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ANALYSIS OF FARM RISK AND COPING STRATEGIES AMONG MAIZE FARMERS IN LERE LOCAL GOVERNMENT AREA OF KADUNA STATE, NIGERIA

ABSTRACT

This study assessed the farm risk and coping strategies among maize farmers in Lere Local Government Area of Kaduna State, Nigeria. Multistage sampling procedure was used to select 120 farmers from six maize producing communities out of the three districts in the Local Government Area for the study. Primary data were collected through the use of questionnaires and interview schedule and were subjected to both descriptive and inferential statistics. Findings from the study revealed that the mean age of the maize farmers is 40 years with 69.0% of them being male and 72.5% married. The study also showed that 41.4% of the respondents had secondary education with a mean farming experience of 9 years. The results also revealed that the mean annual income of respondents is N126041. The study also revealed that majority of the farmers are risk averse (60.8). The logistic regression result showed that that age, sex, educational level and farm size had positive and significant relationship with adoption of farm risk coping strategies. The major risk coping strategies adopted by farmers in the study area include; fertilizer application, mixed farming, non-farm activities, irrigation etc.

Key Words: Determinants, farmers, access, credit, agricultural production, Bassa Local Government.

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1. INTRODUCTION

The agricultural sector is characterized by higher exposure to a variety of risks compared to the other economic sectors. Agricultural risks include production, market, credit, technological, institutional and human resource risks. Moreover, the agricultural risk environment is changing with high frequency and severity. The changes in agricultural risk environment can be divided into two main groups; climate change and market liberalization. Farmers operate in an external farm environment that is becoming more and more uncertain. Climate change or natural disasters particularly droughts directly cause highly variable agricultural production outcomes and food supply and threaten food security. Natural disasters are exacerbated by agricultural market liberalization that affects input and output prices. These changes threaten millions of those who depend on agriculture for their livelihoods and food particularly in resource-poor areas. Furthermore, these changes disrupt the social and economic development and increase the government spending on relief and compensation.

The frequency and severity of agricultural risk environment particularly in the last few decades has increased on account of widespread climate variability and changes. For instance, the duration and intensity of droughts have generally increased. According to FAO (1), while regional droughts have occurred in the past, the spatial extent of current droughts is broadly consistent with expected changes in the hydrologic cycle under warming. Droughts threaten many regions over the world; Sub-Saharan Africa, the Middle-East and North Africa, South-Eastern Europe, Central Asia, Australia, Brazil, India, USA and China. In Africa, 8 million hectares (ha) of crops in Mozambique were damaged since 1990 by droughts. Similarly, Southern Africa was supplied of for food and non-food assistance with the cost of $950 million in ten countries during drought between 1991 and 1992 [2]. The horn of Africa has been affected by droughts almost every year for the past 12 years.

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Maize (Zea mays) which is a global staple food is an important cereal being cultivated in all agricultural zones of Nigeria. The production has risen from subsistence level to commercial owing to its use as raw material by agro based industries such as beverage, soap and pharmaceuticals [3]. According to [4], the vegetable part is also used in making silage for ruminants while the crop residue forms useful source of feed for cattle during dry season, even as the grain is a major component of poultry and pig ration

Despite the importance of maize in Nigeria, production is still low as the supply cannot meet with the demand. Current production is about 8 million tonnes with average yield per hectare of 1.5 tonnes. This is low especially when compared with world average of 4.3 tonnes per hectare. A close look at countries like South Africa (2.5 tonnes per hectare), Maritus (5.8 tonnes per hectare) and Egypt (7.1 tonnes per hectare) reveals that Nigeria's production is still unimaginably low given the large expanse of arable land, large population of small scale maize based farmers and the encouragements the farmers receive from Government [5]. The low output in maize from 4.3 tonnes per hectare global average to 1.5 obtained in Nigeria could be attributed to poor risk management practices among maize based farmers in Nigeria. However, not much emphasis is given to risk management practices by farmers and policy makers in Nigeria hence the obvious consequences that are negatively impacting on the yield of maize. According to [6], poor production of yield will continue to be observed in crops like maize in Nigeria, considering the dependency of farmers on changes in production environment and natural conditions. Such social, economic, technical and financial ambiences are not factored into decision making process of maize based farmers so as to enhance maize yield through adequate risk management strategies. The broad objective of this study is to analyse farm risks and coping strategies among maize farmers in Lere Local Government Area of Kaduna state, Nigeria. The specific objectives are to:

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i. to describe the socioeconomic characteristics of maize farmers in Lere Local Government Area of Kaduna State.

ii. to assess the risk attitudes of farmers in the study area

iii. assess the risk attitude of maize farmers in the study area

iv. describe the risk coping strategies adopted by maize farmers in the study area

v. determine the factors influencing maize farmers adoption of risk coping strategies in the study area?

2. MATERIALS AND METHODS

The study was conducted in Lere Local Government Area of Kaduna State, Nigeria. Lere Local Government Area is situated at latitude 10° 50' N and longitude 7° 54' N. The LGA is made up of three districts: Garu, Kadaru and Lere with Saminaka in Lere district as its headquarter. The study was conducted in these three districts. The study area has an estimated human population of about 180,000. It lies within the sub humid zone, which is characterized by a dry season period from November to April and a rainy season from May to October. There are a few rivers in the area but there are seasonal streams and ponds which usually dry up during the dry season, although few ponds survive the dry season and serve as source of water for domestic use as well as drinking water for the livestock. Vegetation is typical of the Northern Guinea savannah woodland. However, because of the effects of annual bush fires, there are now many species of both the Northern and the derived savanna zones found in the area. Settlement patterns are mainly hamlets and farm compounds. There are more than ten different tribes, including Kurama, Hausawa, Amarwa, Warsa and Fulani, and Hausa is the general spoken language. The main occupations of the people are farming, fishing and trading. Mixed farming of crop cultivation and animal production is the usual practice, and the LGA is known for its maize production and supply to several parts of Nigeria. Infrastructure development is poor with some areas being inaccessible during the rains. The

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data for this study was sourced primarily. The primary data will be generated through administration of well-structured questionnaire designed in line with the objectives of the study**.** Multi-stage sampling technique was adopted to select sample for this study. The first stage involved the selection of all the three district in the Local Government for the study. The second stage involved a purposive selection of two communities from each of the districts giving a total of six communities for the study. These communities are: Abadawa, Kayarda and Saminaka in Lere district. Disallah, Goron Dutse and Maigamo in Garu district while Kaduru district, Kaku, Kadura Tasha and Ukissa were selected. Purposive selection was based on high volume of maize production. The third stage involved random selection of twenty (20) maize farmers from each of the communities selected. This gave a total of one hundred and twenty (120) respondents for the study. Descriptive statistics and logistic regression was used to analyze the objectives of the study.

2.1 Model Specification

2.1.1 Logistic Regression Model

The regression model is expressed as:

$Y=a + b_1x_1 + b_2x_2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots b_8x_8 + e$ …….. (1)

Where Y = Adoption of risk coping strategies (High adoption =1, while low adoption =0)

X_1 = Age (years)

X_2 = Farming experience (years)

X_3 = Gender (male or female)

X_4 = Household size (hectares)

X_5 = Annual income (N)

X_6 = Educational status (years spent in school)

X_7 = Extension contact

X_8 = Farm size (ha)

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a = Constant (intercept)

e = Error term

b_1- b_8= regression parameters estimated

3. RESULTS AND DISCUSSION

3.1 Socio-economic characteristics of maize farmers.

The results presented in Table 1 revealed that majority (63.0%) of the farmers were within 31-40 years. The mean age of the farmers was 40 years. This result shows that majority of the farming population were young and in the active age group implying that the farmers can make positive contribution to agricultural production as well as serve as agents of innovation transfer. This result is similar to the findings of Onyedicachi (2015) who in his study on the effect of social capital on access to micro credit among maize farming households in Abia State, Nigeria found a mean age of 41 years among rural farming household in Abia State, Nigeria. Sex of the respondents reveals that 69.0% of the farmers were male while 31.0% are female. The predominance of male farmers in the study area could be attributed to the labour intensive nature of maize production which could be very tedious, hectic and time consuming especially for females who have to combine this farming activity with their domestic chores. The result in Table 1 also revealed that greater (72.5%) percentages of respondents in the study area are married while 27.5% of respondents are single. This is a usual practice where most married people engage in farming to provide food for the family. Result from Table 1 also shows a mean household size of seven persons. This is a peculiar situation in rural areas as most of these farmers believed that it is better to have more children who would work on the farm than hiring external labour. The polygamous nature of the community, which allows a man to marry more than one woman, could be another reason why they have more children. Farmer's educational attainments showed that (48.3%) of the farmers had secondary and tertiary education respectively. This in effect shows that 96.6% of the beneficiaries of the

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farmers in the study area are literate. The high level of literacy exposes them to some level of managerial ability in their farm business. Table 1 further revealed the mean years of farming experience of the respondents as 9 years. It implies that farmers in the study area have much experience in farming and therefore might have better knowledge of the risk associated with farming as well as their coping strategies. The result also showed that the maize farmers in the study area had a mean farm size of 3.2 hectares. This implies that most of the farmers are small holders and subsistence farmers, a situation that may not allow them to engage in large production and have access to bigger credit facilities. The result showed the mean annual income of the respondents as N126041. It can be seen from this result that the annual income of farmers in the study area is fair enough to enable them adopt farm risk coping strategies. This is because adoption of risk coping strategies is enhanced by high income and earning capacity. A greater percentage (66.7%) of the respondents said they acquire their farmlands through inheritance. The negative effect of majority using inherited land is that it would lead to fragmentation of farm land as a result of sharing among siblings hence reducing the size of farm land for agricultural practices. Land ownership besides being considered as collateral, dictates the amount of money the financial institutions can offer. Borrowers face barriers securing transactions with inherited land simply because ownership rights are not formally documented. The result also revealed that majority (84.1%) of the respondents were not members of any association. The membership of clubs, associations or cooperatives could avail farmers the opportunity to obtain credit, receive inputs and obtain information on important and recent practices/innovations concerning their farming activities.

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Table 1: Socio-economic Characteristics of the Respondents (n=120)

Variable	Frequency	Percentage	Mean
Age			
21-30	26	22.0	
31-40	76	63.0	
41-50	14	12.0	
>50	4	3.0	40
Sex			
Male	83	69.0	
Female	37	31.0	
Marital status			
Married	87	72.5	
Single	33	27.5	
Household size			
1-5	28	23.33	
6-10	74	61.67	
11-15	12	10.0	
>15	6	5.0	**7**
Educational status			
Primary	28	23.3	
Secondary	50	41.6	
Tertiary	24	20.0	
Non formal	18	15.0	
Years of farming			
1-5	23	19.0	
6-10	64	53.0	
11-15	20	17.0	
>15	13	11.0	9
Farm size			
0.1-2.0	20	16.6	
2.1-4.0	92	76.7	
>4	8	6.6	3.2
Annual Income			
50,000-100,000	45	35.9	
110,000-150,000	52	45.0	
160,000-200,000	10	8.3	
210,000-250,000	9	7.5	
>25,000	4	3.3	126041
Land Tenure			
Hired	33	27.5	
Inheritance	80	66.7	
Purchased	7	5.8	
Membership of association			
Yes	19	16.0	
No	101	84.0	

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3.2 Sources of Risk Faced by Maize Farmers in the Study Area

Table 2 revealed that the farmers' ranked low price due to output quality as the first and most important source of risk with 71.6 %. Smallholders usually accept low prices for their crops when the broker informs them that their produce is of poor quality. Smallholder farmers accept these low prices mainly because they are unable to negotiate from a well-informed position. Table 2 also reveals that farmers' ranked disease incidence as the second most important source of risk with 63.3%. This is owing to the fact that disease control through the use of agrochemicals increases the cost of crop production. Poor yield was ranked as the third most important risk incurred by maize farmers. The low quality of the maize produced is also attributed to the use of retained seed which is prone to attack by diseases in the field and during storage. Also, 47.5% percent of the farmers respectively ranked erratic rainfall as the fourth most important source of risk they incur in in their maize business. In recent times, irregular rainfall has been experienced by farmers in Nigeria, especially in the Northern parts of the country. The consequent effect of erratic rainfall is delay in planting dates and death of plants when dry spell periods are prolonged. This is followed by destruction of crops by cows who graze on the farm (40.8%). 37.5% of the maize farmers' rate rise in input prices as the sixth most important source of risk. Unavailability of improved inputs is one of the major constraints faced by farmers in Nigeria and this obliges them to rely heavily on seed stored at harvest, which losses its viability over time. Again, the result shows that 30.0% of the farmer‘s rate output loss due to inadequate storage as the seventh most important source of risk affecting their maize production. Due to lack of storage facilities, most smallholder producers are keen to sell produce almost immediately after harvest in order to ease congestion, leading them to sell their produce at lower prices. The farmers ranked loss of assets due to conflict/theft as the least source of risk. Violent conflict engenders destruction of human life, livelihood support systems, the environment, physical and economic

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infrastructure. The destruction of recognized landmarks leads to sustained uncertainty and low motivation to invest in agrarian economic activities.

Table 2: Distribution of Respondents according to Sources of Farm Risk

Risk	Frequency	Percentage	Rank
Low output prices	86	71.6	1st
Pest and diseases	76	63.3	2nd
Excess rain	11	9.1	8th
Inadequate rain	57	47.5	4th
Storage losses	36	30.0	7th
Theft	11	9.1	8th
Conflict	5	4.1	9th
Poor yield	66	55.0	3rd
Destruction by animals	49	40.8	5th
Rise in current input price	45	37.5	6th

2.3 Risk Attitude of Farmers

The risk attitude of farmers revealed that greater (60.8%) of the maize farmers are risk averse, 23.3 % had neutral attitude towards farm risk while only 15.8% were risk taken or preferred

Table 3: Distribution of Respondents based on Risk Attitude

Risk	Frequency	Percentage
Risk averse	63	52.5
Risk neutral	28	23.3
Risk preference/taking	29	24.1
Total	**120**	**100**

3.4 Risk Copping Strategies

Majority (65.0%) of maize farmers used fertilizer application as a method of improving the soil fertility thereby improving the quantity and quality of yield. Most of the soils have been over-used and therefore not fertile enough for maximum crop yields. This is followed by enterprise diversification in the form of mixed cropping (55.3%). This serves to avoid total

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loss of a whole farming enterprise. In event of poor yields of one crop, the farmer will fall back on the other.

Also 45.8% engaged in non-farm activities to augment the income from sales of farm produce.

The result also shows that 40.8% of the farmers use irrigation as a strategy to deal with risk of drought and erratic rainfall. It was realized that most of the farmers had the technical know-how in using the simplest irrigation system. Irrigation is not just a risk management strategy but also has a major impact on output through complementing it with multiple cropping and improved seeds during cultivation. It can also be seen that about 37.5% of the farmers in the study area did not sell all the farm produce at the same time because farm produce is associated with seasonal price variation. Farmers try to take advantage of periods when supply is low and the demand is high so as to get good prices, thereby maximizing profit. Other copping strategies adopted by maize farmers include planting of improved maize varieties (35.8%), application of insecticides/pesticides (30.8%). Use of native guards (8.3%) and fencing (4.17%) were the least adopted risk copping strategies. This is probably due to the high financial involvement associated with the strategies which low or medium income farmers can not afford.

Table 4: Distribution of Respondents based on Risk Copping Strategies

Risk	**Frequency**	**Percentage**
Irrigation	49	40.8
Mixed cropping	67	55.3
Non-farm activities	55	45.8
Spreading of sales	43	35.8
Fertilizer application	78	65.0
Improved varieties	45	37.5

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Application of Insecticides	37	30.8
Fencing of Farm	5	4.17
Use of native safeguards	10	8.3

Multiple responses

3.5 Factors Influencing adoption of Risk Copping Strategies among Maize farmers

The result of logit regression analysis in Table 5 below shows that age, sex, educational level and farm size had positive and significant relationship with adoption of farm risk coping strategies

Age

. The result from the study reveals that age is positive and significant at 1% level of probability. Thus, as the age of the farmer increases, the tendency to adopt risk-coping strategies increases which, however is contrary to expectation. Issa *et al.,* (2016) supported this assertion by stating that older people may tend to adopt better coping strategies because they have more experience in farming and are better able to assess the characteristics of modern technology than younger farmers

Gender

Gender of the household head is positive and significant at 1 percent. This implies that male-headed households adopt more risk-coping strategies than female-headed household. This is in line with the a-priori expectation. Male- headed household have relatively more access to information, land, technology, inputs and credit than female- headed households.

Farm size

The coefficient of farm size is positive and significant at 1%. This implies that as the farm size increases, the likelihood to adopt agricultural risk-coping strategies also increases. This is in line with the a-prior expectation. The reason is that the large-scale farmers are usually

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high capital base farmers and, therefore, can easily purchase and use improved inputs and practices than small-scale farmers thus, increasing the adoption of risk-coping strategies.

Educational level

The coefficient of educational level is positive and significant at 1%. This implies that as the farmer acquires more education, the likelihood to adopt agricultural risk-coping strategies also increases. This is in line with the a-prior expectation. Issa *et al.* (2016) also found that farmers with high level of education adopt new technologies easily and use them effectively

Table 5: Logit Regression of Factors Influencing Maize Farmers Adoption of Risk Copping Strategies

Variable	**Coefficient**	**Standard Error**	**P-Value**
Constant	-0000195	-0000637	0.001
Age	1.004734	-1234285	0.004*
Farming Experience	-8651865	-348964	0.724
Sex	2.786833	2.444219	0.003*
Household size	-9054254	-0956095	0.347
Income	-9999878	-0000166	0.461
Educational Level	1.432252	-1728567	0.003*
Extension Contact	- 6150633	-4992727	0.549
Farm Size	3.065249	1.122121	0.002*

Pseudo R^2 =0.2540
*significant at1% level of probability

4. CONCLUSION

Based on the findings of the study, it can be concluded that, majority of the respondents were married and within their active ages. The study also showed that majority of the respondents had one form of education or the other with majority having reasonable years of farming

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experience and annual income. The study also established that majority of the farmers are risk averse. The estimate of logit regressions showed that age, sex, educational level and farm size had positive and significant relationship with adoption of farm risk coping strategies. The farmers' ranked low price due to output quality as the first and most important source of risk followed by disease and pest, Poor yield, erratic rainfall, destruction of crops by grazing animals, output loss due to inadequate storage and loss of crops due to conflict/theft. The major risk coping strategies adopted by farmers in the study area include; fertilizer application, mixed farming, non-farm activities, irrigation etc

5. RECOMMENDATIONS

Based on the findings of this study, the following recommendations, among others are put forward:

i. Government and private insurance companies should develop more effective insurance product for maize farmers to patronize and use as shock absorbers against risky events.

ii. Financial institutions and banks as well as government poverty alleviation fund programs are encouraged to strengthen the provision of credit assistance to maize farmers to enable them to adopt the most efficient practices to increase production beyond subsistence level.

iii. Farmers are encouraged to form formidable cooperatives to manage production and marketing related problems.

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