Abstract

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# Farmers' Perception and Management of Natural Hazards in Production and Security of Farm Investment in Isuikwuato, Abia State, Nigeria

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This study on farmers' perception and management of natural hazards in production and security of farm investment was carried out in Isuikwuato Local Government Area of Abia State, Nigeria. The study was sought to identify farmers' perceived natural hazards in food production; identify adopted measures used in mitigating impacts of the hazards and determined factors that influenced farmers from taking formal insurance policy against these hazards. Sixty farmers were chosen following a multi-stage random sampling technique. The instrument of data collection was via a set of semi-structured questionnaire which was administered by personal interview method. The data were analyzed using descriptive statistics, 5 point likert scale and probit regression model. The result revealed fire outbreak, outbreak of diseases and pests, flooding, erosion, drought, theft, and ill health as natural hazards experienced by the farmers. The most perceived hazard was fire outbreak and the least perceived was floods. Farmers' level of education, farming experience, previous farm income and enterprise type were significant determinants of farmer's decision to take formal insurance. Experienced farmers mitigated effects of these hazards using cultural techniques. We recommended that government should provide a cushion infrastructure in form of dams to conserve floods and flowing streams to provide water for irrigation and ameliorate effects of occasional droughts and erratic rainfall. Farmers on their part should be encouraged by farm extension agency to take up formal insurance policy from designate companies against losses to their investments.

Keywords: Natural Hazards, Farm Investment Security, Cultural Management.

## 1. Introduction

Agricultural production depends much on weather, climate and soil condition. Most times natural disasters occasioned adverse climate and weather elements bring about droughts, extreme temperature and rainfall, flood, erosion, leaching that manifest in animal death, famine, crop failure, loss of properties, food insecurity, mass emigration and negative growth of the economy. Natural disasters to a farmer are hazards that demand prompt attention. Cherry (2010) was of the view that perception is a sensory experience of the world around the perceiver that allows him/her recognize both environmental stimuli and take actions in response to them. She further stated that through perceptual process, information about properties and elements of the environment that are critical to human survival are known. In her opinion, perception not only creates experience of the environment but helps the perceiver to act within the environment.

Perception seems simple and direct, but it is in fact fiendishly complex and very indirect involving use of five senses of sight, smell, touch, sound, and taste as well as a set of senses to detect changes in body positions and movements. Perceptual process is thus a sequence of steps that begins with the environment, through attended stimulus to perception of stimulus, and leads to recognition and action in response to the stimulus. There are clear indications that farmers have insufficient skill to perceive environmental hazards and this plays important role in occurrence of enterprise failure especially when the farmer has few years of farming experience. A single natural disaster can stunt enterprise growth for many years due to production lost, damaged infrastructure and diversions of scarce resources for recovery needs (Carter, and Barrett, 2006; Harwood et al., 1999). The likelihood that occurrence of natural hazard will result in a decline in wellbeing of farming in an area (vulnerability) can be managed considerably by accurate and timely predication and prompt taking of counter measures to reduce their impact on agriculture (Sivakumer, et al., 2005). Farming is financially risky as on daily basis farmers are confronted with changing weather; erratic product prices, poor yield, pest and diseases attack (Salimonu

and Falusi, 2009). Agricultural risks have over years been associated with negative outcomes of imperfectly predictable biological, climatic and price variables under the control of agricultural producers (World Bank, 2005). Many adjustments to natural hazards and processes have centered on land use planning, construction of structures to control natural processes, formal insurance policies, evaluation, disaster preparedness, and bearing losses (doing nothing). Which option a farmer chooses depends on a number of factors that must include hazard perception (Botkin and Keller, 1997). Salimonu and Falusi, (2009) were of the view that farmers perception of natural hazard differs which was attributed to their differences in level of education, farming experience, environment and culture. In Nigeria at formal level, farmers have options of taking crop or livestock insurance policy with Nigerian Agricultural Insurance Corporation (NAIC), National Health Insurance Scheme (NHIS) or any other insurance company to cover insurable risks. Realizing these, this study had a major objective of analyzing farmers' perception and management of natural hazards in production and security of farm investments in Isuikwuato area of Abia State, Nigeria. In achieving this, the study had specific objectives to: (i) identify farmers' experienced natural hazards and classify level of perception; (ii) identify measures used in mitigating impacts of the hazards; (iii) determine factors that influence farmers' decision to taking formal insurance policy against occurrence of natural hazards in the study area.

#### 2. Materials and Methods

This study was carried out in Isuikwuato Local Government Area (LGA) of Abia State. Nigeria. Isuikwuato LGA lies between Latitudes  $5^{0}41'N$  and  $5^{0}46'N$  of the Equator and Longitudes  $7^{0}45'E$  and  $7^{0}41'E$  of the Greenwich Meridian with a population of 115,749 inhabitants made up of 56,600 males and 59,134 females (NPC, 2006). The area has undulating topography and is typically agrarian producing food crops like cassava, melon, and maize under mixed cropping system; and cash crops like Cashew, and oil palm. Livestock such as poultry, sheep, and goats are kept in small scale by some farmers. These farming systems are homogeneous in the area. Farmers involved in this study were chosen using a three-stage random sampling technique. In the first stage, six autonomous communities were randomly chosen from fifty-six (56) autonomous communities within the three major clans of Imenyi, Oguduassa, and Isuamawu that make up the area. The chosen communities were Nunya, Eluama, Umuanyi, Obinetiti, Acha, and Amiyi Obilohia. In the second stage, two villages were chosen at random from each of the selected communities. This gave a total of

twelve villages involved in this study. In the third stage, five farm household were randomly selected from each chosen village giving a sample of sixty (60) farm households involved in this study. Primary data was collected from selected farm households using a pre-tested semi-structured questionnaire which was administered by personal interview method. Data gathered were analyzed descriptively and inferentially. Objectives (i) and (ii) were analyzed descriptively with frequency distribution table, means and percentages. In classifying farmers' level of perception of the hazard(s), individual Likert type questions on a five-point scale was used. Perception category nominal scores were: Strongly perceived (5); Perceived (4); Not sure (3); Didn't Perceive (2); and Strongly didn't perceive (1). The mean nominal score was (1+2+3+4+5)/5=3.0. Farmers with perception score of 3.0 and above were considered to have perceived and those with mean scores of below 3.0 were considered to have not perceived the hazard(s). Objective (iii) was analyzed with probit regression model. Factors that determined households decision to take formal insurance policy were thus subjected to a model of limited dependent variable as introduced by Tobin (1958) and as applied by Amamiya (1981) and corrected for bias in participation decision (Heckman, 1976). This probit model was stated as follows:

$$Yij = \alpha j + \beta j \sum_{k=1}^{3} Hijs + \epsilon ij \dots \dots \dots eq1$$

Where the  $H_{ijs}$  are vectors of s explanatory variables of the jth farm household deciding to take a formal insurance policy;  $Y_{ij}$  is a vector of binary variables such that  $Y_{ij} = 1$  if the jth household takes formal insurance policy on its farm enterprise(s), and 0 if otherwise. Since  $Y_{ij}$  can only assume two different values for the decisions, 1 or 0, the expected probability was defined as follows:

 $E (Yij) = E [\alpha j + \beta j \sum_{k=1}^{s} Hijs + \epsilon ij] = \alpha j + \beta j \sum_{k=1}^{s} Hij E (Hij) \dots eq2$ 

Equation (2) defines the proportion of households with characteristics  $(H_{ij})$  likely to take formal insurance policy in their farms. The empirical model was specified thus:

EXPij =  $\beta 0$  +  $\beta 1$  (FEij) +  $\beta 2$  (HSij) +

 $\beta$ 3 (EDij) +  $\beta$ 4 (FYij) +  $\beta$ 5 (FSij) +

 $\beta 6 (ETij) + \beta 7 (DSij) + \epsilon i j ... eq 3$ 

These variables are as defined in Table 1. The dependent variable was the decision of a farm household to take formal insurance policy as defined in equation (1). The explanatory variables were binary, continuous and/or discrete in nature. It was hypothesized that taking of insurance policy by a household would positively be influenced by: FEij, HSij; EDij; FYij; FSij; but would negatively be influenced by: DSij;.

Table 1. Description of Variables analyzed by Probit Regression Model								
Variable	Variable	Hypothesized	Description of Variable					
	Type	Variable Sign						
		Eqn. 3						
EXPij	Binary		1 if the jth household decides to take formal insurance policy; 0					
			otherwise;					
FE ij	Continuous	+	Number of years involved in farming;					
HSij	Discrete	+	1 if size of household is greater than 4 persons; 0 otherwise					
EDij	Continuous	-	Number of years of formal education;					
FYij	Continuous	-	Last Year's farm income in Naira;					
<u>FSij</u>	Continuous/	+	Number of hectares planted with crops/Number of livestock					
	Discrete		kept;					
ETij	Binary	+/-	Enterprise type (Crop=1; Livestock=2; Both=3);					
DSij	Continous	+	Distance of farmer to formal insurance (NAIC,NHIS) office;					
eij			Stochastic error term					
Σ			Summation sign					

Table 2. Farm Household Socioeconomic Characteristics in Isuikwuato, 2013.

Variable	Frequency	Mean of continuous/Discrete variables	Percentage (%)
Farming Experience (Years):			
Less than 5.0	7	3.9	11.7
5 - 09	10	7.8	16.7
10-14	15	11.5	25.0
15 – 19	17	17.4	28.3
20 and above	11	26.5	18.3
Household Size (Number):			
1-5	17	4.1	28.3
6 – 11	30	8.3	50.0
Greater than 11	13	12.5	21.7
Formal Education of Household head			
(Years):	9	0.0	15.0
No formal Education	11	5.4	18.5
Primary Education	26	9.8	43.3
Secondary Education	14	13.9	23.3
Tertiary Education			
Farm Size (Hectare):			
Less than 1.0	10	0.6	16.7
1.0-2.0	26	1.7	43.3
2.1-3.0	20	2.5	33.3
Above 3.0	4	4.7	6.7
Farm Income ( <del>N</del> '000):			
45-70	29	61.0	48.3
71-96	16	83.2	26.7
97-122	8	106.0	13.3
Above 122	7	156.1	11.7
Distance to formal insurance Office (km):			
35-40	28	37.4	46.7
41- 45	15	43.7	25.0
Above 45	17	47.2	28.3

Source: Field Survey, 2013

#### 3. Results and Discussion

# **3.1 Socioeconomic Profile of the Farmers**

Table 2 revealed the farmers involved in the study as having some reasonable years of farming experience. Few of them (11.7%) had less than five years' experience in farming with as much as 17 or 28.3% of them having farmed for between 15 and 19 years in the area. A reasonable experience in farming no doubt enhances a famer's awareness of occurrence of natural hazards and compels him/her to device or copy popular or unique mitigation measure to reduce the negative impact. The table further showed that half (50.0%) of the farm households had household size of between 6 and 11 members. Meanwhile, 28.3% of the respondents had smaller households of between 1 and 5 persons while 21.7% of them had larger households of more than 11 persons. Members of the households are persons to implement adopted mitigation for occurring natural hazards. Whether a large household size or a small one would implement adopted measures better, is yet to be known.

Level of education attainment was quite high as cumulatively 85.0% of household respondents received formal education with a reasonable proportion (43.3%) having received secondary school education. Formal and informal knowledge, no doubt is necessary in managing enterprise challenges. The farm sizes were majorly less than three hectares with a good proportion (43.3%) cultivating between 1.0 and 2.0 hectares. It revealed predominantly small scale farm operators more akin to individually and collectively implements measures that ameliorate effects of any natural hazards within the limits of technology that is available.

The means of the various seasonal farm income cohorts ranged from N61, 000.00 to N156, 000.00. These differences reflect largely the scale of each farmer's operation. Further, majority of the farmers were located farther than 40 kilometers from the formal farm insurance (NAIC) office in Umuahia, the headquarters of the state. This might call for further decentralization of farm formal insurance institution by encouraging establishment of desk officers at level of local governments.

# 3.2 Natural Hazards, Farmer Perception and Management

Table 2, revealed that farmers in Isuikwuato area had perceived and experienced many natural hazards. The most highly perceived natural hazard was fire outbreak and the least perceived was occurrence of flood. Between these two hazards they also perceived in ascending order the following hazards: theft, pests, enterprise disease, ill health, soil erosion and drought. In response, they applied some cultural mitigation measures to manage the hazards that included slashing the bush ends farmlands to act as fire break against fire outbreaks; keeping surveillance over farms and harvesting crops promptly to guard against thieves. Other measures were setting of traps for mammalian pests and birds and planting resistant varieties of crops; constructing contiguous earth mounds to block water inflows, planting cover crops (melon) and constructing water channels that ended in distant ditches to control soil erosion and flood. Perception of occasional droughts required them shifting their enterprise and embracing vegetable cultivation along banks of nearby streams.

# **3.3 Determinants of Decision to Take Formal Insurance Policy by Farmers**

Table 3, showed estimates of probit regression analysis on variables hypothesized to influence farmers' decision of taking formal insurance policy to cover their enterprises. The table showed that four out of the seven variables included in the model were statistically significant at different probability levels. The highly significant variables at 1.0% alpha level were years of farming experience, level of formal education of the decision maker, and previous years' farm income. These variables all had positive influence except years of farming experience. This meant that the larger the number of years of formal education acquired by a farmer, and the amount received as previous farm income on an enterprise, the more the farmer decides to take formal insurance to cover the enterprise. These are plausible because both farm income and acquired formal knowledge are cherished motivators that jealously guide an entrepreneur to invest in measures to protect self against inherent losses.

Farming experience having a negative influence on decision to take formal insurance suggests that more experienced farmers employed skills acquired over years to mitigate influence of these hazards and therefore cared less to take formal insurance policy. This observation truly attests to small scale farming intensity that validates their use of cultural measures in providing 'adequate' protection to unforeseeable losses.

Enterprise type was another variable that had a less but positive significant (10.0% alpha level) influence on decision of farmers to taking formal insurance policy for their enterprises. These were categorized into livestock farming, crop farming or mixed farming. The livestock (poultry) famers tended to cover their flock more than crop farmers. This probably was on grounds of devastating losses associated with diseases and pests of the animals when poorly managed.

	Tal	ble 2. N	atural	Hazard	(s), Farme	rs Leve	el of Per	rcepti	on and Mitigation Measures		
Natural Hazard	Farmer Hazard Perception								Mitigation Measure(s)		
	Strongly Perceived	Perceived	Not Sure	Did not Perceive	Strongly Did not Perceive	Total Score	Mean	Rank			
Flood	23 (115)	15 (60)	6 (18)	7 (14)	9 (9)	216	3.60	8 <sup>th</sup>	Constructing contiguous earth mounds to block water inflows; Constructing water channels ending in distant ditches.		
Drought	19 (95)	21 (84)	7 (21)	8 (16)	5 (5)	221	3.68	7 <sup>th</sup>	Shifted to stream bank vegetable farming;		
Soil Erosion	20 (100)	23 (92)	4 (12)	5 (10)	8 (8)	222	3.70	6 <sup>th</sup>	Intercropped with melon as cover crop; Constructing contiguous earth mounds to block water inflows		
Fire Outbreak	24 (120)	27 (108)	3 (9)	3 (6)	3 (3)	246	4.10	Ist	Slashing the bush ends of the plot to serve as fire break; Burning plant residues in deep evening hours to minimize fire spread through wind effects.		
Pests	19 (95)	27 (108)	9 (27)	2 (4)	3 (3)	237	3.95	3 <sup>rd</sup>	Setting traps for mammalian and avian pests; Erecting scare crows with rags to frighten pests.		
Enterprise Diseases	20 (100)	25 (100)	9 (27)	3 (6)	3 (3)	236	3.93	4 <sup>th</sup>	Planting disease resistant crop varieties.		
Theft	26 (130)	19 (76)	7 (21)	5 (10)	3 (3)	240	4.00	2 <sup>nd</sup>	Keeping closer watch on farms especially when crops have matured; Harvesting all matured crops early.		
Ill health	21 (105)	22 (88)	4 (12)	5 (10)	8 (8)	223	3.72	5 <sup>th</sup>	Reporting to health centers when sick; Routine vaccination pregnant women and infants; Taking prescription from patent medicine dealers.		

Source : Field survey, 2013. Figures in parentheses are nominal scores while others are the frequencies

Table 3. Probit Regression Estimates of Determinants of Decision to Take Formal Insurance policy
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Table 5. Probit Regression Estimates of Determinants of L	Decision to Take Fo	ormai insurance p	oncy
Variables	Estimates	Standard Error	Z-Value
Farming Experience	-0.056	0.025	-2.248***
Level of formal Education	0.655	0.147	4.450***
Enterprise type	0.151	0.089	1.697*
Farm size	0.039	0.084	0.471
Household size	0.049	0.051	0.973
Previous year Income	0.187	0.059	3.175***
Distance to NAIC, and NHIS Office	0.054	0.066	0.414
Intercept	-2.228	0.460	-4.840***
Pseudo Chi Square	110.01***		
df	53		

\*= Significant at 10.0%; \*\*= Significant at 5.0%; \*\*\*= Significant at 1.0%

# 4. Conclusions and Recommendations

Farmers in the study area had perceived and experienced many natural hazards. The most perceived and experienced hazard was fire outbreak and the least perceived was flood. Other hazards perceived and experienced to varying levels were diseases, erosion, ill health, pests attack, droughts and theft of products.

In event of occurrence of these hazards, those knowledgeable with some cultural skills mitigated their effects. Flood was managed by construction of contiguous earth mounds to block water inflows and construction of water channels that ended in distant ditches. Erosion control involved construction of contiguous earth mounds to block water inflows and planting of leguminous cover crops, especially melon. Pests and diseases were controlled with traps and resistant varieties. Farmer's decision to take formal insurance to cover their enterprise was influenced by farmers' level of education, farming experience, previous farm income and enterprise type.

We recommend that government should provide a cushion infrastructure in form of dams to conserve floods and flowing streams to provide water for irrigation and ameliorate effects of occasional droughts and erratic rainfall. Farmers should be encouraged by farm extension agency to take up formal insurance policy from designate companies against losses to their enterprises. Finally, further decentralization of farm formal insurance institution by encouraging establishment of desk officers at level of local governments will encourage farmers to take up formal insurance policy.

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