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Determinants of Vulnerability to Food Insecurity among Rural Households in Ekiti State, Nigeria

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Abstract

Assessing vulnerability to food insecurity is instrumental to addressing food security challenges in developing countries. Food production rate in Nigeria is not keeping pace with its population growth rate and this is a serious case for concern with respect to food availability to feed the teeming population. Against this backdrop, this study examined the determinants of vulnerability to food insecurity in Ekiti Sate, Nigeria by applying statistical and econometric tools. Three-stage random sampling procedure was used to elicit cross-sectional data from a total of 150 rural households across 5 local government areas (LGAs) of Ekiti State using semi-structured questionnaire. The Coping Strategy Index (CSI) was used to assess vulnerability to food insecurity status of the households and ordered logit regression was used to identify the factors affecting vulnerability. Findings revealed that 35.33% of the households were moderately vulnerable, while 33.33% and 31.33% were mildly and severely vulnerable, respectively in the study area. Borrowing food, eating seed stock, begging for food and reducing meals were the major coping strategies adopted by the households. Regression results show that out of the 10 significant variables, age of household head, number of dependents, non-food expenditure and number of coping strategies positively influenced vulnerability while being married, educational level, farm income and off-farm occupation negatively influenced vulnerability to food insecurity among the households. The study concluded that policies that address capacity building, increased rural income and its source diversification are likely to enhance resilience of rural farming households in the study area.

Keywords: Coping strategies, Household vulnerability, Food security, Ordered logit.

Introduction

Food security and food insecurity are at the opposite extremes of a spectrum. Food security occurs when people have unfettered access to quantity and quality of food necessary for them to live a meaningful life. The global understanding of food security comprises of various concepts such as ecological, social, economic and political aspects that help to recognize the choices and problems that determine whether people have enough resources to consume the food they need and desire. The importance of investigating food security is necessitated by the recent events of increasing population (Ogundari, 2017).

Nigerian food production is increasing at less than 2.0% while population growth rate is estimated to be 2.5% per annum (NPC, 2012; Aku, 2012) which makes the country spend enormous amount on food importation. During the period 2014-2016, the level of undernourishment in sub-Saharan Africa rose to about 220 million when compared to 180 million recorded between 1990 and 1992 and Nigeria is one of the food deficit countries in sub-Saharan Africa (FAO, 2015). This has led to many rural farmers adopting some coping strategies against food shortage related shocks coupled with the pervasive poverty prevalent in rural Nigeria (Adepoju and Yusuf, 2012).

In literature, the idea of vulnerability is used with different implications. Much of the disaster management literature use vulnerability with reference to a natural hazard while the food security literature, and part of the social risk management and poverty literature (Mansuri and Healy, 2001; Calvo and Dercon, 2005; Holzmann and Jørgensen 2011), define vulnerability in terms of an unfavourable future outcome. Vulnerability refers to people's propensity to fall or stay below food security threshold within a certain timeframe (Løvendal and Knowles, 2005). In this study, vulnerability is viewed in terms of coping strategies. The global increase in food prices and global financial crises has put challenges on and increases food insecurity (Eyob, 2012). This is further driven by unemployment, underemployment, rising cost of living, household composition, low asset ownership, low education level, high dependency on the informal sector and population pressure as a result of natural phenomenon and rural-urban migration. It is thus important to better understand the role of shocks and strategies that households and especially rural communities can adopt to reduce the likelihood of food insecurity.

Therefore, the general objective of this study is to examine the determinants of vulnerability to food insecurity among rural farming households in Ekiti State while the specific objectives of the study are to: profile households by their socio-economic characteristics, determine the level of vulnerability of households to food insecurity, identify the factors determining vulnerability of the households to food insecurity and examine the coping strategies adopted by the households against food-shortage and related shocks.

There are three main approaches to vulnerability measurement, Vulnerability as Expected Poverty (VEP), Vulnerability as low Expected Utility (VEU) and Vulnerability as Uninsured Exposure to Risk (VER) (Naudé et al., 2009). Both the VEP and the VEU approaches employ the same measure in analyzing vulnerability but the VEU approach, unlike the VEP, takes covariate shocks into consideration while the VER assesses whether observed shocks generate welfare losses (Oni and Yusuf, 2008). Many authors have used the three approaches in literature. Chaudhuri (2000, 2001) used VEP, Ligon and Schechter (2003) applied the VEU approach, and Skoufias (2002), Quisumbing (2002), Oni and Yusuf, 2008) adopted VER. This study uses the VEP approach because of data limitation despite the shortcomings in using cross-sectional data approach to infer vulnerability because it captures only idiosyncratic risks and does not address covariate risks (community and national related risks) (Oni and Yusuf, 2008).

Various studies carried out in developing countries have highlighted a number of factors considered as determinants of household's vulnerability to food insecurity status. Adepoju and Yusuf (2012), in the study on poverty and vulnerability in rural South-west Nigeria and using the relative poverty line of ₦3313.57, reported that a total of 324 (55.7%) households were vulnerable. This result indicates that vulnerable households were higher than the proportion of the poor in South-western Nigeria. This finding is in line with findings from other studies by Chaudhuri *et al.*, (2002) and Kasirye (2007) in which the proportion of vulnerable is greater than the proportion of households that were actually poor. Hussaini *et al.,* (2016) identified the determinants of food insecurity among farming households in Katsina State, North-western Nigeria using a cross sectional sample survey, Focus Group Discussion and Key Informant Interview, coping strategy index and ordered logit. They found that majority (73%) of the households were vulnerable to food insecurity, 44% were less food insecure, while 17% and 12% were moderately food insecure and severely food insecure respectively. The study concluded that food insecurity was high in the study area and therefore recommended that the farming households be provided with opportunities to diversify their livelihood activities. Ogundari (2017), in a study categorizing households into different food security situations in Nigeria, found that households that consume only home-produced food have high probabilities of being food insecure, while households that consume only market-purchased food are less likely to be food insecure. According to the study, the implication of this finding is that harmonisation of food security indicators helps identify households with different nature of food (in) security problems that require different types of policy interventions most especially in Nigeria.

Research Methodology

Study Area:

This study was carried out in Ekiti State of Nigeria. The state is located on latitude 7° 15[1] North and longitude 4° 45[1] and 5° 45[1] East of the Greenwich meridian. The inhabitants of the state are mainly farmers, civil servants and petty traders. The state enjoys tropical climate with two seasons, namely rainy season (April-October) and dry season (November- March). The strategic location of the state allows both farm and non-farm activities to thrive side by side in the state and it has a good mix of male and female farmers. Agriculture is the main occupation of the people and it provides income and employment for over 75% of the population in the state.

Methods of Data Collection and Sampling Procedure:

Semi-structured questionnaire was used to gather the required data for this study from representative 150 crop farmers using a three-stage sampling technique. Data were collected on socioeconomic and vulnerability characteristics. The CARE International/World Food Programme (WFP) Household Coping Strategy Index (CSI) (Maxwell *et al*., 2003) was used to measure vulnerability to food insecurity considering its appropriateness in measuring vulnerability to food insecurity (Migotto *et al.*, 2005). The CSI index was calculated by multiplying the frequency and consensus severity of using a set of eleven coping strategies against food shortage related shocks. The higher the score the higher the probability of a household being vulnerable to food insecurity.

Methods of Data Analysis:

Descriptive statistics were used to profile the households by their socioeconomic characteristics, factor analysis was used to group the CSI scores into three levels of vulnerability (mild, moderate and severely vulnerable), ordered logistic regression was used to assess the factors determining vulnerability of the households to food insecurity, while Likert scale was used to analyse the coping strategies adopted by the household against food shortage related risks.

According to Grilli and Rampichini (2014), an ordered logit model is a regression model for ordinal response variable. Thus, the ordered logit model for an ordinal response *Yi* with C categories is defined by a set of C-1 equations where the cumulative probabilities, $g_{ci} = \Pr(Y_i \leq y_c|x_i)$ are related to a linear predictor $\beta' x_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \cdots$ through the logit function:

$$logit(g_{ci}) = \log\left(\frac{g_{ci}}{1-g_{ci}}\right) = \alpha_c - \beta' x_i, \quad c = 1,2, \dots, C-1. \quad \dots. (1)$$

The parameters α_c are thresholds/cut-points which are in increasing order ($\alpha_1 < \alpha_2 < \dots < \alpha_{c-1}$).

The ordinal response Y_i is the dependent variable reflecting the 3 categories of vulnerability to food insecurity:

Y_i= 0; Households who are mildly vulnerable
Y_i = 1; Households who are moderately vulnerable
Y_i= 2; Households who are severely vulnerable
α_j = the intercept term, β_j vector of parameter to be estimated
X_1 = Sex of household head (male=1, otherwise =0)
X_2 = Age of household head (years)
X_3 = Household size (number of persons)
X_4 = Marital status of household head (married=1, otherwise=0)
X_5 = Farm income (Naira)
X_6 = Education level of household head (years)

X_7 = Food expenses (Naira)
X_8 = Access to extension services (Yes = 1, otherwise=0),
X_9 = Duration of incapacitation by sickness (days)
X_{10} = Amount of labour used (hours)
X_{11} = Off-farm occupation (Yes = 1, otherwise=0)
X_{12} = Size of dependents (number of persons)
X_{13} = Farm size (hectares)
X_{14} = Number of coping strategies
X_{15} = Non-food expenses (Naira)

Results and Discussion

Profiling Households by Socioeconomic Characteristics:
Table 1 shows that approximately 7 out of every 10 respondents are males, in age bracket 41-50 years and live in households of 4-7 members and at least 2 dependants. Furthermore, 4 out of every 10 respondents cultivate between 0.8 and 1.2 hectares of land, seven-tenths earn between ₦3,000 and ₦13,000 monthly while close to 60% had tertiary education. It could be deduced that households in the study area are educated smallholders of medium household size with meagre farm income and who are still in their economically productive years.

Classification of Households by Vulnerability Indices:
Classification of households into vulnerable groups is essential to know the cut-point for the household food insecurity status for necessary intervention programs (Ogundari, 2017). Table 2 shows that, out of 150 households sampled, 33.33% were mildly vulnerable, 35.33% were moderately vulnerable while 31.33% were severely vulnerable to food insecurity. Households who range between 0-0.4 are the vulnerable ones who are still able to cope, those with index 0.41-0.46 are the ones that need urgent but temporary external assistance to get out of shocks while the ones with emergency levels are those with index between 0.47 and 0.84.

Determinants of Vulnerability to Food Insecurity in the Study Area:
Although fifteen (15) variables were hypothesized to influence vulnerability to food insecurity, the ordinal logistic regression result affirmed only ten (10) factors as being significant determinants of household vulnerability (Table 3). These are: age of the household head, marital status, education level, number of dependents, farm income, non-food expenses, access to extension services, labour hour use, off-farm occupation and numbers of coping strategies. The estimated cut-off points (μ) satisfy the conditions that $\mu 1 < \mu 2 < \mu 3$. This implies that these categories are ranked in an ordered way (Hussaini *et al*., 2016). The first cut-off point (Y=0 for "mildly vulnerable group") was used as a mark for the purpose of comparison. Estimated coefficients and marginal effects are presented in Table 3. Marginal effects are used for explanation since estimated coefficients from an ordered logit model are difficult to interpret because they are in log-odds units.

The results showed that a unit increase in age of the household head will cause 1.87% decrease in probability of the household being mildly vulnerable, 0.07% increase in the probability of the household being moderately vulnerable and 1.80% increase in probability of the household being severely vulnerable to food insecurity in the study area. Age is significant at 1% level of probability and has a positive relationship with food insecurity in both the moderate and severely vulnerable categories but not significant in the moderately vulnerable group. This finding is consistent with previous studies by Opiyo *et al*. (2014) and Babatunde *et al*., (2008) who found that elderly farmers are relatively less productive in rural communities of Kenya and Kwara State (Nigeria), respectively, and are thus

exposable to the vagaries of (negative) economic realities. Elderly household heads are probably worse off in terms of labor strength and preparing strategies to cushion their families against adverse food security threats and impacts and likely to make them more vulnerable.

The coefficient of marital status (married) of the households is both negative and significant at 10% level of probability in both moderate and severely vulnerable groups, but it is positive in the mildly vulnerable groups. It means that people who stay together (as spouses) are less likely to increase the probability of being moderately and severely food insecure by 0.4% and 10.0% respectively than single or married household heads who are separated or widowed. This result is like studies (such as Obayelu, 2010 and Kaloi *et al.*, 2005) that concluded that married couples or households headed by the married are likely to be more food secure than others. Education level coefficient is positive and significant at 5% level in mildly vulnerable households while it is negative and significant at 5% level in severely vulnerable households. The implication of this is that as more people get educated in the study area, the probability of the households being mildly food insecure increases while the chances of becoming severely food insecure decreases. This is because education equips individuals with the necessary knowledge of how to make a living. This result conforms to previous study by Welderufael (2014), who found that the effect of education on food security works indirectly by influencing the actions of the farmers in how to make a living.

Furthermore, a unit increase in farm income will increase the probability of being in the mildly vulnerable category and reduce the probability of being in the severely vulnerable category. The coefficient of this variable is significant at 5% level of probability for both the mildly vulnerable and the severely vulnerable groups. The negative effect indicates that an increase in monthly farm income will reduce the chances of a household in the study area becoming severely food insecure. This finding is consistent with previous studies by Bogale and Shimelis (2009) and Bashir *et al*. (2012). Also, a unit increase in the number of dependents will increase the probability of being in severely vulnerable category while reducing the probability of being in the mildly vulnerable category. This variable is significant at 1% level of probability in both cases. The implication of this result is that the more dependents a household has, the less likely to be mildly vulnerable and the more likely for it to be severely vulnerable since a larger proportion of household resources are directed to dependants who cannot contribute much towards household welfare. This finding is consistent with the findings of Opiyo (2014).

The coefficient of non-food expenses is significant at 10% both for the mildly and severely vulnerable households but not significant for the moderately vulnerable households. This variable has an inverse relationship with food insecurity in the mildly vulnerable groups and a direct relationship with the severely vulnerable group. The implication is that a unit rise in spending on non-food items will reduce the probability of a household being mildly food insecure and increase the likelihood of the household being severely food insecure. This implies that spending on non-food items reduces the amount of resources that will be available to combat food insecurity. Access to extension services ($p<0.10$) will reduce the chances of being severely vulnerable to food insecurity. This is because contact with extension services tends to enhance the chances of a household having access to better and improved varieties of crop. It gives the farmers opportunity to learn new production techniques that can increase their yield and improve their present and future food security situation. This result is consistent with the findings of Ayantoye *et al*. (2011) and Lemma (2014).
The coefficient of labour hour use is negative for the severely vulnerable group implying that a unit rise in hours spent on farm labor will reduce the probability of the households being severely food insecure. More energy expended at work can accelerate production, harvesting and processing of crops on the

farm thereby contributing to total output and reducing food insecurity. This is in line with findings of Carter *et al*. (2013) and Fafchamps and Czukas (1998) on the study of food insecurity in New Zealand and West Africa, respectively. In the same vein, a unit increase in off-farm occupation ($p<0.10$) will reduce the probability of a household being severely food insecure and increase the chances of being mildly food insecure. Access to alternative employment opportunities help to diversify income sources and increase amount of income received by households. As the number of coping strategies increases, the likelihood of being mildly vulnerable reduces while the chances of being severely vulnerable increases in the study area. Coping strategies are adopted more by households that are much more in need.

Household Coping Strategies:
Figure 1 shows the result of the Likert scale analysis of the coping strategies. It revealed that 78%, 74%, and 75% of the total households strongly agreed that relying on less preferred food, limiting portion of food and reducing meals, respectively, are the least severe coping strategy in the study area. About 70%, 66% and 67% of the total household chose borrowing food, purchasing food on credit and allowing household members to eat elsewhere as moderately severe, respectively. About 59% 75%, and 75% of the households chose gathering of wild foods, begging for food and skipping days without eating as very severe respectively. About 66% and 65% of the households strongly agreed that eating seed stock and restricting adults at meal are severe, respectively.

Conclusion and Recommendation

Assessment of vulnerability to food insecurity is a step towards ensuring food security in developing countries. This study thus sought to assess the determinants of vulnerability to food insecurity in Ekiti State. Households in the study area were found to be fairly distributed across the vulnerability statuses. As age was discovered to be very crucial in reducing vulnerability to food insecurity, more active youths are needed as farmers since they are less likely to be vulnerable to food insecurity and will therefore be more effective in food production. Emphasis is also needed on farmers' education and income diversification drives as these are likely to enhance resilience of rural farming households to food insecurity. Furthermore, it is vital that government promotes agricultural education and extension services in the study area. The effects of household dependency make it imperative to educate rural households on reproductive health to be able to plan for smaller family sizes. Since the government cannot do all, more strategies should be worked out through Private-Public-Partnership (PPP) in addressing issues of food insecurity at household level.

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Table 1a. Socioeconomic characteristics of the respondents.

Variables	Frequency	Percentage
Sex of head		
Female	45	30.0
Male	105	70.0
Age of head		
≤ 40	29	19.3
41-50	104	69.3
51-60	14	9.3
>60	3	2.1
Household size		
≤ 3	30	20.0
4-7	103	68.7
≥ 8	17	11.3
Farm size (hectares)		
≤ 0.4	36	24.0
0.8 -1.2	63	42.0
≥ 1.6	51	34.0
Farm Income (Naira)		
≤ 3,000	4	2.7
3,001-13,000	110	73.3
13,001 - 23000	30	20.0
≥24,000	6	4.0
Education level		
Primary	52	34.7
Secondary	14	9.3
Tertiary	84	56.0
Number of dependents		
≤ 2	109	72.7
3-5	30	20.0
≥ 6	11	7.3
Total	**150**	**100.0**

Table 1b: Summary statistics of continuous variables

Variables	Mean	Standard dev.	Min.	Max.
Age (yrs)	59.3	10.6	30.0	81.0
Household size	6	2	1	9
Number of dependents	1	2	0	8
Farm income (₦)	10556.00	6828.48	3000.00	35000.00
Farm size (ha)	4.4	1.1	2.0	7.0
Food expenditure (₦)	12756.67	6867.33	4000.00	33000.00
Duration of incapacitation by sickness (days)	2	1	1	5
Amount of labour used (hrs.)	4.9	1.1	2.0	6.0

Source: Field Survey (2017)

Table 2: Distribution of households into vulnerability status.

Vulnerability category	Vulnerability Index	Frequency	Percentage
Mildly vulnerable	0 to 0.4	50	33.3
Moderately vulnerable	0.41 to 0.46	53	35.3
Severely vulnerable	0.47 to 0.84	47	31.4
Total		**150**	**100.0**

Source: Field Survey (2017)

Table 3. Determinants of vulnerability to food insecurity in Ekiti State, Nigeria

Variables	Coefficient	Marginal effects		
		MiV	MoV	SV
Age	0.093***	-0.019***	0.001	0.018***
	(0.029)	(0.006)	(0.003)	(0.006)
Household size	0.069	-0.014	0.001	0.013
	(0.097)	(0.019)	(0.002)	(0.019)
Sex of household head	-0.250	0.049	0.0003	-0.049
(male)	(0.386)	(0.074)	(0.0083)	(0.078)
Marital status (married)	-0.522*	0.104*	-0.004	-0.100*
	(0.275)	(0.055)	(0.016)	(0.053)
Education level	-0.667**	0.134**	-0.005	-0.128**
	(0.309)	(0.062)	(0.020)	(0.060)
Farm size	-0.041	0.008	-0.00032	-0.008
	(0.117)	(0.024)	(0.002)	(0.023)
Farm income	-6.52e-05**	1.31e-05**	-5.03e-07	-1.26e-05**
	(2.66-e05)	(1.00e-05)	(1.00e-05)	(1.00e-05)
Dependents	0.345***	-0.069***	0.003	0.066***
	(0.124)	(0.025)	(0.010)	(0.024)
Non-food expenses	9.24e-05*	-1.85e-05*	7.12e-07	1.78e-05*
	(4.85e-05)	(1.00e-05)	(1.00e-05)	(1.00e-05)
Access to extension	-0.725*	0.157	-0.032	-0.125*
	(0.433)	(0.099)	(0.039)	(0.067)
Labor hour use	-0.198*	0.040**	-0.002	-0.038*
	(0.102)	(0.021)	(0.006)	(0.020)
Off-farm occupation	-0.648*	0.136*	-0.018	-0.118*
	(0.384)	(0.083)	(0.026)	(0.066)
Food expenses	-7.59e-06	1.52e-06	-5.85e-08	-1.46e-06
	(3.47e-05)	(1.00e-05)	(1.00e-05)	(1.00e-05)
Coping strategy	0.108***	-0.022***	0 .001	0.021***
	(0.040)	(0.008)	(0.003)	(0.008)
Days incapacitated by	0.063	-0.013	0.001	0.012
sickness	(0.142)	(0.028)	(0.002)	(0.027)
μ_1	3.009			
μ_2	5.009			
Number of observations = 150				
Log likelihood = -135.805				
LR chi^2 (15) = 57.61				
Pseudo R^2 = 0.1750				

Standard error in parentheses. Levels of significance = ***, ** and * for 1%, 5% and 10%, respectively.
Source: Field Survey (2017) **MiV:** Mildly vulnerable; **MoV:** Moderately vuln.; **SV:** Severely vulnerable.

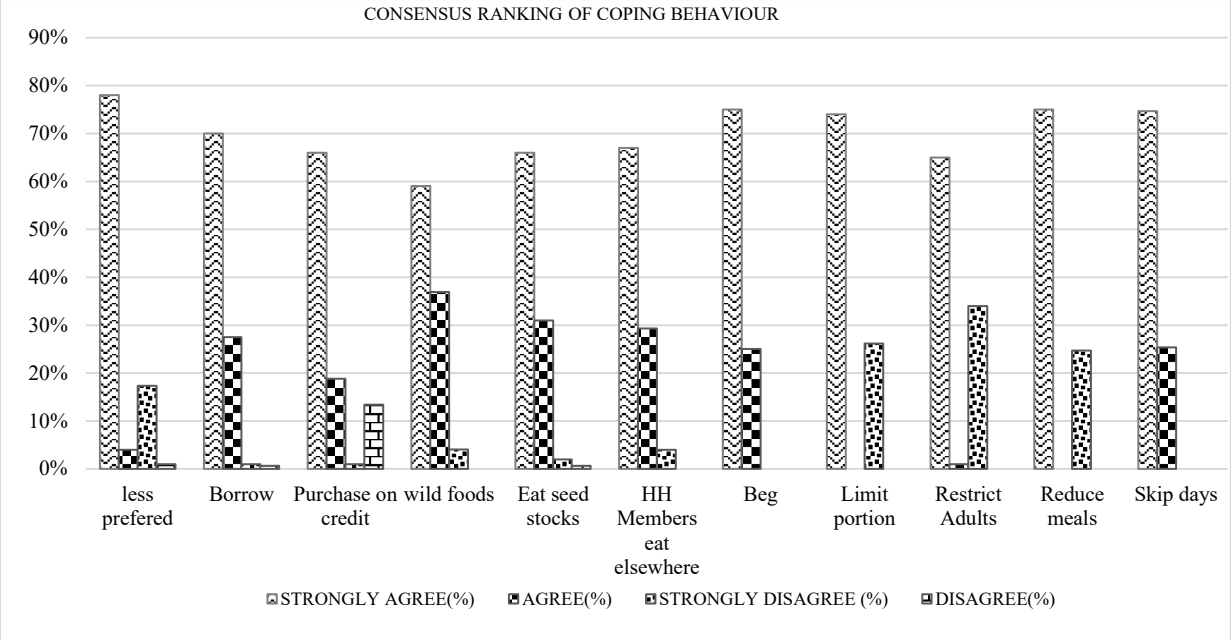

Figure 1: Consensus Ranking of Household Coping Strategies
Source: Field Survey (2017)