RISK AND MANAGEMENT STRATEGIES OF YAM PRODUCERS IN BOSSO AND PAIKORO LOCAL GOVERNMENT AREAS OF NIGER STATE, NIGERIA

Ogaji,A.;Yisa,F.;Umar,A.; Oseghale,A.I.and Salami ,O.D

Department of Agricultural Economics and Farm Management. Federal University of Technology, Minna, Niger State.

Corresponding Author E-mail: abuogaji@gmail.com

08062125740

ABSTRACT

The study investigated the risk and management strategies practice among yam farmers in Bosso and Paikoro Local Government Areas of Niger State, Nigeria. Sample size of 184 respondents was selected for the study through random sampling technique and data were collected using a structured questionnaire and an oral interview schedule. Descriptive statistics, safety first principle and MLE were used to analyze the data. The major risks faced by the respondents were thefts, natural disasters, variation in commodity price, change in government policy, and lack of stock. Also, all the farmers were intermediate risk averse and the factors influencing their attitude to risk were; gender, household size, access to credit and access to extension services. The management strategies adopted to mitigate these risks were vigilante, application of fertilizer, improved storage facilities, crop diversification and use of pesticide. It can be concluded that the farmers in the study areas have an inclination to adopt risk management measures in their production enterprises, therefore it is recommended that government at all levels as well as extension agents should encourage more people (especially the youth) in the rural areas to go into yam farming, as it was found to be profitable in the study areas and this will go a long way to add to their income as well as reduce food insecurity in the country. It was also recommended that yam farmers should be provided with more credit facilities that will encourage them and increase their capacity to adopt risk management strategies and as such reduce risk to the minimal level.

INTRODUCTION

Risk is a probability or threat of damage, injury, loss, or any other negative occurrence that is caused by external or internal vulnerabilities, and that may be avoided through preemptive action, (Ermakov*et al.,* 2014) while uncertainty is potential, unpredictable, and uncontrollable outcome of a situation in which something is not known (Carleton, 2016). A risk is not an uncertainty (where neither the probability nor the mode of occurrence is known), a peril (cause of loss), or a hazard (something that makes the occurrence of a peril more likely or more severe. Agriculture production is subject to risk and the farmers' reaction towards risk influences their decisions on selection of inputs. Management of risk in agriculture is significant on several grounds, even though the minimization of farming risk does not always improve their welfare. Claire, (2010) stated that failure to manage risks would have direct consequences on farmers' incomes, market stability and food security. The need for the management of risk and uncertainty with yam production will be better appreciated when it is realized that 70% of the Nigerian population are farmers (Ekong,

2010). These farmers do not have the understanding of risk and management strategies skills or approach to manage problems and reduce consequences of risk and uncertainties. These situations therefore justify the need for a thorough assessment of existing risks in management of yam farms. Also, an understanding of how the farmers are affected and react to these risks will in due course help in the design of improved risk management strategies to be approached. Generally, farmers are known to be willing to sacrifice their potential income to avert risk due to the attendant negative outcome that accompanies risk (Dewan, 2011). The behavioural attitude of the farmers determine the quantities and type of resources they employed which in turn influence the aggregate farm output they are likely to obtain. In Nigeria, the yam production systems are dominated by rural farmers (Niger State Agricultural Development Project, 2012). These farmers operate mainly within the limits of their highly insufficient resources which tend to limit their capacity to employ most recommended risk management technologies. As such they are often left with only the option to either leave their farm operations to natural risk factors or ineffective strategies based on indigenous knowledge. The study's objectives describe the various risks involved in yam production. determine the factors influencing the farmers' risk attitudes and describe the risk management strategies among yam farmers in the study area.

METHODOLOGY

Study Area

The study area was Bosso and Paikoro Local Government Areas of Niger state. Niger state is situated in the north-central geopolitical Zone of Nigeria with Minna as its Capital City. It has a vast land mass of 86,000km2; approximately 8.6 million hectares constituting about 9.3% of the total land area of the Country. Niger state is laying on latitude 3.20^0 and longitude 11.30^0 north,Bosso headquarters are in the town of Maikunkele. According to the National Population Census (NPC) of 2016, Bosso has an area of 1,592km^2 and a Population of 208,100 persons (NPC, 20I6). Bosso lies between 60^0E and 280^0E longitude and latitude of 90^0N and 40^0N of the Equator. The second study area was Paikoro Local government. It has a total area of 2066 km^2 and a population of 222,200 as revealed by the 2016 census projection. It is geographically located within longitude $6^0$37 to $6^0$63 east and latitude $9^0$25 to $9^0$43 north of Niger state. The main occupation of the people in Bosso and Paikoro local government area is farming and the major crops grown by the farmers are: millet, guinea corn, maize, rice, vegetables, yam, cassava, potatoes, melon, ground nut, sugar cane, soybeans and some fruits among others. A sample selected in stages was employed to select yam farmers in the study area. The first stage involved the purposive selection of Zone II, in Niger State because of the prevalence of yam production in the area, The second stage involved random selection of Bosso and Paikoro Local Government Areas from Zone II, in the third stage, four (4) major yam producing villages/Communities were selected from each of the selected two Local Government Areas, giving a total of eight 8 communities, the formula that was used in selecting sample size proportionate to the population of yam farmers is given as (Abdullahi *et al.,* 2018). Data were collected from the yam producers with the use of questionnaire

Descriptive Statistics

Objectives one (i), and four (iv) were analyzed using descriptive statistics. This

involves the use of tables, charts, measures of central tendency such as mean, median, frequency distribution.

Ordinary Least Square Regression (OLS)

Following Ogaji (2019) as well as Ajetomobi and Binuomote (2006) the safety first principle was used to determine the risk attitudes of yam farmers as stated in objective (ii). Safety first principle model involves the use of OLS (Ordinary least square) regression analysis. Following Timothy (2015), the production function is specified as:……..……(1)

Where;

Y = Output (kg),

X_1 = Yam Setts (kg),
X_2 =Fertilizer (kg),
X_3 = Labour (mandays),
X_4= Farm size (hectares),
α = Intercept/constant
ln = Natural log,

The risk attitude coefficient is then computed thus :……...(3)

where;

K= coefficient of risks in category

= Coefficient of variation

S = Standard deviation of output,

y = Mean of output,

Xi = Coefficient of the most significant variable from the regression model,

Pi = Input price (₦)

P = Market price of output,

F1 = Elasticity of production of most important input.

Following Ajetomobi and Binuomote, (2006) and Ogaji, (2019) a farmer is risk preferring if $k<0$, low risk averse if $0<k<0.4$, intermediate risk averse if $0.4\leq k\leq 1.2<2.0$ and high risk averse if $1.2<k<2.0$.

Logit regression model

Objective ii The logit regression model was used to achieve the factor influencing the farmer's attitude to risk. The implicit form of the ordered logit model is specified as……...……... (4)
The explicit form of the function is specified as:……..(5)
where;

Y= risk attitude index
X_1= Age (years),
X_2= Gender (1 if male, 0 otherwise),
X_3= Marital status (1 if married, 0 otherwise),
X_4= Educational level (years),
X_5= Household size (number)
X_6= Farming experience (years),
X_7= Access to credit (1=yes o= otherwise)
X_8= Membership of cooperative societies (1, if member, 0 otherwise),
X_9 = Access to extension services/contact (numbers)
X_{10}= Lnyam setts (₦),
X_{11}= LnLabour employed (man days).

Variables	Measurement	Expected signs
Yam setts	Continuous (Kg)	+
Fertilizer	Continuous (Kg)	+
Labour	Continuous (Mandays)	+/-
Farm size	Continuous (number of hectare)	+
Age	Continuous (Years in number)	+
Gender	Dummy (0= female, 1= Male)	+/-
Marital Status	Dummy (1 if married, 0 otherwise)	-
Educational level	Dummy (1= literate, 0= Illiterate)	+
Household size	Continuous (number of family members)	+/-
Farming experience (Years)	Continuous (number years)	+
Access to credit	Continuous (naira)	+
Membership of cooperative societies	Dummy (1= Yes, 0= No)	+
Access to extension services/contact	Continuous (number of visit)	+

RESULTS AND DISCUSSION

Major Sources of Risk involved in Yam Production

The result of the risk associated with yam farmers in the study area is as presented in Table 4.1. From the result, the major risk faced by yam farmers in the study area were thefts (= 4.61), and variation in commodity price (=4.00) and ranked 1st, and 3rd respectively as the highest source of risks. This is expected given to the insurgency of Fulani herds' men, livestock that destroy people's farm, and cases of banditry in most villages. This has created fear in the heart of the farmers, since all the effort put to work is yielding a low return, people could no longer go to their farm land for the fear of unknown gunmen. This also led to an increase in market price on the commodity, because the farmers wanted to make profit for the little ones they could gather from the farm. Fluctuation in commodity price is also agreed to be one of the major factors that probe risk in the business and this is because most agricultural produce are seasonal and perishable. The season of great harvest and abundance always makes the farmer sell at a lower price in order to prevent spoilage and also have an effect on the price of the produce. Most of the framers agreed that natural disaster (=4.28) which ranked 2nd is one of the risks they encounter especially flooding as in the case of last farming season.

However risk associated with yam production in the study area which most of the farmers disagree to lack of technical-knowhow (=2.85), inadequate labour (=2.60), Lack of storage facility (=2.46), unfavourable weather (=2.40), and Low market demand (=2.15) ranked 9th, 10th, 11th, 12th, and 15th, respectively. And this due to the fact that majority of the farmers uses their household as a source of labour, they still apply the indigenous method of farming practices to business, they also have enough storage facility to store the yam up to the next farming season and because of consuming nature of yam more than half of the product is been sold at harvest and this do not give room to low market demand.

Table 4.1: Major risks involved in yam production (n=184)

Risk in yam production	*WS	WM	Rank	Decision
Thefts	848	4.61	1st	Agree
Natural Disaster	788	4.28	2nd	Agree
Variation in commodity price	735	4.00	3rd	Agree
Government policy	713	3.86	4th	Agree
Lack of stock	693	3.77	5th	Agree
Health status	630	3.42	6th	Agree
Inadequate credit facilities	590	3.20	7th	Agree
Disease and Pest infestation	578	3.14	8th	Agree
Lack of technical-know how	524	2.85	9th	Disagree
Inadequate labour	479	2.60	10th	Disagree
Lack of storage facility	453	2.46	11th	Disagree
Unfavourable weather	441	2.40	12th	Disagree
Death	418	2.27	13th	Disagree
Borrowing of finance	415	2.26	14th	Disagree
Low market demand	396	2.15	15th	Disagree
Total	**8,701**			

* means, multiple response exits
Source: Field survey, 2021.
Note: WS=Weight Sum, WM = Weight mean

Risk Attitudes of Yam Farmers

The regression result for the risk attitudes of yam farmers in the study area using the safety first model is as presented in Table 4.2. The result shows a coefficient of determination (R^2) of 0.8676 and the F-value of (293.21) was significant at 0.01 probability level which indicates a good fit of the model. The results revealed all the respondents were risk aversive as their respective risk attitude scores ranged between $0.4< k <1.2$. Based on this outcome, it can be inferred that the goal of the farmers is not only profit maximization but also for the purpose of food security of the farming household (Sadiq *et al.,* 2018).

Table 4.2 Regression analysis of yam farmer for risk attitudes

Variables	Coefficients	T – value
Constant	.4303624	9.54***
Yam setts	.9589054	23.55***
Fertilizer	-.0673406	-1.51
Labour	.0342356	1.31
Farm size	-.1373389	-3.00***
R-square	0.8676	
Adj. R-square	0.8646	
F-value	293.21***	

Source: field survey, 2021
Note: Number in parenthesis is T-values
***= 1% significant level.

Result in Table 4.2.1 shows the attitudinal ranking of yam farmers in the study area and here the risk attitude of the respondents were categories into four which shows the farmers level of risk aversion. From the result, all the respondents (184) fall within intermediate risk averse 0.4<k<1.2. This implies that farmers were risk averse and as such they employed some management strategies which contributed to their production success as intercropping farming. Risk averse farmers according to Jirgi, (2013), are more likely to practice intercropping as a way of diversification in order to avoid total crop loss in a bad production year.

Table 4.2.1: The risk attitudinal ranking of yam farmers in the study area

Risk category	Frequency	Percentage
Risk preference <0	-	-
Low risk averse 0<k<0.4	-	-
Intermediate risk averse 0.4<k<1.2	184	100
High risk averse 1.2<k<2.0	-	-
Total	184	100

Source: field survey, 2021

4.4 Factor Influencing the Farmers Risk Attitudes

The result of the Logit regression analysis to analyze the factors influencing the farmers risk attitude in the study area was presented in Table 4.3 Result indicates a likelihood ratio of 110.32 that was significant at 0.01 probability level. This confirms that the slope coefficient is significantly different from zero. The pseudo R^2 value of 0.5390 further confirms that the slope coefficient is not equal to zero. In other words, the independent variables are significant in explaining the risk attitudes of the respondents. Ojo, (2013) reported pseudo R^2 value of 0.36, which indicates a good fit for logistics models. Therefore, the R^2 value of 0.53 obtained in this study is an indicative of good fit for the estimated model. Results in Table 4.5 indicate that the explanatory variables that significantly explained the factors influencing the risk attitudes of farmers were gender, household size, access to credit and access to extension service with estimated maximum likelihood of -2.43, 0.18, -0.67 and 1.47 respectively. Gender was found to be negative and statistically significant at the 0.05 probability level. This implies that the male farmers were less risk averse than the female counterpart. Which can be attributed to the fact that the male farmers tend to take more risk by adopting new innovation practices than the female farmers. Household size was found to be positive and significant at 0.05 probability level implying that the higher the household size, the greater the consumption needs of the family and thus, less willingness to bear risk. Access to credit was found to be negative and statistically significant at the 0.10 probability level. This implies that the farmer becomes less risk averse with availability of credit facilities. This could probably be due to the fact that the farmers tend to take more risk especially on new innovation practices because of their large capital base. Access to extension service was positive and significant at 0.05 probability level. This implies that the more extension services a farmer had, the higher the probability to be risk averse because of the risk management knowledge acquired from extension service by the farmers. According to Saleh (2014), extension education helps in educating farmers on new farming practices, and production risk mitigating strategies to adopt.

Table4.3. Factor influencing the farmers risk attitudes

Variables	Coefficient	Standard error	z-value
Age	-.40757	.0317959	-1.28
Sex	-2.427765	1.14789	-2.11**
Marital Status	-.0847018	.6086783	-0.14
Educational level	.031506	.0361054	0.87
Household size	.1762965	.0799548	2.20**
Farming Experience	.0153591	.0553806	0.28
Access to credit	-.6685178	.4029543	-1.66*
Cooperative Society	-.8712073	.5795949	-1.50
Access to extension service	1.474005	.5233776	2.82**
Ln yam setts	-1.513654	1.417469	-1.07
Ln labour	.2705105	2.06952	0.13
Constant	2.467204	1.937434	1.27
Pseudo R Squared	0.5390		
Log likelihood	-110.31777		
LR Chi squared	32.68***		

Source: Field Survey, 2021
Note: Number in parenthesis is Z-values
*, **, and ***= implies significant levels 10%, 5%, and 1% respectively.

4.5 Marginal Effect and Quasi Elasticity

The result in Table 4.3.1 shows the estimated marginal effects and their quasi-elasticity is calculated for the significant variables. The significant variables affect the probability of risk aversion by farmers. In literature, (Rahji and Fakayode, 2009: Ojo, 2013), the quasi-elasticity rather than the marginal effects was used for explanatory purposes, this is because they are easier to interpret. The partial elasticities of farmers' household size, and access to extension service were all elastic with quasi-elasticity above 1. This means that a one percent change in their household size and access to extension service leads to more than proportionate change in the probability of the farmers to avert risk. In other words, the risk aversion attitudes of the farmers are greatly affected by the marginal increase in household size and access to extension services respectively. On the other hand, the partial elasticity of gender and access to credit was found to be inelastic. This implies that a one percent change in gender and access to credit leads to a less than proportionate change in the probability of the farmers to avert risk. The elasticity of the variables suggests that the probability of the farmers to avert risk is not greatly affected by the marginal changes of the variables.

Table 4.3.1 Estimated marginal effects and quasi elasticity

Variables	Marginal Effect	Quasi elasticity
Gender	-.501991	-2.21
Household size	.036453	2.32
Access to credit	.13823	1.71
Access to extension service	.3047812	3.05

4.6 Risk Management Strategies among Yam Farmers

The risk management strategies adopted by yam farmers in the study area was analyzed using descriptive analysis and the result is as presented in Table 4.4. The result of the risk management strategies adopted by yam farmers shows that the major risk management strategies adopted and practice by the yam farmers in the study area include the establishment of a group called the vigilante (=4.60), to mitigate against theft and banditry, application of agrochemicals (=4.60) to control pest and disease infestation, storage facilities(=4.36), crop diversification(=4.31), use of pesticide (=4.25), use of improve varieties of yam setts (=4.23), and fire tracing (=4.13) and ranked 1st, 3rd, 4th, 5th, 6th, and 7th respectively. Most of the farmers were into intercropping, mix cropping farming system, this implies that majority of the farmers do not rely only on yam produce as source of income and livelihood, majority of the farmers also use improved varieties of yam setts to mitigate the effect of pest and disease. Similarly, the old rugged method of mitigating natural disasters, especially fire outbreak and bush burning, were still being practiced by the farmers in the study area.

Other management strategies adopted by the farmer in the study area include: cooperative society (=3.72), availability of family labour (=3.67), extension contact/service (=3.54), off farm work (=3.45), crop insurance (=3.35), training and education (=3.21), reduction in consumption rate (=2.98), and Irrigation (=2.91).

Table 4.4: Risk management strategies among yam farmers

Management strategies	*WS	WM	Rank	Decision
Vigilante	847	4.60	1st	Agree
Application of fertilizer	847	4.60	1st	Agree
Storage facilities	803	4.36	3rd	Agree
Crop diversification	793	4.31	4th	Agree
Use of pesticide	783	4.25	5th	Agree
Use of improved resistance varieties	779	4.23	6th	Agree
Fire tracing	760	4.13	7th	Agree
Cooperative society	685	3.72	8th	Agree
Availability of family labour	675	3.67	9th	Agree
Extension contact/service	652	3.54	10th	Agree
Off farm work	634	3.45	11th	Agree
Crop insurance	617	3.35	12th	Agree
Training and education	590	3.21	13th	Agree
Reduce consumption	549	2.98	14th	Disagree
Irrigation	536	2.91	15th	Disagree

* means, multiple response exits

Source: Field survey, 2021.

Note: WS=Weight Sum, WM = Weight mean

CONCLUSION

The study concluded that the major source of risk farmers are exposed to varies from thefts, Natural disaster, variation in commodity price, disease and pest infestation and health status of the farmers. The farmers were intermediate risk averse having an inclination to adopt risk management measures in their production enterprise. Gender, household size, access to credit, and access to extension services were the factors influencing farmers' attitudes to risk while the risk management strategies adopted were vigilante, application of fertilizer, storage facilities, crop diversification, use of pesticide, fire tracing and cooperative society. in the study area. It is recommended that agricultural insurance policy should be introduced in order to facilitate sustainable food crop production and provision of credit should be given to farmers as it was found to be negatively significant to factors influencing farmers risk attitude and this will encourage yam farmers to increase their capacity to adopt risk management strategies and as such reduce risk to the minimal level.

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