



## Qualitative evidence on risk management strategies among maize farmers in Bauchi State, Nigeria: Lesson for Africa's agricultural development

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### General Note

Article is recommended to print as color version in recycled paper. *Save Trees, Save Nature.*

### ABSTRACT

This study evaluates the risk management strategies among maize crop farmers in Bauchi State, Nigeria. Descriptive statistics and other models were used for data analysis. The study revealed that 55.5% of the farmers were females with mean age of 42 years,

57.87% were married with an average household sized of 8 persons and at least primary education. Production risk, marketing risk, financial risk, institutional, human and personal risk were identified as major sources of risk in the agro forestry maize farming under which 79.9%, 69.1%, 50.6%, credit facilities, government/personal policies and inadequate family labour as risks occurring all year around within the last five years. The results further shows that 90% of the identified risks were rated high risks and mostly occurs all year round 52.63% of the respondents had risk averse attitude. The multinomial regression model reveals that the coefficient of age and farming experience were positive across the risk categories and statistically significant at 1% level of probability significant at 1%, 5% and 10% respectively across neutral and risk takers category. The result of the marginal effect and quasi – elasticity estimates reveals that variables were both positively and negatively elastic in the risk attitude of respondents. The study further showed that 78.8%, 73.0% and 89.6% of the respondents employed intercropping, gathering market information and use improved seeds as their preventive, mitigating, and coping strategy respectively. Therefore, the study revealed that risk perception was based on the nature of risk experienced by the farmers and it varied according to farmer's risk attitude and the risk management strategy used by the farmer. It was therefore recommended that maize crop farmers should be encouraged to form agricultural co – operatives in order to pool resources together and negotiate jointly with input suppliers to manage the inherent risks in farming system among others.

**Keywords:** Risk, Management, Maize, Farmers, Nigeria.

## BACKGROUND

Agriculture is the economic backbone of the majority of households in Nigeria .The sector employs over 70% of the labour force in the country (NBS, 2005) making the sector vital to households and the national economy. Agricultural production capacity in Nigeria is dominated by small holder's farmers in rural area, growing food crops and rising livestock at subsistence level. Farming in the Nigeria is however highly characterised by risks ranging from adverse weather conditions, pest and diseases, marketing/price risk, institutional risks to human risks, which in turn leads to uncertainties (Ayinde et.al 2008). Farmers operate on the edge of extreme certainty, sometimes falling just below and sometimes rising just above the threshold of survival. They have limited knowledge on weather rainfall will be good or bad over a season; the prices the will receive for produce sold or weather their crops would be infected by disease. These risks are not under the control of farmers but some farmers have developed ways of coping and managing them. Risks are an uncertainty that affect an individual welfare and is often associated with adversity and loss. Risk is believed to play an important role in the investment decision of individual farmers. Agricultural risk originates from different sources ranging from production risk to marketing risk and from financial risk to institutional risk and political risk.

Maize farming is a common agricultural venture in north eastern Nigeria, providing food and job for a large number of households. Despite the programs and interventions by the government, sub-sector still produce below its potential. More often than not farming season in Nigeria are not adequately planned and forecasted. Farmers usually base their production activities on guess estimate which leave more to be desire. The consequences are exposure to risk and uncertainty which lead to losses.FAO (2010) observed that despite the rapid growth in maize production in Nigeria the sub-sector is still constrained by a number of factor namely, pest and disease agronomy problems, shortage of planting materials, inconsistent policy measures, poor market access, limited diversification of processing options, inefficient extension delivery system and inadequate access to improved processing technology. However, these problems will undermine the effective management of the maize industry and thus reduce the supply of the produce in both local and global market, if not carefully handled. There is therefore the need for farmers to beware of the risk management strategy to boost output.

Agricultural risk management in Nigeria is rarely undertaken in a systematic and integrated manner across farms. Consequently, the approach to management has been hampered pitfall. Traditional risk management views risk as a series of single and unrelated element where individual risk are categorised and managed separately. Most government agricultural projects and programmes are designed with insufficient information on the socio economic characteristics (age, household, size, gender, farm size, and income) of the farmers (Ayinde et al., 2008). For this reason, limited information is available to carter for farmer's attitude towards risk. This assertion calls for critical look at the decision making environment where farmers operate in Nigeria. This study attempts to provide information about farmers' attitude towards risk which is viral in improving their behaviour, increasing output, rate of adoption of new /improved technology and management decision making process (Ayinde et al, 2008; Binici et al., 2003). The relevance of risk management to increased productivity cannot be over emphasized. The sector holds a lot of potentials to actualize the desire for the country and Africa to be food secure and economically stable.

## The Study Area

This study was carried out in Bauchi LGA of Bauchi State, Nigeria. Bauchi LGA is one of the 20 LGAs of the state located in the North-eastern part of the country. Bauchi city is the capital of Bauchi State, of the Bauchi LGA within the state, and the traditional Bauchi emirate. The LGA had a population of 493,810 and annual growth rate of 3.1% (NPC, 2006). The projected population is estimated to be about 593,073 people by the end of 2012. Bauchi LGA occupies a total land area of 3,687sq.km representing about 7.5% of the state's total land mass and is located between latitude 10.18° and 12.00° N of the Equator. Longitudinally, the LGA lies between longitude 9.50° and 13.00° E of the Greenwich Meridian. Bauchi LGA is covered by Sahel Savannah (semi-desert) vegetation zone. This type of vegetation comprises isolated stand of thorny shrubs. The climatic condition of the area is characterized by two distinct seasons, dry and wet. It receives rains late, usually around May or June and records the highest amount of 700mm per annum. The mean daily maximum temperatures of the LGA range from 29.2 °C in July and August to 37.6 °C in March and April, while the LGA has a mean daily minimum temperature ranges from about 11.7 °C in December and January to about 24.7 °C in April and May (Ibrahim, et al., 2005). The soil type of the area varies from sandy, clay loam and clay soil. The sunshine hours in the LGA range from about 5.1 hours in July to about 8.9 hours in November. Indeed, October to February usually records the longest sunshine hours.

## METHODOLOGY

### Sampling Procedure and Sample Size

Bauchi Local Government (L.G.A.) has the largest concentration of maize farms in the state based on the information. All the maize farmers registered in the L.G.A. formed the sampling frame for the study. These farms were scattered all over the 12 wards in the L.G.A. with more concentration in Hardo Dan'iya, Majidadi, Birshi-miri, and Kangere-Tirwun wards. A total of 95 maize farmers were selected using simple random sampling procedure from the list of registered maize farmer association of the area.

### Method of Data Collection

Primary data were collected on socio economic characteristics such as age, household size and level of formal education. Data were also collected on farm characteristics such as farming experience, farm size, mode of land acquisition and farming status. Also institutional factors such as extension contact, source of farm labour, coping with land constraint and source of capital were obtained and analysed. Furthermore data on sources of risk (production risk, marketing risk, financial and institutional risk) perceived magnitude of risk (frequency of occurrence, period of risk is most perceived) and management strategies (preventive, mitigating and coping strategies) were collected with the use of structured questionnaires.

### Analytical Techniques

#### *Descriptive statistics*

Simple descriptive statistics like means, standard deviation, percentages, tables and frequency were used to determine the socio economic characteristics: identify the risks facing maize farmers, their perception towards risks and risk management strategies used by maize farmers. Farmers perception of magnitude of risk were categorised based on frequency of occurrence, level of risk and period of risk.

#### *Likert Attitudinal scale Approach (LAS)*

A 5-point Likert scale was used to measure farmers' attitude towards risk. The response are strongly disagree (SD), Disagree (D), Undecided/Neutral (U), Agree (A) and Strongly Agree (SA). The responses were given scores of 1,2,3,4 and 5, respectively. The values were added to obtain a score of 15, which was then divided by 5 to obtain 3.0, taken as the mean (risk neutral). Factors with mean score less than 3.0 were taken as risk averse while those with mean score above 3.0 were risk preference.

## RESULTS AND DISCUSSION

### Sources of risks to small-scale maize production

Table 1 shows the sources of risk to maize farming and degree of occurrence within the last five years in the study area. This shows that 79.9% and 77.2% of the respondents identified dangerous weed and destruction of crops by animals, respectively, as risks occurring all year round within the last five years. Also, 23.9% and 31.3% had experienced erratic rainfall and flood, respectively, occurring twice within the last five years. Other risk sources such as inadequate land (64.9), pests and diseases (59.1%) and lack of

farm inputs (54.4% were also identified by the sampled respondents. This result agrees with the findings of Jugi (2013) that the unavailability of farm inputs, especially fertilizer, is an important source of risk to farmers. Also, Ajijiola *et al.*, (2011) noted that the major sources of risk were pest and disease outbreak, erratic rainfall pattern, price fluctuation, changes in government policies and theft. Study by Onubougu *et al.* (2014) reiterated that land unavailability is a risk facing small scale agriculture in south eastern Nigeria.

Furthermore, results shows that 56.8% and 54.4% of the respondents had experienced the risk of inadequate improved cultivars and inadequate soil nutrient yearly, in the last five years. This can be attributed to poor communication between the farmers and researchers in technology transfer; and limited arability of agricultural land which is revolved by the small scale farmers who often prefer to continue with familiar crop cultivars and production activities with lower risk. Marketing risk as presented in Table1, shows that 69.1% and 51.7% of the respondents had experienced low price of maize and inadequate market for produce respectively, occurring yearly. Furthermore, 57.5% of the respondents had experienced high cost of input. This could be attribute to the absence of input price regulatory agencies and institutions to small scale farmers. Kahan (2013) noted that the potential success to small scale farm enterprise rests on their ability to divide risks and reduce working capital. One way farmers can achieve this by engaging in crop share lease.

The distribution of maize farmers according to financial risk shows that, 3.9%, 50.6% and 3.9% of the respondents had experienced lack of adequate insurance coverage, inadequate credit facilities and high interest rate, respectively. Lack of adequate insurance coverage (3.9%) implies that majority (96.9%) of the farmers do not have formal security against unforeseen circumstances in their farms. Having crop insurance plays an important role in mitigating risk in small farms. In contrast, having crop insurance negatively influences a farmer's management decision and may lead to the farmer taking unnecessary risk. The result also shows that 50.6% of the respondents had no access to adequate credit and as such may not be able to purchase productive assets needed to expand their enterprise. This is attributed to absence of credit institutions in rural areas.. Only 3.9% of the respondents experience high interest rate. It implies that majority 64.5% of the respondent do not use formal credit sources to finance maize production. Further, the results shows that 18.1% and 50.2% of the respondents had experienced lack of microfinance bank/cooperative and government policy lag respectively, as institutional risks to maize farming in the study area. This implies that the respondents do not use micro-finance/cooperative to mitigate against risks in farming. This could be attributed to unstable agricultural finance policies and implementation strategies.

Also, 50.2% of the respondents indicated government policies affected their farming activities at various levels. This reveals the respondents may not have interest in government agricultural programmes. This indicates that government agricultural policies and programmes are not sufficiently structured to suit the needs of small scale maize farmers. This could also be related to the subsistence level of agriculture practiced by rural farmers which is essentially for family sustenance rather than commercial gains. Human/personal risks presented in Table 1, shows that 32.5%, 60.2%, 52.2%, 20.5%, 43.6% and 1.5% of the respondents had experienced ill health, lack of technical knowhow, theft, adulteration of input, conflict with Fulani men and communal conflict, respectively, 1-5 times in the last five years. This implies that farmers could be embracing cultivation of crops that are likely less strenuous than maize farming. In addition, 64.5% of the respondents experienced inadequate family labour. This could be attributed to rural-urban migration by young people in search of white collar jobs (Ani, 2002).

**Table 1: Sources of Risks of Maize Farmers**

Risk Sources	Percentage of Respondents	Number of times experienced (last 5 years)	Ranking
<b>Production Risk</b>			
Dangerous Weed	79.9	5	1 <sup>st</sup>
Destructions By Animals	77.2	5	2 <sup>nd</sup>
Inadequate Farming Land	64.9	5	3 <sup>rd</sup>
Maize Pest And Disease	59.1	5	4 <sup>th</sup>
Inadequate Improved Cultivars	56.8	5	5 <sup>th</sup>
Lack Of Farm Inputs	54.5	5	6 <sup>th</sup>
Inadequate Soil Nutrient	54.4	5	7 <sup>th</sup>
Flood	31.3	2	8 <sup>th</sup>
Bush Fire	24.3	1	9 <sup>th</sup>
Erratic Rainfall	23.9	2	10 <sup>th</sup>

<b>Marketing Risk</b>				
Low Price Of Output	69.1	5		1 <sup>st</sup>
High Cost Of Inputs	57.5	3		2 <sup>nd</sup>
Inadequate Market for Produce	51.7	5		3 <sup>rd</sup>
<b>Financial Risk</b>				
Inadequate Credit Facilities	50.6	5		1 <sup>st</sup>
Inadequate Insurance Coverage	3.9	1		2 <sup>nd</sup>
High Interest Rate	3.9	3		3 <sup>rd</sup>
<b>Institutional Risk</b>				
Government/Personal Policy	50.2	2		1 <sup>st</sup>
Lack of Functional MFB/Cooperative.	18.1	5		2 <sup>nd</sup>
<b>Human/Personal Risk</b>				
Inadequate Family Labour	64.5	5		1 <sup>st</sup>
Lack of Technical Knowhow	60.2	3		2 <sup>nd</sup>
Theft	52.5	3		3 <sup>rd</sup>
Conflict with Fulani Men	43.6	5		4 <sup>th</sup>
Farmer's Ill Health	32.4	2		5 <sup>th</sup>
Adulteration of Inputs	20.5	3		6 <sup>th</sup>
Communal Conflict	1.5	1		7 <sup>th</sup>

Source: Field Survey Data, 2018 \*Multiple Responses

Further, 60.2% of the respondents lack the technical skills to carry out modern farm operations. Modern farming skills such as agrochemical use and observing planting/ spacing specifications for improved maize production require additional training to carry out. This could be attributed to certain socio economic characteristics such as level of formal education, access to land and extension contact (Ayinde *et al.*, 2012). Furthermore, 20.5% of the respondents had experienced adulteration of inputs. This can be attributed to poor extension contact, high price of inputs and risk attitude of maize farmers in the study area. Also 43.6% of the respondents experienced conflict with nomads yearly in the last five years. Further findings in Table 1 shows that 52.5% of the farmers had experienced theft, thrice in the last five years.. This may possibly be attributed to the rural settings where farming activities take place at subsistence level in distant farms. Theft in small farms might be as a result of the unemployment and under-employment and the need to sustain living. Job creation is bound to reduce crime rate especially among young farmers in rural areas. Lastly, the ranking in Table 1 shows that, maize pest and disease, low price of output, inadequate credit facilities, government policy and inadequate family labour ranked highest in the risk classification. While erratic rainfall, inadequate market for produce, high interest rate, lack of functional micro financial outfits/Cooperative and communal conflict ranked lowest.

### Maize farmer's perceived magnitude of risk

The perceived magnitude of risks experienced by respondents is presented in Table 2. Perceived risks were rated high, low and neutral. Also, period of the year when risk is most severe were indicated. Results shows that 70% of the identified production risks were rated high risk. Among the production risks, maize pests and diseases (69.9%), erratic rainfall (56.8%), dangerous weed (56.4%), inadequate farm land (79.2%), inadequate soil nutrient (80.3%), destruction of crops by animals (67.6%) and lack of farm input (64.9%) were rated high. This implies that the respondents were conversant with the perceived risks. This could be attributed to their years of experience, labour management technique and season, since the respondents had a mean of 20 years of experience.. The respondents were indifferent (neutral) about the magnitude of flood (57.1%) in the study area. This implies that the occurrence of flood may not be seen as a major risk factor. Also, 20% of the production risks were perceived as low risk. Inadequate improved cultivars (64.1%) and bush fire (78.8%) were perceived as low risk occurring all year round and in the dry season, respectively. This implies that farmers may have resorted to using familiar crop-cultivars and do not have formal security against on-farm losses for maize farming. Bush burning is perceived to occur during the dry season when more trees and grasses are dry.

Furthermore, perception on marketing risks presented in Table 2, shows that low price of output (64.5%) and inadequate market (48.3%) for produce were experienced all year round by the respondents. Both risks were also rated high and low in that order. High risk perception of low output price can be attributed to market inconsistencies such as the absence of standard unit of measurement for produce, storage facilities, poor road infrastructure in the rural areas and forces of demand and supply on

agricultural produce. Njoku (1994) recommended improved marketing policy to involve improved marketing facilities such as stable packaging equipment and storage facilities. Low risk perception of inadequate market (48.3%) indicates the existence of high demand for maize and maize products in the market, hence the need to cultivate the crop even with the inherent marketing risk perceived. Fakayode *et al.*, (2012) also reported packaging and exploitation by middlemen to be the most perceived sources of production and market risks. Also, high cost of input (54.8%) was perceived as high risk. This implies shortage of necessary production input for the farmer to manage risk. This confirms the expectation of frequent price fluctuation encountered in the market.

Table 2 shows that, lack of microfinance banks/cooperative (MFB) (64.1%), inadequate credit facilities (69.9%) and high interest rate (59.1%) were perceived as high risks in the study area. This implies that maize farming is undertaken at a subsistence level with little or no opportunity to increase capital. It could be attributed to rural economy, double digit interest rate charged on loans, bureaucracy in obtaining loans, the nature of collateral required to obtain loans and lack of awareness about the benefits of cooperative society.

**Table 2: Small-scale farmers perceived magnitude of risk.**

Risk Sources	Rate of Respondents	Percentage of Respondents	Period Percieved
<b>Production Risk</b>			
Maize Pests and Diseases	High	69.9	All year round
Erratic Rainfall	High	56.8	Rainy Season
Dangerous Weed	High	56.4	All year round
Inadequate Farming Land	High	79.2	Rainy Season
Flood	Neutral	57.1	Rainy Season
Inadequate Soil Nutrient	High	80.3	Rainy Season
Lack Of Farm Inputs	High	64.9	Rainy Season
Destruction by animals	High	67.6	Dry Season
<b>Marketing Risk</b>			
Low Price Of Output	High	64.5	All year round
High Cost Of Inputs	High	54.8	Rainy Season
Inadequate Market for Produce	Low	48.3	All year round
<b>Financial Risk</b>			
Lack of Micro Finance Bank (MFB)	High	64.1	All year round
Inadequate Credit Facilities	High	69.9	Rainy Season
High Interest Rate	High	59.1	All year round
<b>Institutional Risk</b>			
Inadequate Insurance Coverage	High	96.9	All year round
Government/Personal Policy	High	89.2	All year round
<b>Human/Personal Risk</b>			
Inadequate Family Labour	High	73.7	Rainy Season
Lack of Technical Knowhow	High	59.8	All year round
Theft	Low	64.9	All year round
Farmer's Ill Health	Low	51.0	All year round
Adulteration of Inputs	Neutral	57.9	Dry Season
Communal Conflict	Neutral	93.8	Rainy Season

Source: Field Survey Data, 2018

The institutional risks presented in Table2 were perceived as high risk. Results show that inadequate insurance coverage (96.9%) and government policy (89.2%) had high risk perception, respectively. The risks were also perceived all year round. Inadequate insurance coverage could be as a result of unfavorable agricultural insurance policy for small scale farmers, especially in the study



area. Furthermore, the respondents may not want to incur additional cost of production, hence will maintain subsistence level of production. The findings of this study also revealed that small scale maize farmers in the study area practice mixed cropping in small and fragmented farmlands, as such, do not have the financial means to take up insurance coverage. Inconsistent government policies could be in terms of poor finding and budget utilization to small scale agriculture.

The human/personal risks perceived by the respondents as shown in Table 2, were farmer's ill health, inadequate family labour, lack of technical knowhow, theft, adulteration of inputs. The result in Table 2 shows that farmer's ill health (51.0%) and theft (64.9%) were rated as low risks, respectively. Also, 57.9% and 93.8% of the respondents were in different/neutral about adulteration of inputs and communal conflict which occurred in the dry and rainy seasons, respectively. This could indicate poor awareness on the use of agrochemicals on farms. Communal conflict could arise during the rainy season when land is sourced for farming or as a result of land tenure system practiced by farmers in the area. Also 73.7%, 59.8% and 82.6% of the small scale maize farmers rated inadequate family labour, lack of technical knowhow and conflict with Fulani men, as high risks, respectively. Inadequate family labour was experienced during the rainy season when labour may be grossly insufficient due to farm engagement by farmers. Conflict with Fulani men was experienced mostly during the dry season due to migration of cattle to more palatable grazing sites which is in short supply in the North especially during the dry season. However, lack of technical knowhow occurred all year round. This could be attributed to insufficient communication about farming techniques between the researcher and the farmers, through extension agents. All the respondents had different perception about the sources of risks outlined in Table 2. Similar results were obtained by Hall *et al.*, (2003) who found that farmers' perception of sources of risk and management responses were significantly different across farm categories and product types. Farmers' risk perception is determined by the risk attitude exhibited. The more risk averse a farmer is, the higher the perceived magnitude of the risk sources.

#### Risk attitude of maize farmers

Table 3 shows the distribution of respondents according to their risk attitude. Results in Table 3 shows that 52.63%, 21.05% and 26.32% of the respondents were risk averse, risk neutral and risk taker/preference, respectively. Risk averse status of maize farmers can be attributed to marital status and household size of the respondents. Household size and the added responsibility of marriage could result in a farmer settling for less farm financial gains and maintenance of household, since most of the respondents were married and had significant household sizes (Table 3). Moreover, subsistence farmers may likely focus solely on feeding the household from farm proceeds and as such, overlook other monetary gains from farming. Farmers without family commitment are more willing to take risk and carry out trials on their farms. Mean age of the respondents (42 years) indicates farmers prefer to settle for traditional farm operations rather than adopt techniques beyond their mental capacity. Mental capacity reduces with age, as farmers advance in age, their ability to carry out complex farm operations diminishes, and hence they will likely adopt obsolete farming techniques. Similar studies have been conducted by Nmadu *et al.*, (2012) pointing out age, sex and level of education as important determinants of risk attitude of small scale farmers in Niger State. Majority (87.1%) of the farmers had formal education; hence their ability to make technical changes in their farms will increase. Also, educated farmers may likely look for improvised farming techniques or engage in off farm income generating activities such as civil service, banking and public service in other to avert the risk. Also, farm characteristics such as farm size and mode of land acquisition can influence farmers' risk attitude, where the respondents has a mean farm size of 1.8 hectares and acquired land through rent (Table 3). Subsistent farmers tend to be risk averse due to the overriding priority of household maintenance. Olarinde and Manyong (2007) analysed the risk aversion of crop farmers in Northern Nigeria which revealed that susceptibility to risk was highly premised on socioeconomic factors and farm specific variables.

Furthermore, large household size can increase food insecurity among small holder families, as a result increase risk averse attitude. Due to the nature of agricultural production which is characterized by risk, engaging in off-farm jobs may be a way out. Also, farmers solely into crop production avoid risk in other to maintain scale of production in subsequent seasons. Also, farming experience has a direct impact on farmers' managerial competence and decision making process. It helps farmers identify production risks, set realistic time and efficiently allocate resources in their farms (Nurudeen, 2012). Extension contact will assist the farmer with modern farming practices thus, encouraging the farmer to avoid taking risks blindly. Similar result have been obtained by Ayinde *et al.*, (2012) who pointed farmers' access to extension agents as one of the key determinants of their risk attitude. Farmers who obtain capital from formal sources will likely expand the area of land under cultivation thereby increasing their taking capacity. Where agricultural funds are targeted at small scale farmers, their risk taking ability may likely be improved and vice versa.

**Table 3: Distribution of Respondents According to Risk Attitude**

RISK ATTITUDE	FREQUENCY	PERCENTAGE %
Risk averse	50	52.63
Risk neutral	20	21.05
Risk takers	25	26.32
<b>Total</b>	<b>95</b>	<b>100.0</b>

Source: Field Survey Data, 2018

### Risk management strategies adopted

The results in Table 4 shows the management strategies adopted by the respondents against the identified sources of risk to maize farming in the study area. Results are presented based on multiple responses and are classified as preventive, mitigation and coping strategies. Preventive strategies presented in Table 4 reveal that, 78.8%, 74.1% and 79.9% of the respondents employed intercropping, investing off farm and primary processing, respectively. Intercropping is a form of crop diversification where a farmer can choose a combination of crops probably to prevent pests and disease outbreak and soil nutrient deficiencies. Farmers tend to engage in other income generating activities since they may find it difficult to separate farming from household needs. It has been reported that small scale farmers sustain their farm income with earnings from off farm work. Similarly, about 22.8% and 34.7% of the respondents used pesticides/herbicides and fertilizer application, respectively. The low percentage could be attributed to inaccessibility and cost of fertilizer, lack of awareness on the usefulness and application of agrochemicals in small farms. It could also imply that farmers practice shifting cultivation and land fallowing to restore the nutrient content of the soil due to the bottlenecks associated with fertilizer acquisition. Majority, 78.8% and 74.1% of the respondents adopted intercropping and off farm investment as preventive strategy against production risks such as inadequate land, whether conditions and soil nutrient. Also 79.9% used primary processing techniques to manage spoilage and extend shelf life of produce. Only 39.3% of the respondents had storage facilities. This indicates that majority (60.7%) of the small scale maize farmers do not have storage facilities for maize produce. Further results in Table 4 show that 20.5% and 23.9% of the respondents use extension services and government assistance preventive strategies. This means that majority of the farmers did not use the institution due to insufficient research information and policy lag associated with agricultural policies. Mitigation management strategies presented in Table 4. Shows that , 73.0% and 58.3% of the respondents used gathering of market price information and spreading sales, respectively. This implies that farmers in the study area source information about the prevailing market prices for their produce before making sales. This can help put them in less compromising positions about future prices. One benefit of this is that farmers can actually make better short and long term marketing decisions. Spread of sale can relieve the farmer of seasonal price fluctuation and may even help raise earnings. Only 23.9% of the respondents adopted cooperative society as mitigation strategy. This implies that the benefits of cooperative are not effectively conveyed to small scale maize farmers in the study area. Majority of the respondents did not have any form of crop insurance. Coping strategies presented in Table 4 shows that 56.0%, 24.3%, 45.2%, 68.0% and 48.6% of the respondents used working off farm, reduced consumption, borrowing, hiring labour and planning expenditure, respectively, as coping strategies for risks. This confirms that farmers have alternative sources of income due to the unpredictable nature of agricultural activities. Majority (75.7%) do not reduce their food consumption level in order to manage risk. This is because household primary reason for farming is family sustenance.

**Table 4: Risk Management Strategies Used**

Management Strategies	Percentage of Respondents *	Ranking
<b>Prevention Strategies</b>		
Primary Processing	79.9	1 <sup>st</sup>
Intercropping	78.8	2 <sup>nd</sup>
Investing off farm	74.1	3 <sup>rd</sup>
Storage facilities	46.3	4 <sup>th</sup>
Fertilizer Application	34.7	5 <sup>th</sup>
Government Support	23.9	6 <sup>th</sup>
Spraying herbicides/pesticides	22.8	7 <sup>th</sup>
Extension Contact	20.5	8 <sup>th</sup>
Record Keeping	10.8	9 <sup>th</sup>



**Mitigation Strategies**

Gathering Market Information	73.0	1 <sup>st</sup>
Spreading sales	58.3	2 <sup>nd</sup>
Selling of asset	37.8	3 <sup>rd</sup>
Price support	30.9	4 <sup>th</sup>
Cooperative Society	23.9	5 <sup>th</sup>
Crop Insurance	0.0	6 <sup>th</sup>

**Coping Strategies**

Faith in God	89.6	1 <sup>st</sup>
Hired Labour	68.0	2 <sup>nd</sup>
Local Contribution	56.4	3 <sup>rd</sup>
Working off farm	56.0	4 <sup>th</sup>
Change in farming technique	51.0	5 <sup>th</sup>
Planning expenditure	48.6	6 <sup>th</sup>
Borrowing	45.2	7 <sup>th</sup>
Reduced Consumption	24.3	8 <sup>th</sup>

**Source:** Field Survey Data, 2018 \* Multiple responses.

Results from the study shows that small scale farmers often pull resources with friends/relatives during planting season and customarily payback during harvest periods, as coping strategy against risks. This infers that farmers in the study area make contingency financial plans for their farm operation. Majority (68.0%) of the respondents used hired labour as risk management strategy. This implies that small scale maize farmers in the study area may not have the capacity to carry out certain aspects of farming since majority are female and married (Table 4). Further the results shows that, 56.0% and 89.6% of the respondents used local contribution and faith in God as risk management strategies. This implies that farmers have alternative local means of saving cash and obtaining loans for farming during the season and rural farmers have their traditional religious beliefs attached to farming as some foresee disasters as an act of God. The ranking showed that primary processing, gathering market information and faith in God ranked highest in the management strategies adopted, respectively. While record keeping, crop insurance and reduced consumption were ranked lowest in the management strategies adopted in the study area.

## CONCLUSION

It can be concluded from the study that sources of risks identified in this study centred mainly on the system of production, marketing and financing of maize production and the rate of occurrence varies according to season. The study revealed that risk perception was based on the nature of risk experienced by the farmers and it varied according to the farmer's risk attitude. The study also categorized the risk attitude of farmers into three and most farmers are risk averse in their attitude. Application of the multinomial logit regression in the study revealed that risk attitude of maize farmers is influenced by their age, marital status, level of formal education, farming experience, and farm size.

## RECOMMENDATIONS

Based on the findings, the following policy and further research recommendations were made.

1. It is recommended that the governments in collaboration with organized private sector should institute a loan scheme specifically targeted towards empowering women in the agricultural subsector, since it has been observed that women are dominant gender in maize farming. Also, it is suggested that the women should organize themselves into cooperative societies to enable them pull resources together and negotiate jointly with input suppliers to manage the inherent risks in maize farming.
2. The knowledge from this study showed that lack of input such as fertilizer is a source of risk to maize farming. The current agricultural policies targeted at making fertilizer more accessible at subsidized rate under the growth enhancement support scheme should be sustained. Also, the on-going credit liberalization policy of the government aimed at encouraging borrowing by farmers at single digit interest rate should be continued to enable farmers increase their farm inputs and purchase improved cultivars.
3. The role of crop insurance cannot be overemphasized in risk management. African Governments and organized private sector should focus on creating a cost effective crop insurance coverage against risks associated with weather conditions. More research should be carried out on the cost implications of these risk management strategies.

4. Farmers in Nigeria and Africa should develop a broad range of strategies through record keeping which take into account the advantages and disadvantages (benefits and costs) of each risk management option individual and in combination and adjust some socio-cultural inclinations such as traditional rites carried out before, during and after the farming season that limit the effectiveness of some management strategies.
5. The land in Nigeria and Africa should be more accessible to small scale farmers. The ties between researchers and extension agents should be strengthened to increase the number of extension contacts among maize farmers.

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**Conflict of Interest:**

The authors declare that there are no conflicts of interests.

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**Data and materials availability:**

All data associated with this study are present in the paper.

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