

## FARM RISKS AND MANAGEMENT STRATEGIES AMONG ARABLE CROP FARMERS IN ODOGBOLU LOCAL GOVERNMENT AREA OF OGUN STATE, NIGERIA

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### ABSTRACT

This study examines farm risk and management strategies adopted by arable crop farmers in Ogun State, Nigeria. A two-stage sampling procedure was employed to select 120 respondents for the study with the aid of questionnaire. Data were analysed using descriptive statistics, Likert scale and logit regression model. Results revealed that erratic rainfall, pest and diseases were the major production risks faced by the farmers. Ill-health (69.2%) and low produce price (92.5%) were the major personal risk and marketing risk experienced by the farmers respectively. The major financial risks were insurance (86.7%) and lack of access to loan (83.3%) while the major institutional risk was lack of agricultural loan and subsidies (100%) from government. The major preventive strategy adopted by the arable crop farmers were use of agrochemicals and selling at reduced price. The most employed mitigation strategies were diversification (82.5%), on-farm sales (78.3%), *esusu* (77.5%), cooperative society membership (71.7%) and self-medication (70%). The prominent coping strategies employed were hired labour (77.5%), off-farm activities (73.3%) and borrowing (60%). The significant factors influencing the attitude of arable crop farmers to risk were sex, educational level of the farmers, household size, farming experience, membership of cooperative association, access to bank loan, farming system and off farm income. The study concluded that the arable crop farmers were risk averse and recommended that efforts should be geared towards training the farmers on the appropriate management strategies with emphasis on the need for the farmers to adopt innovations that will enhance improved farm practices in the study area.

**Keywords:** Arable crop, farm risk, management strategies, logit

## INTRODUCTION

Arable farming is a type of crop production that entails the production of wide range of annual food crops. This means that the crops life cycle from germination to seed production is complete within one year (Ibidapo *et al.*, 2018). Arable crops include; beans, soybean, cotton, yam, maize, cocoyam, cassava, rice, among others. Farming is a risky business. As with other types of farming, arable farming is subjected to uncertainties of weather condition, prices, pests and diseases infestation, hired labour availability, machinery and equipment malfunctioning and government policy (Kahan, 2013). These have negative effects on food prices, availability and farm profitability.

Binici *et al.* (2003) defined risk as an uncertainty that affects an individual's welfare and is often associated with adversity and loss. Smallholder farmers face many risks in their farming activities which hinder them from pursuing their farming as a business. The risk situation is made worse by the fact that the farmers operate in an environment with weak markets and lack access to sufficient support institutions that can assist the farmers to cope with risks. These lead not only to uncertainty in the level of production, but also to uncertainty in output prices. This can result in severe income losses and to fluctuations in consumption. Given their limited ability to offset these shocks, many rural small scale farm households suffer from extreme farm income fluctuations (Wolg, 1999).

Several studies identified production risk, marketing risk, financial risk, institutional risk, and human risk as the major sources of risk in agricultural production (Anton, 2008; Njavro 2009; Nto *et al.*, 2011; Ndem and Osondu, 2018). Production risk originates from adverse weather condition, insects, diseases, technology and any other events that directly affects production quantity and quality. Marketing risk emanates from uncertainty in the market for commodities such as fluctuations in output and input prices. Financial risk revolves round the method of acquiring and financing capital and farmer's ability to pay financial obligations. Institutional risk arises from changes in government and/or legal policies and standards that affect agriculture. Human risk emanates from man. The risk could be due to labour shortage, ill health, death, divorce, injury, fire outbreak, burglary or theft. Jirgi (2013) opined that risk occurs in agriculture because agriculture is contrived with many challenges, most of which are beyond the farmer's control. Such challenges include bad weather, flood, drought, pests and diseases, etc. Alimi and Ayanwale (2005) reported technical, market and financial risks as the prominent risks encountered in onion production in Kebbi State, Nigeria. Nmadu and Dankyang (2015) submitted that production, price and financial risks were perceived as riskier than marketing and personal risk; and most likely to occur all year round among small scale farmers in Kaduna State.

Risks are completely unavoidable in agriculture. Farmers must consistently adopt some measures to mitigate the effect of risk on their farming enterprise. Risk management, according to United State Department of Agriculture (2016), involves making selection among alternatives that degrade the economic consequences that can result from risks and uncertainties. The process of farm business management deals with decision aimed at eliminating or avoiding the incidence of risk or minimizing the adverse effects. Farmers usually adopt a number of strategies some of which, Hazzel (1992) categorised as choosing reliable enterprise, diversification, intercropping, irrigation, pest control, sale of assets, money lending and engaging in non-farm work. According to Kahan (2013), attitudes to risk are often related to the financial ability of the farmer to accept a small gain or loss. Farmers differ in the degree to which they accept risk. Some farmers are willing to accept more risk than others. Farmers' attitudes may be classified as: risk-averse (those who try to avoid taking risks), risk-takers (those who are open to riskier business options), and risk neutral (farmers who lie between the risk-averse and risk-taking position). This study, therefore, sought to investigate farm risks and management strategies adopted by arable crop farmers in Odogbolu Local Government Area of Ogun State, Nigeria.

Specifically, the study sought to;

- i. identify the major sources of risk to arable crop farmers in the study area;
- ii. determine the risk attitudes of arable crop farmers in the study area;
- iii. examine the determinants of the arable crop farmers' attitude to risk in the study area; and
- iv. identify the strategies adopted by arable crop farmers in managing risks.

## **METHODOLOGY**

The study was conducted in Odogbolu Local Government Area of Ogun state, Nigeria. The LGA is located on latitude 6°50'N and longitude 3°46'E in the Northwestern part of the state. The area occupies a land mass of 541 km<sup>2</sup> and a population of 127,123 (NPC, 2006). It consists of tropical rain forest and a small stretch of derived savannah. The people are predominantly farmers, growing food crops in virtually all parts of the local government area. The study area is noted for the production of arable crops such as maize, cassava, melon, vegetables, plantain, yam and rice.

### **Sampling Procedure and Sample Size**

A two-stage sampling procedure was employed to choose the respondents for the study. In the first stage, four communities were randomly selected from the list of communities in the study area. In the second stage, 120 arable crop farmers were randomly selected proportionate to the population of the respective communities.

Primary data were collected with the aid of a structured questionnaire administered to the selected respondents through one-on-one interview. The data collected include: socio-economic characteristics of the selected farmers, farming activities, types of risks and management strategies used by the arable crop farmers.

**Data Analytical Techniques**

Descriptive statistics such as frequency counts, percentages and mean values were used to identify major source of risks facing the arable crop farmers and risk management strategies adopted by the arable crop farmers.

Likert attitudinal scale (LAS) was used to determine the risk attitude of respondents. A five-point Likert scale was used to measure the farmers’ attitude towards risk. The farmers were asked questions graded on a 5-point scale, the responses were 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 and ranked using weighted mean (X). The mean score was 3. Therefore, using the cut-off point value of 3.0, farmers with mean score less than 3.0 were taken as risk averse while those with mean score above 3.0 were risk takers.

Logit regression model was used to determine the socio-economic factors influencing the attitudes of arable crop farmers to risk in the study area. The prominent attitude of the farmers (risk averse) takes the value of 1 and 0 otherwise. The logit model postulates that the probability (Pi) that a farmer will be risk averse is a function of an index Zi.

Zi is also the inverse of the standard logistic cumulative function of Pi, i.e.,

$$P_i [y = 1] = f[Z_i] \dots\dots\dots (1)$$

The probability of a farmer being risk averse given by

$$p_i [y = 1] = \frac{1}{1+e^{z_i}} \dots\dots\dots (2)$$

The probability of not being risk averse is given by:

$$Q_i [y=0] = 1 - P_i [y = 1] \dots\dots\dots (3)$$

Since,

$$1 = p_i [y = 1] = \frac{1}{1+e^{z_i}} \dots\dots\dots (4)$$

$$e^{z_i} = \frac{p_i[y=1]}{1-p_i[y=1]} \dots\dots\dots (5)$$

The dependent variable (yi) is a dummy (1 if the farmer is risk averse, 0 if otherwise).

$$Z_i = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + \dots\dots\dots + b_nX_n + e \dots\dots\dots (6)$$

Where:

b<sub>0</sub> = constant; X<sub>1</sub> = Age of farmer (years); X<sub>2</sub> = Sex of farmer (1 if male; 0 otherwise); X<sub>3</sub> = Educational level (years) X<sub>4</sub> = Marital status (1 if married; 0 otherwise); X<sub>5</sub> = Household size (No of people) X<sub>6</sub> = Farm size (ha); X<sub>7</sub> = Farming experience (years); X<sub>8</sub> = Cooperative

membership (1 if a member; 0 otherwise);  $X_9$  = Access to credit (1 if yes, 0 otherwise);  $X_{10}$  = Frequency of extension visit (1 if fortnightly; 0 otherwise);  $X_{11}$  = Income (₦);  $X_{12}$  = farming system (1 if mixed; 0 otherwise);  $X_{13}$  = Off-farm income (₦);  $e$  = random term.

## RESULTS AND DISCUSSION

### Socio-economic Characteristics of the Respondents

Table 1 presents the summary of the result on socio-economic characteristics of the respondents in the study area. The result reveals that the mean age of the sampled respondents was 51.8 years. This implies that the respondents were relatively old. This result corroborates the findings of Ndem and Osondu (2018) that farmers risk taking ability decreases with age. The mean household size of the respondents was six people. This implies that majority of the respondents had small household size. Distribution by farm size revealed a mean farm size of 0.53ha. This implies that the arable crop farmers were small scale farmers. The mean year of farming experience of about 14years is an indication that the arable crop farmers are well experienced in the farming business and have better understanding of the system, conditions, trends terrains, prices and risks inherent in arable crop farming. This result agrees with Kruase (1995) that experience reduces management risk.

**Table 1: Summary Statistics of Selected Socio-Economic Variables**  **$n = 120$**

Variable	Minimum	Maximum	Mean	Std. Deviation
Age	29	84	51.8	12.378
Household size	1	20	6	2.973
Farm size	0.6	2	0.53	0.330
Farming experience	2	40	14.39	8.964
Farm income	20,000	800,000	143,940.00	55879.348
Off-farm income	0	500,000	30,900.00	5948.715

**Source: Data from field survey, 2017**

The mean off-farm income of ₦30,900 implies that the arable crop farmers were involved in other income generating activities to boost their incomes and mitigate the risk effects in the study area. Ayinde *et al.* (2008) submitted that, the presence of other sources of income enhances the risk bearing ability of farmers and thus reduces their level of risk management.

### Major Sources of Risks to Arable Crop Farmers

The major sources of risks to arable crop farmers in the study area is presented in Table 2. The results reveals that the production risks encountered by the arable crop farmers were pests and diseases (75.8%), erratic rainfall (98.3%) and inadequate soil nutrients (40%).

These risks could have negative effect on the output as well as income realised by the farmers. This result is similar to the findings of Ayinde *et al.*, (2008) who reported that the major causes of farm loss were pest and disease outbreak, erratic rainfall pattern, theft, etc. Results also revealed that the major human/personal risks experienced by the arable crop farmers were theft (46.7%), ill health (69.2%) and labour shortage (33.3%). With respect to marketing risk, 48.3% of the respondents stated high cost of inputs such as seeds, fertilizers and pesticides as their marketing risk while 92.5% stated low produce price which affects their revenue base as their marketing risk. The major financial risks to the farmers were lack of access to loan (83.3%), high interest rate (42.5%) and lack of insurance (86.7%). Access to loan could help the farmers expand their farm business, increase their incomes and change their attitudes towards risk. Insurance coverage is also a way of mitigating the effects of risks on farm business and its lack could be attributed to the high cost and bureaucracy involved in acquiring agricultural insurance coverage. Ndem and Osondu (2018) reported that lack of adequate insurance coverage implies that farmers do not have formal security against unforeseen circumstances in their farms. Changes in agricultural policies by government (40%), lack of agricultural loan and subsidies from government (100%) and ineffective extension services (47.5%) were the major sources of institutional risks faced by the respondents in the study area.

**Table 2: Major Types of Risks Faced by the Respondents in the Study area**

<b>Types of Risks</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>Production Risk</b>		
Pests and diseases	91	75.8
Erratic rainfall	118	98.3
Inadequate soil nutrients	48	40
<b>Human/Personal Risk</b>		
Theft	56	46.7
Ill-health	83	69.2
Labour shortage	40	33.3
<b>Marketing Risk</b>		
High cost of input	58	48.3
Low produce price	111	92.5
<b>Financial Risk</b>		
Lack of access to loan	100	83.3
High interest rate	51	42.5
Lack of insurance	104	86.7
<b>Institutional Risk</b>		
Government policies	48	40
Agric. loan & subsidies	120	100
Ineffective extension services	57	47.5

**Source: Data from field survey, 2017 \*Multiple Responses**

The results in Table 2 is an indication that the farmers were affected by production, personal, marketing, financial and institutional risks. Similar results were reported by Alimi and Alayande, (2005); Nto *et al.*, 2011; Jirgi, 2013; Usman *et al.*, (2017); Ndem and Osondu, 2018).

### **Attitudes of the Arable Crop Farmers' to Risk**

Table 3 presents the result of Likert attitudinal scale (LAS) used to determine the farmers risk attitude in the study area. The result reveals that majority (66.7%) of the farmers were risk averse. The risk-averse farmers try to evade risky enterprise. They tend to be more conservative and prefer to choose less risky sources of income. A risk averter does not evade risk completely; however, he would seek to be recompensed for the risk taken by receiving a higher profit than would normally be obtained if there were no risk.

**Table 3: Distribution of Respondents by their Attitudes towards Risks** **n =120**

<b>Risk attitude</b>	<b>Frequency</b>	<b>Percentage</b>
Risk takers	18	15.0
Risk neutral	22	18.3
Risk averse	80	66.7

**Source: Data from field survey, 2017.**

Few (15%) of the respondents were risk takers who were opened to riskier business options Unlike the risk-averse, risk-takers would prefer to choose higher outcome alternatives. When given options, risk-taking farmers tend to prefer the chance to make gains rather than securing themselves from potential losses. About 18% of the respondents were risk neutral, that is, they lied between the risk-averse and risk-taking farmers. The result in Table 3 implies that majority of the respondents were risk averse. Similar results were obtained by Ayinde *et al.* (2008); Nmadu and Dankyank (2015); Ndem and Osondu (2018).

### **Determinants of Arable Crop Farmers' Attitude to Risk**

Table 4 presents the determinants of the respondents' attitude to risk. The log likelihood value of the model is 88.871. The chi-square (LR-statistics) value of 23.596 which was statistically significant at 1% level shows that the model has a good fit. It confirms that the slope coefficients are significantly different from zero. In other words, the independent variables are jointly significant in explaining the determinants of farmers' attitude to risk.

**Table 4: Logistic Regression Result on Determinants of farmers' attitude to risk**

Variables	$\beta$ coefficient	Wald	Exp(B)
Age	0.010	0.163	1.011
Sex	-1.449	4.861**	0.235
Educational level	-0.551	2.932**	1.735
Marital status	0.174	0.200	1.190
Household size	0.220	3.651**	1.246
Farm size	0.607	0.256	1.835
Farming experience	-0.056	2.115**	0.945
Cooperative society	-0.812	2.072**	0.444
Access to bank loan	-2.615	2.661**	0.073
Extension visits	0.347	0.777	1.414
Farm income	0.000	0.096	1.000
Farming system	-0.936	6.415**	0.392
Off-farm income	-0.000	2.210**	1.000
Constant	0.183	0.013	1.201
<b>Model Summary</b>			
<b>-2 Log likelihood</b>	<b>Cox &amp; Snell R Square</b>	<b>Nagelkerke R Square</b>	<b>Chi-Square</b>
88.871	0.210	0.825	23.596

**Source: Computed from Field Survey Data, 2017.**

*\*\*significant at 5%*

The result reveals that the significant factors influencing the attitude of arable crop farmers to risk were sex ( $P < 0.01$ ), educational level of the farmers ( $p < 0.01$ ), household size ( $p < 0.01$ ), farming experience ( $p < 0.05$ ), cooperative society membership ( $p < 0.05$ ), access to bank loan ( $p < 0.01$ ), farming system ( $p < 0.01$ ) and off farm income (0.05). Sex ( $P < 0.01$ ) of the farmers was found to have an inverse significant relationship with farmers' risk aversion attitudes in the study area. This implies that female farmers were more risk averse than male farmers in the study area. This could also be due to the fact that male farmers own most of the fixed assets on the farm and are therefore willing to take risk more than the female folk who often times depend on the male. Educational level of the farmers also had a negative significant relationship with risk attitude of the farmer. This implies that farmers with lower level of education were more risk averse and vice versa in the study area. This result agrees with the findings of Oluyole (2005) that high literacy level enables farmers to understand, adopt and use improved farm practices which are risky in nature. Years of farming experience of the arable crop farmers had a negative significant relationship with risk aversion attitude at 1% alpha level. This suggests that arable crop farmers with few years of experience were more risk averse than the highly experienced farmers in the study area. Furthermore, access to bank loan ( $p < 0.01$ ), membership of cooperative society ( $p < 0.01$ ), farming system ( $p < 0.01$ ) and off farm income (0.05) had negative significant influence on risk averse attitude of



respondents in the study area. These indicate that these variables reduce the ability of farmers to be risk averse implying that farmers that had access to bank loan, belong to a cooperative society, engaged in mixed farming system and off farm activities were not risk averse, capable of investing in innovation and adopt improve farm practices in the study area. Conversely, household size ( $p < 0.05$ ) had a positive influence on risk aversion attitudes of the respondents. This implies that farmers with large household size were risk averse in the study area. This could be because they have a lot of responsibility such as providing food, education, shelter, clothing, etc. for their household members and therefore cannot invest their money in an uncertain enterprise. This is in accordance with the findings of the study carried out in Borno State by Tijjani *et al.*, (2018) that household size of farmers had positive significant influence on adoption of improved pearl millet production practices.

#### **Risk Management Strategies Adopted by the Arable Crop Farmers**

The management strategies employed by the respondents were grouped into preventive strategy, mitigation strategy and coping strategy. As shown in Table 5, the major preventive strategy adopted by the farmers were the use of agrochemicals (85%) and selling produce at reduced price (74.2%). Agrochemicals such as fertilizers and pesticides were used to curb the risk of soil fertility and pest and diseases attack.

**Table 5: Distribution of Respondent by Risk Management Strategies**

Management strategy	Frequency	Percentage
<b>Preventive strategy</b>		
Use of agrochemicals	102	85.0
Crop processing	55	45.8
Sell at reduced price	89	74.2
Extension contact	34	28.3
<b>Mitigation strategy</b>		
Diversification	99	82.5
On-farm sales	94	78.3
Off-farm income	75	62.5
Use of resistant varieties	58	48.3
Cooperative society	86	71.7
<i>Esusu</i>	93	77.5
Self-medication	84	70.0
Visit clinics/hospital	43	35.8
Trado-medicine	54	45.0
Bulk sales	56	46.7
Spreading sales	41	34.2
On-farm sales	49	40.8
<b>Coping strategy</b>		
Hired labour	93	77.5
Borrowing	72	60.0
Off-farm activities	88	73.3
Reduced consumption	57	47.5
Selling assets	31	25.8

**Source: Data from field survey, 2017 \*Multiple Responses**

Also, most of the farm produce, especially the perishable ones were sold at reduced price to avoid total wastage. Other preventive strategies were crop processing (45.8%) and extension contacts (28.3%). The result also shows that the major mitigation strategies employed by the arable crop farmers include production diversification (82.5%). Diversification, which is the production of two or more crops and livestock simultaneously helps to spread risk. Also, 62.5% engaged in off-farm income as mitigation strategy. Etuk *et al.*, (2018) reported off-farm income as livelihood diversification strategy among farm households in Akamkpa Local Government Area of Cross River State. Majority (78.3%) of the farmers employed the strategy of selling their produce on the farm to curb post-harvest losses and losses due to the perishability of the produce. Those that engaged in monthly contribution called *esusu* to mitigate the effect of risk accounted for 77.5% of the respondents' while 71.7% belongs to

cooperative society. The result on cooperative society agrees with the findings of Idrisu *et al.*, (2012) who suggested formation of marketers' cooperative society as an intervention measure in coffee marketing in Kogi State. Majority (70%) of the respondents mitigate the effect of ill health using self-medication, the art of purchasing and using drugs without being prescribed by qualified medical practitioner. The coping strategies employed were hired labour (77.5%), off-farm activities (73.3%), borrowing (60%), reducing consumption (47.5%) and sales of assets (25.8%). Engaging in off-farm activities ensures that farmers have alternative sources of income due to irregular nature of agricultural activities.

## **CONCLUSION AND RECOMMENDATIONS**

Findings from this study revealed that the arable crop farmers in the study area were affected by production risk, human or personal risk, marketing risk, financial risk and institutional risk. The results also revealed that majority of the respondents were risk-averse and adopted prevention, mitigation and coping strategies as their risk management strategies.

Based on the findings of the study, the followings recommendations are made:

- 1) Efforts should be geared towards training farmers on the appropriate management strategies with emphasis on the need for the farmers to adopt innovation that will enhance improved farm practices.
- 2) Risk aversion attitude of the farmers was found to decrease with education. Government at the local government level should therefore organize adult education programme for the farmers to increase their knowledge and understanding on risk and application of the appropriate management strategies
- 3) Government should focus on creating and sensitizing the farmers on suitable insurance coverage to mitigate the effect of risks associated with yield and weather conditions.

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