farmers in the literature (such as [17,18,16]). Also, there is a long established literature on risk management strategies used by various crop farmers in Nigeria. However, there is little about factors influencing farmers' attitudes towards risk among crop farmers in the literature. Even with the little in the literature, model that takes proper care of factors that influence different levels (order) of crop farmers' risk attitudes (low, medium and high) is scarce to the best of our knowledge. Hence, this study analysed attitudes towards risk and risk combating strategies among maize and cassava farmers in Southwest, Nigeria. The objectives of the study are to; identify farmer' attitudes towards risk in the study area, factors influencing farmers' attitudes towards risk and identify risk combating strategies among the farmers. This paper contributes to the body of knowledge by giving adequate considerations to factors that influence different levels (order) of maize and cassava farmers' risk attitudes (low, medium and high) with the respective magnitude on each of the levels through the use of ordered probit regression model. This study will assist policy makers on organizing programmes that will greatly improve farmers' level of risk attitudes such that the expected magnitude of influence on each of the levels are known for policy making.

1.2 Theoretical Framework

Recently, it has been discovered that there are some inherent advantages that make Ordered Probit Model to be better than Multinomial Logit Model when it comes to choice issues. Multinomial logit model has been used to assess the determinants of farmers' risk attitude in the literature (such as [11]) but ordered probit model has been known to be more suitable because of the ordering nature of the dependent variable. The estimated coefficients in ordered probit model cannot be interpreted directly but can be used to calculate the probabilities of the dependent variable with different levels together with the corresponding marginal probabilities [19]. According to [20], the presence of two intercepts which are the threshold parameters indicate that there are three different categories.

Multinomial probit model, which allows for two or more categories, has been discovered to suffer from the assumption of "independence of irrelevant alternatives", as it is assumed that errors are independent for each category. For the purpose of avoiding this problem, the ordered probit model accepts the dependent variable (risk attitude) to assume values which are ordinal in nature [21]. [22] also stated that estimation of models with ordered type which virtually involves the probit relationship function have been extensively carried out using Ordered Probit model approach. Latent continuous metric is vital to the ordinal responses being observed by the researcher, which is explained below.

Y*, which is the latent continuous variable, is a linear function of some variables, X and a normally distributed disturbance term:

$$Y_i^* = X_i\beta + \varepsilon \quad (1)$$

The latent variable Y_i* could be coded as 0,1,2,3,...,m as it displays itself in ordinal categories. The response of category m is thus observed when the underlying continuous response falls in the *m*-th interval as:

$$Y^* = 0 \text{ if } Y^* \leq \delta_0 \quad (2)$$

$$Y^* = 1 \text{ if } \delta_0 < Y^* \leq \delta_1 \quad (3)$$

$$Y^* = 2 \text{ if } \delta_1 < Y^* \leq \delta_2 \quad (4)$$

$$Y^* = 3 \text{ if } \delta_2 < Y^* \leq \delta_3 \quad (5)$$

where δ_1 (i=0, 1, 2, 3) are the unobservable threshold parameters which will be estimated together with other parameters in the model. δ_0 is normalized to a zero value when an intercept coefficient is included in the model [23] and therefore only m-1 additional parameters are estimated with β_s. Similar to the models for binary data, the probabilities for each of the observed ordinal response which in this study had 3 responses (0, 1, 2,) are given as:

$$\text{prob } (Y = 0) = P(Y^* \leq 0) = P(\beta'X + \varepsilon i \leq 0) = \text{ø}(-\beta'X) \quad (6)$$

$$\text{prob } (Y = 1) = \text{ø}(\delta_1 - \beta'X) - \text{ø}(-\beta'X) \quad (7)$$

$$\text{prob } (Y = 2) = 1 - \text{ø}(\delta_1 - \beta'X) \quad (8)$$

where $0 < \delta_0 < \delta_1 < ... < \delta m-1$ …. n is the cumulative normal distribution function such that

the sum total of the above probabilities is equal to one. The probability that Y_i falls into the jth category is given by

$$prob(Y_i = j) = \phi(\delta_j - \beta' X_i) - \phi(\delta_{j+1} - \beta' X_i), \quad (9)$$

j=0,1,2,...J,

where δ_j and δ_{j+1} represent the upper and lower threshold values for category j, respectively.

The log likelihood function is the sum of the individual respondents' log probabilities:

$$L = \sum_{j=1}^{j} \sum_{y_1=j} \log(\phi(\delta_j - \beta' X_i) - \phi(\delta_1 - \beta' X_i)). \quad (10)$$

Marginal effects are calculated to know how much each explanatory variable affect (increases or decreases) the likelihood of respondents in each of the three categories of the dependent variable. The marginal effects for an ordered probit model can be calculated as done by [24].

$$\frac{\partial P(Y_i = j)}{\partial X_k} = \left[\phi\left[\delta_{j-1} - \sum_{k=1}^{k} \beta_k X_k \right] - \phi\left[\delta_j - \sum_{k-1}^{k} \beta_k X_k \right] \beta_k \right], \quad (11)$$

where $\frac{\partial P}{\partial X_k}$ is the partial derivative of the probability with respect to explanatory variable X_k.

A positive (negative) marginal effect of X_k suggests that the probability of a respondent selecting that particular category increases (decreases) with X_k.

2. METHODOLOGY

2.1 Study Area

The study area is Southwest Nigeria comprising of Lagos, Ogun, Oyo, Osun, Ondo and Ekiti States. The area lies between longitude 2^0 31^1 and 6^0 00^1 East and Latitude 6^0 21^1 and 8^0 37^1N [25] with a total land area of 76,852km^2 and a population of 27,722,432 [26]. The study area is bounded in the East by Edo and Delta States, in the North by Kwara and Kogi States, in the West by the Republic of Benin and in the South by the Gulf of Guinea. The vegetation in Southwest Nigeria is made up of fresh water swamp and mangrove forest, the low land forest stretches inland to Ogun State and part of Ondo State while secondary forest is towards the northern boundary where derived and southern Savannah exist [25]. Southwest Nigeria is within the tropical rainforest, the area has bimodal rainfall distribution. There are distinct dry and rainy seasons. The wet season is associated with the Southwest monsoon wind from the Atlantic Ocean while the dry season is associated with the northeast trade wind from the Sahara desert. The region has an average annual rainfall and temperature of 1486 mm and 26.70C respectively [27]. The region has high density of human population with rain-fed agriculture as primary occupation of the people. The states are known for the cultivation of food crops such as maize, cocoyam, cassava, vegetable and yam [28].

2.2 Data Collection and Sampling Procedure

Primary data were collected through the use of well-structured questionnaire and interview schedule on the selected respondents. Multistage sampling procedure was used in the selection of the respondents. In the first stage, two out of the six states in the region were randomly selected and the selected states are Ondo and Oyo. In the second stage, five Local Government Areas (LGAs) that were prevalent in the cultivation of food crops (maize and cassava) from each of the two States were purposively selected. In the third stage, four communities from each of the selected Local Government Areas were randomly selected. Thus, 40 communities were selected. The lists of maize and cassava farmers were collected from the Agricultural Development Project (ADP) office in each of the selected States. The collected lists of maize and cassava farmers were used in the fourth stage where four (4) respondents cultivating each of maize and cassava were randomly selected from each of the selected communities making a total of 320 respondents.

2.3 Data Analytical Procedure

The collected data were analysed using descriptive statistics and ordered probit regression model. In order to classify farmers into different risk attitudes, this study adopted the method used by [11] where farmers were provided with a set of questions which are related to their risk seeking behavior. Each farmer ranked his response to the questions from five (indicating high acceptance) to one

(indicating low acceptance) as shown in Appendix I. The mean response of each farmer was determined and used to classify the risk nature of the farmer as follows: 1.00 - 2.49 = Risk-averse (Low risk seeking/high risk averse), 2.5 = Risk neutral (Intermediate risk seeking/averse) and 2.51 - 5.00 = Risk-seeking (High risk seeking/low risk averse). Two copies of questionnaire out of 320 administered were not used for the analysis because of insufficient data.

2.3.1 Model specification for ordered probit regression model

Ordered Probit Regression Model was used to examine the factors influencing farmers' attitudes towards risk among cassava and maize farmers in the study area. Ordered Probit Model is the most appropriate model due to the fact that the dependent variable takes discrete values and these values have a natural ordering [29]. Respondents were provided with a set of questions which are related to their risk seeking behavior and were used to classify the risk nature of the farmer with the value {1,2,…J} for *J*, take a positive integer. The ordered probit model for this study is specified as follows;

$$Z_{i=1,2,..j} = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10} + b_{11}X_{11} \quad (12)$$

where;

Z = Risk attitudes (0 = Risk Averse (Low risk seeking/high risk averse), 1 = Risk Neutral (Intermediate risk seeking/averse) and 2 = Risk Taker (High risk seeking/low risk averse)).

The independent variables are as follows:

- X_1 – Gender (1=Male, 0=Female)
- X_2 – Age in years
- X_3– Experience (years)
- X_4 – Educational status in years spent in school
- X_5 – Household size
- X_6 – Farm size (ha)
- X_7 – Non-farm Income (Naira)
- X_8 – Membership of Association (1= Yes, 0= No)
- X_9 – Marital Status (1=Married, 0=Not married)
- X_{10} – Extension Agent Visits
- X_{11}– Availability of storage facilities (1= Yes, 0= No).
- b_i – Parameters to be estimated.

3. RESULTS AND DISCUSSION

3.1 Risk Attitudes of Respondents

People naturally differ in the way they take decisions involving risk and uncertainty and these differences are often described as differences in risk attitude. Understanding of individual risk preferences is a prerequisite to understand economic behavior [7]. Table 1 shows that 46.8% and 51.2% of cassava and maize farmers respectively were risk averse, while about 25.3% and 21.9% of cassava and maize farmers respectively were risk taker. This implies that majority of the respondents in the two enterprises were risk averse which may form part of the factors that threaten the livelihood of farmers in the study area [12]. The results of this study contradict the outcome of a study by [30] which stated that most of the respondents were risk preferring.

3.2 Factors Influencing Farmers' Attitudes towards Risks among Cassava Farmers

The ordered probit model estimation results, which show factors influencing cassava farmers' attitude towards risk, are presented in Table 2. According to [20], the presence of two intercepts which are the threshold parameters indicate that there are three different categories. The threshold parameters δ_1 and δ_2 are significant at 1% and 5% level respectively, which implies that the ordered probit model with the 3 different attitudes is highly appropriate. The log likelihood value of -155.95 indicates that the explanatory variables used in the ordered probit model are

Table 1. Distribution of respondents by risk attitudes

Risk attitude	Cassava		Maize	
	Frequency	Percentage	Frequency	Percentage
Risk Averse	74	46.8	82	51.2
Risk Neutral	44	27.9	43	26.9
Risk Taker	40	25.3	35	21.9
Total	158	100.0	160	100.0

Source: Computed from field survey, 2015.

Table 2. Ordered probit estimation results for risk attitudes among cassava farmers

Variables	Coefficients	T-value	Marginal effects		
			Prob (Z=0)	Prob (Z=1)	Prob (Z=2)
Gender	0.515**	2.08	-0.204	0.043	0.161
Age	-0.029**	2.06	0.114	-0.002	-0.009
Marital Status	-1.559	1.86	0.415	-0.148	-0.564
Household Size	0.057	1.14	-0.023	0.005	0.018
Educational Status	0.270	0.72	-0.107	0.030	0.077
Experience	0.024***	4.66	-0.009	0.002	0.007
Membership of Association	-0.121***	2.48	0.048	-0.010	-0.038
Storage Availability	-0.239	0.84	0.095	-0.020	-0.075
Non-farm Income	1.04e-07***	5.27	-4.12e-08	8.71e-09	3.25e-08
Extension Agent Visit	0.216***	3.18	-0.086	0.018	0.067
Farm Size	-0.063	1.45	0.025	-0.005	-0.020
δ_1	0.307***	3.54	Log likelihood = -155.95		
δ_2	0.510**	2.01			
Chi^2 (11)	89.70**		Prob. = 0.050		

Significant at 10% level; ** Significant at 5% level; * Significant at 1% level*
Source: Computed from Field Survey Data, 2015

appropriate. The probability value of 0.050 for chi squared of 89.70 shows that at least one of the parameters of the variables is different from zero. This means that the null hypothesis that all parameters equal to zero in the model is rejected. The empirical results from the analysis revealed that gender and age, are significant at 5% level, while experience, membership of association, non-farm income and extension agent visits are significant at 1% level. There is a positive relationship between gender and risk attitude which implies that male cassava farmer tends to have higher probability of being risk seeking. This supports the findings of [11] that the probability of risk seeking is increased by sex relative to the risk aversion group. The reason for this relationship could be attributed to the inbuilt ability of male-headed households to take risk as they acknowledged the fact that risk is associated with huge benefits.

There is a negative relationship between age of the respondent and risk attitude, indicating that increase in the farmer's age would bring about higher likelihood of being risk averse. The reason for this scenario could be that old age prevents farmers from engaging in risky ventures, hence the need to be risk averse or neutral. [31] also reported that increase in age would make farmers to take lesser risk on the farm. Years of farming experience of the respondents exhibited a direct relationship with risk attitude, showing that increase in farming experience tend to increase the probability of being risk seeking. Findings from this study support [32] who stated that fish farmers with higher experience tend to have lesser probability of being risk averse. This could be attributed to the fact that farmers with higher experience in farming will have good understanding of production technology, associated challenges and benefits of taking risks.

Membership of association reduced the probability of the famers being risk seeking as a negative relationship existed between them, which is not in line with the *a priori* expectation. This could be linked to the weakness of the farmers' associations in bearing farmers' risks experienced in the course of cassava production. Findings from this study are similar to that of [30] where it is stated that farmers who are members of one association or the other are more risk averse. Non-farm income has a positive and significant influence on risk attitude, indicating that farmers with higher non-farm income tend to have higher likelihood of being risk seeking. This shows the importance of income diversification as a strategy used in combating risk. Extension agent visit is also identified as a significant factor that positively influenced risk attitude of cassava farmers, which implies that farmers with higher number of extension visits tend to have lower probability of being risk averse. This is in line with the findings of [33] where it is reported that the more useful extension visits farmers have, the less risk averse such farmers will be. Extension education delivered by extension agents boosts farmers' knowledge and access to technological learning and improved production inputs that are capable of increasing productivity.

The marginal effects for the independents variables are reported in Table 2. Marginal effects measure the response of farmers' attitude towards risk when there is a unit change in the explanatory variables. The marginal effect for gender indicates that being male cassava farmer will increase the likelihood of being high risk seeking by 16.1%, increase the likelihood of being intermediate risk averse by 4.3% and decrease the likelihood of being low risk seeking by 20.4%. A unit increase in the age of the cassava farmer would increase the probability of being high risk averse by 11.4%, while it reduces the probability of being intermediate risk averse and high risk seeking by 0.2% and 0.9% respectively. In the case of experience of the cassava farmers, farmers with higher years of farming experience tend to have increase in the probability of being high risk seeking, intermediate risk seeking and decrease in the probability of being high risk averse by 0.7%, 0.2% and 0.9% respectively.

The marginal effect for membership of association indicates that being a member of farmers' association will reduce the likelihood of being high risk seeking by 3.8%, reduce the likelihood of being intermediate risk averse by 1.0% and increase the likelihood of being high risk averse by 4.8%. Increase in the level of non-farm income would increase the probability of being high risk seeking, intermediate risk seeking and reduce the probability of being high risk averse by 3.25e-06%, 8.71e-07% and 4.12e-08% respectively. The marginal effect for extension agent visits implies that if cassava farmers have higher number of extension agent visits, the likelihood of being high risk seeking increases by 6.7%. Also, increase in the number of extension agent visits would lead to increase in the likelihood of being intermediate risk seeking by 1.8% and decrease in the likelihood of being high risk averse by 8.6%.

3.3 Factors Influencing Farmers' Attitudes towards Risks among Maize Farmers

Table 3 presents the ordered probit model estimation results for risk attitudes among maize farmers. The threshold parameters δ_1 and δ_2 are significant at 1% and 5% level respectively, which implies that the ordered probit model with the 3 different attitudes is highly appropriate. The log likelihood value of -153.66 indicates that the explanatory variables used in the ordered probit model for maize are appropriate. The probability value of 0.010 for chi squared of 94.62 shows that at least one of the parameters of the variables is different from zero. This means that the null hypothesis that all parameters equal to zero in the model is rejected.

The empirical results from the analysis revealed that age, household size, educational status, membership of association, storage availability and farm size are significant at 1% level. There is a negative relationship between the age of the respondent and his/her risk attitude, indicating that increase in the farmer's age would bring about higher likelihood of being risk averse. The reason for this scenario could be that old age prevents farmers from engaging in risk management strategies in case of risk, hence the need to be risk averse or neutral. [31] also reported that increase in age would make farmers to take lesser risk on the farm. Household size exhibited a negative relationship with risk attitudes, implying that maize farmers with higher household size tend to have higher probability of being risk averse. [18] reported that increase in household size tends to increase risk-averse behaviour of food crop farmers as a result of an increase in the food consumption needs of the household. There is a positive relationship between educational status and risk attitudes of maize farmers, which indicates that farmers with higher level of education would have higher probability of being risk seeking compare to the less educated ones. This is consistent with the findings of [34]; [35]; [18] who reported that the more educated farmers are, the more the willingness to take risk. Membership of association reduced the probability of the famers being risk seeking and the reason could be linked to the weakness of the farmers associations in bearing farmers' risks experienced in the course of maize production.[30] also stated that farmers who are members of one association or the other are more risk averse.

There is a positive relationship between storage availability and risk attitudes, which shows that maize farmers who have storage facility tend to have higher probability of being risk seeking. This is an indication that availability of storage facility plays importance role in enhancing risk taking ability of farmers. Increase in farm size tends to increase the probability of being risk seeking, which is in line with the findings of [31] where it is reported that farmers tend to take more risk as the size of the farm increases.

Table 3. Ordered probit estimation results for risk attitudes among maize farmers

Variables	Coefficients	T-value	Marginal effects		
			Prob (Z=0)	Prob (Z=1)	Prob (Z=2)
Gender	-0.080	0.37	0.032	-0.010	-0.022
Age	-0.019***	2.75	0.008	-0.002	-0.005
Marital Status	-0.245	0.43	0.097	-0.024	-0.073
Household Size	-0.059***	3.46	0.024	-0.007	-0.016
Educational Status	0.019***	4.06	-0.008	0.002	0.005
Experience	-0.011	0.96	0.004	-0.001	-0.003
Membership of Association	-0.770***	3.04	0.307	-0.096	-0.211
Storage Availability	0.195**	1.95	-0.778	0.024	0.053
Non-farm Income	1.65e-08	0.04	-6.57e-09	2.06e-09	4.51e-09
Extension Agents Visit	-7.01e-05	0.05	2.79e-05	-8.75e-06	-1.92e-05
Farm Size	0.196***	2.44	-0.078	0.025	0.054
δ_1	0.820***	3.21	Log likelihood = -153.664		
δ_2	0.313**	2.17			
Chi^2 (11)	94.62***		Prob. = 0.010		

Significant at 10% level; ** Significant at 5% level; * Significant at 1% level*
Source: Computed from Field Survey Data, 2015.

Table 3 also presents the marginal effects for the independents variables. Marginal effects measure the response of maize farmers' attitude towards risk when there is a unit change in the explanatory variables. A unit increase in the age of the maize farmer would increase the probability of being high risk averse by 0.8%, while it reduces the probability of being intermediate risk averse and high risk seeking by 0.2% and 0.5% respectively.The marginal effect for household size indicates that higher household size of maize farmers will increase the likelihood of being low risk seeking by 2.4%, decrease the likelihood of being intermediate risk averse by 0.7% and decrease the likelihood of being high risk seeking by 1.6%. In the case of educational status of the farmers, farmers with higher level of education tend to have increase in the probability of being high risk seeking, intermediate risk seeking and decrease in the probability of being high risk averse by 0.5%, 0.2% and 0.8% respectively.

The marginal effect for membership of association indicates that being a member of farmers' association will reduce the likelihood of being high risk seeking by 2.1%, reduce the likelihood of being intermediate risk averse by 9.6% and increase the likelihood of being high risk averse by 3.1%. Farmers with storage availability would have higher likelihood of being high risk seeking by 5.3%, higher likelihood of being intermediate risk seeking by 2.4% and lower probability of being high risk averse by 77.8%. Increase in the size of the farm would increase the probability of being high risk seeking, intermediate risk seeking and reduce the probability of being high risk averse by 5.4%, 2.5% and 7.8% respectively.

3.4 Strategies at Combating Risks in Cassava and Maize Production

Farmers' strategies at combating risks in cassava and maize production as shown in Table 4 revealed the most used strategies among the respondents. Majority of the maize farmers indicated multiple cropping, engaging in less risky enterprises, income diversification, timely planting, early harvest and cooperative society as strategies at combating risks, which were ranked according to their usage as 1^{st}, 2^{nd}, 3^{rd},4^{th}, 5^{th} and 6^{th} respectively. In cassava enterprise, early harvest, multiple cropping, income diversification, engagement in less risky enterprise, cooperative society and crop rotation were the strategies identified by the farmers and they are ranked as 1st, 2^{nd} 3^{rd}, 4^{th}, 5^{th} and 6^{th} respectively. Majority of the strategies identified in this study are similar to the ones identified by [36]. The remaining strategies identified by cassava farmers are ranked as follows; timely planting (7^{th}), planting of resistant varieties(8^{th}), making fire traces (9^{th}), irrigation (10^{th}), obtaining and adjusting to price information (11^{th}) and insurance (12^{th}). Maize farmers identified irrigation (7^{th}), planting of resistant varieties (7^{th}), making fire traces (9^{th}), crop rotation (9^{th}), obtaining and adjusting to price information (11^{th}) and insurance (12^{th}). The implication of insurance identified as the least used strategy

Table 4. Farmers' strategies at combating the risks associated with cassava and maize production

Strategies	Cassava		Maize	
	Frequency	Rank	Frequency	Rank
Multiple Cropping	134	2nd	144	1st
Insurance	15	12th	10	12th
Cooperative Society	100	5th	88	6th
Planting of Resistant Varieties	70	8th	60	7th
Income Diversification	120	3rd	101	3rd
Engaging in Less Risky Enterprise	110	4th	120	2nd
Obtaining and Adjusting to Price Information	20	11th	15	11th
Irrigation	57	10th	60	7th
Making Fire Traces	68	9th	50	9th
Timely Planting	88	7th	90	4th
Crop Rotation	95	6th	50	9th
Early Harvest	140	1st	89	5th

Multiple Responses Exist
Source: Computed from Field Survey Data, 2015

could be an indication that cassava and maize farmers were not interested in agricultural insurance scheme because of lack of trust and the cumbersome processes involved. All the sampled farmers in the two enterprises did not mention learning technical know-how on the application of some of the inputs used on the farm. This shows that majority of the respondents did not acknowledge the fact that some inputs increase while others reduce the level of output variance (production risk) because of the usage as stated by [5].

4. CONCLUSION

It can be concluded that majority of the respondents in the two enterprises were risk averse which may form part of the factors that threaten the livelihood of farmers in the study area. Being male farmer, increase in years of farming experience, higher non-farm income, and increase in the number of extension visits tend to increase the probability of being risk seeking, while increase in the age of farmer and membership of association tend to increase the likelihood of being risk averse among cassava farmers. Also, higher level of education and having storage facilities tend to increase the probability of being risk seeking, while increase in the age of farmer, higher household size and membership of association would lead to higher likelihood of being risk averse among maize farmers. Moreover, majority of the respondents in cassava and maize enterprises indicated multiple cropping, engagement in less risky enterprises and income diversification as strategies at combating risks while the least strategy used was insurance. Therefore, it is recommended that the agricultural insurance industry in Nigeria should be further strengthened and empowered to service risky farm businesses. This is important due to the fact that the impact of the Agricultural Insurance Industry still needs to be felt more in order to encourage farmers who are risk averse to be risk seeking. Also, youths should be encouraged and empowered to venture into maize and cassava farming at their early stage of life when there is strength and vigour to build social capital and networks to serve as coping strategies when faced with risks. Cassava and maize farmers should be advised to belong to one association or the other where risk being faced is shared or bore. Government should intensify efforts in implementing programs such as family planning programs which would encourage smaller household size since higher household size tends to increase probability of being risk averse. The limitation to this study is that findings from this research work may not be sufficient to make recommendations that affect all the agro-ecological zones of Nigeria because it has not covered all the agro-ecological zones. Therefore, there is the need for further research work on attitudes towards risk and risk combating strategies among maize and cassava farmers in all the agro-ecological zones of Nigeria in other to come up with recommendations that can be used to make policies for the entire country.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDIX I

Method put in place for risk aversion by the farmers

Methods	SA	A	U	D	SD
Enterprise diversification					
Agricultural Insurance					
Off-farm income is used to complement farm income					
Assets are in cash form					
Engagement in only less risky enterprise					
Securing credit to expand farm enterprise					
Involvement in fadama production					
Planting resistant crop varieties					
Obtain marketing information before sales of farm produce					
The farm organization is flexible enough to accommodate changes when they are necessary.					

SA= Strongly agree, A=Agree, U=Undecided, D=Disagree, SD=Strongly disagree

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