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Determinants of Vulnerability to Food Insecurity: A Gender-based Analysis of Farming Households in Nigeria

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I

INTRODUCTION

While considerable attention has been given to the study of food insecurity in developing countries, there are relatively fewer empirical studies, in the literature, on the vulnerability of rural households to future food insecurity. Yet, reducing vulnerability is a pre-requisite for achieving global and national food security targets (Lovendal and Knowles, 2005). Though vulnerability to food insecurity is a general problem among poor farming households, few studies have shown that the problem is more prevalent among female-headed households. For instance, IRIN (2006), conducted an analysis of livelihood and food security status of households and vulnerable groups in Zimbabwe, Zambia and Malawi. It was found that female-headed households were more vulnerable to food insecurity than male-headed households in the three countries; rural women were poorer than men and had turned to casual agricultural labour as a primary source of income. Akinsanmi and Doppler (2005), found that female-headed households in the South-eastern Nigeria were poorer and more vulnerable than their male counterpart. This was caused by unequal access to and control of productive resources. The study concluded that the standard of living of the female-headed households could be enhanced if they are given full legal rights of resources that would make them eligible for loans and make for efficient use of productive resources. Likewise, Owotoki (2005), found that in Kwara state, North-central region of Nigeria, the female-headed households were more food insecure and vulnerable than male-headed households.

This paper analyses the determinants of vulnerability to food insecurity among male and female-headed households in Kwara state of north-central Nigeria. The specific objectives are (1) to describe the socio-economics characteristics of male and female-headed households, (2) to examine the coping strategies employed by households against food shortage-related shock and (3) to identify the determinants of vulnerability of households to food insecurity. Most research on food security in

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Nigeria during the past decades has focused exclusively on determining the food security line and estimating the proportion of the population that are food secure and food insecure. Not much has been done to identify the vulnerable groups within the farming society and examine the factors which determine vulnerability to food insecurity among rural households.

A gender-based analysis of determinants of vulnerability could be useful for designing policies and interventions programme that would specifically target the more vulnerable type of households in the rural areas. More generally, knowledge of the characteristics of those most likely to be food insecure in the future, what factors determine their vulnerability and what methods exist for influencing this probability, could be of great value to government, non-governmental organisations and development agencies in the design of effective food security strategies, both now and in the future. The paper proceeds as follows. Section II discusses the concept of vulnerability. The data collection and methods of analysis are discussed in Section III. Households coping strategies and determinants of vulnerability are analysed in Sections IV and V respectively. The final section presents the conclusions.

II

CONCEPTS OF VULNERABILITY TO FOOD INSECURITY

Food security has been defined as a situation when all people, at all times, have physical and economic access to sufficient, safe and nutritious food needed to maintain a healthy and active life (FAO, 1996). This definition implies that food security is a broad concept that is more than food production and food accessibility. In reality it revolves round four pillars, namely, food availability, food accessibility, food utilisation and stability of food supply (Gross *et al.* (1999). Food availability refers to the physical presence of food at the household level, whether from own production or through markets. Food access refers to ability to obtain an appropriate and nutritious diet and is in particular linked to resources at the household level. Biological utilisation relates to individual level of food security and is the ability of the human body to effectively convert food into energy. The “at all times” language introduces a stability dimension, which point to the need for understanding both current and future status at different points in time. Therefore, a framework for analysing food security must capture the temporal dynamics of food security.

Vulnerability refers to people’s propensity to fall or stay below a pre-determined food security line. The food security line could be caloric-based (i.e., food requirement) or it could include all basic needs (Zeller, 2006). The concept of vulnerability is used with different connotations. A fundamental difference exists between vulnerability as defencelessness *vis-à-vis* a harmful event (for example vulnerability to drought) and vulnerability to a specific negative outcome, following a harmful event for example vulnerability to food insecurity. Vulnerability is a function of exposure to risks/shocks and the resilience to these risks. Risks/shocks are events that threaten households’ food access, availability and utilisation and hence their food

security status. Resilience in the food security context is determined by the effectiveness of risk management strategies (through prevention, mitigation and coping) and by the resources that can be drawn upon. Vulnerable groups comprise people with common characteristics, who are likely to fall or remain below the welfare threshold in the near future. While most of those who are presently below the threshold level may face a high probability of being so in the future, food security and poverty are not static. Several studies show that people move in and out of food insecurity and poverty (Lovendal and Knowles, 2005).

The terms vulnerability and food insecurity are often used interchangeably. This matters less when focusing on the short term under stable conditions, where there is little or no difference between those being food insecure today or tomorrow. However, over longer periods of time, people move in and out of food insecurity and vulnerability becomes the *ex ante* probability of falling or remaining below the set threshold of welfare while food insecurity refers to the current or *ex post* measure relative to the threshold level. Because vulnerability is linked to the uncertainty of events, everyone is vulnerable to food insecurity, but some more so than others. Vulnerability can be thought of as a continuum. The higher the probability of becoming food insecure, the more vulnerable one is. Being food insecure today does not necessarily indicate vulnerability, because the food situation could improve, in particular if looking beyond the very short run. Chronically food insecure people are living below the food security line today. Potentially food insecure people are living on the edge. Although they are not food insecure today, they face a high probability of becoming so.

The probability of becoming food insecure in the future is determined by the present conditions, the risks potentially occurring within a defined period and the capacity to manage the risks. Vulnerability is determined by a cumulative of events through time. What happened yesterday is reflected in today's status and what happened today influences tomorrow's status. Risk factors threaten food security today and cause vulnerability. At the household level, the major types of risks include health (illness, disability, injuries), life cycle-related (old age, death, dowry), social (inequitable intra-household food distribution) and economic risks (unemployment, harvest failure). These risks cause food insecurity by lowering food production, reduce income, reduce assets holding, increase indebtedness and reduce uptake of macro and micro-nutrients (Lovendal and Knowles, 2005). In addition to some of the above risks, threats related to natural environment, health and social conditions could affect groups of households or communities.

III

DATA SOURCE AND METHODOLOGY

The paper is based on primary data collected through a cross section survey of representative farm households in Kwara state in the north-central region of Nigeria

during the year 2005. The sample which consists of 60 households was chosen by multi-stage random sampling technique from six rural villages across the state. A detailed questionnaire was used to collect the required data. Data were collected through the use of a gender disaggregated questionnaire with structured questions. The survey was designed to collect both quantitative and qualitative data consisting of both socio-economic and demographic characteristics of the households. The gender disaggregated information collected included household composition, age, sex, education, employment status, income, work and leisure hours, health conditions of household members, allocation of other resources e.g. land, capital and credit facilities, decision making in the households, household living standards and information on household's coping strategies.

The study area, Kwara state was chosen because of its location and ethnic composition. The state is located in the north-central region and is often regarded as the gateway between the northern and southern regions of Nigeria. This strategic location allows both farm and non-farm activities to thrive side by side in the state and it have a good mix of male and female farmers. Besides there is no study to our knowledge which has analysed the determinants of vulnerability to food insecurity in this area. The total population of the state was about 2.2 million people in 2004 out of which farmers accounted for about 70 per cent. With a total land area of about 32,500 km², the state occupies about 3.5 per cent of the total land area of the country, which is put at 923,768 km². Farming is largely peasant and most farm households rely on rainfed agriculture for their livelihood. Though the average population density of the state as at 2004 was about 68 persons per square kilometer the average farm size is not more than 2 hectares. Output is low and most households have to buy food as what they produce from their own land is insufficient to feed them throughout the year (KWSG, 2005).

Analytical Techniques

Indices of household coping strategies and the weighted sum reflecting the frequency and severity of households coping strategies were used as measures for indicating the level of vulnerability to food insecurity among male and female-headed households. The weighted sum reflecting frequency and severity of household coping strategies is an index based on how the households adapt to the presence or threat of food shortages (Radimer *et al.*, 1990; Maxwell and Frankenberger, 1992; Maxwell, 1996; Hoddinott, 1999). This index which is a subjective measure of food insecurity is considered appropriate for studies on measuring vulnerability to food insecurity (Migotto *et al.*, 2005). In order to examine the determinants of vulnerability of households to food insecurity, a model comprising ten explanatory variables was estimated for both the male and female-headed households. An Ordinary Least Squares regression model was used because the dependent variable is continuous and uncensored. The explicit form of the model is stated as:

$$Y = \beta_0 + \beta_1 \text{agehhd} + \beta_2 \text{eduhhd} + \beta_3 \text{hhsz} + \beta_4 \text{farmsz} + \beta_5 \text{offinc} \\ + \beta_6 \text{valout} + \beta_7 \text{foodexp} + \beta_8 \text{labhour} + \beta_9 \text{extser} + \beta_{10} \text{suscpt} + e \quad \dots(1)$$

The dependent variable, Y is the weighted sum reflecting the frequency and severity of using the coping strategies. It is an index which is based on how the households adapt to the presence or threat of food shortages and it is used as a measure of vulnerability to future food insecurity. The index was computed by using data generated from a series of questions regarding how households were responding to food shortages. These included questions on consumption of less preferred foods, reduced quantity of food to men/women, reduced quantity of food to children and skipping meals. The weighted sum of these different coping strategies was computed for a period of 7 days where the weights reflect the frequency of use by the household. The weighted sum reflecting the use of the coping strategies was also computed.

The independent variables included in the model and their values for both types of household are given in Table 1. We include access to extension services and susceptibility of household head to sickness. Access to extension services is believed to be crucial for food production, because it gives the farmers the opportunity to learn new production techniques that can increase their yield and improve their present and future food security situation. The variable was measured as a dummy and farm household who have access to extension services scored 1 and those without access scored 0. The expected effect on vulnerability to food insecurity is negative. Susceptibility of household's head to sickness is a measure of the probability that the household head is likely to fall sick in the future based on his present health condition. When a household's head is susceptible to sickness, this would affect his or her labour days for farm work and this could directly reduce the level of food production. In case of prolonged sickness, the long term food security situation would be at risk. This variable was measured as a dummy and a farm household who are susceptible to sickness was assigned score 1 and those not susceptible scored 0, the expected effect on vulnerability to food insecurity is positive.

Sample Characteristics

Data characterising the survey households are presented in Table 1. The average household's size of 6 and 5 persons for the male and female-headed households respectively was relatively lower than the national average of 8 persons. Generally family size affects household's access to food since household food requirements and size are positively correlated (Hoddinot, 1999). Thus, the food requirements of the male-headed households would be all things equal, greater than those of the female-headed households. On an average, the male heads were found to be older than the female heads with an average of 56.9 and 51.4 years respectively. The male household heads were much more educated with an average of 9.3 school years than the female household heads with an average of 5.5 school years.

TABLE 1. SAMPLE CHARACTERISTICS BY HOUSEHOLD'S TYPES

(1)	All households (2)	Male-headed households (3)	Female-headed households (4)	t-value (5)
Household size	5.2	5.6	4.7	1.97**
Age of household head (year)	54.2	56.9	51.4	2.10**
Farm size (acres)	1.65	2.19	1.10	1.86*
Education of household head (year)	7.4	9.3	5.5	2.34**
Off-farm income (naira)	745300	881000	609600	3.23***
Total household income (naira)	918229	1073543	762915	2.98***
Value of crop output (naira)	207403.5	229926	184881	2.38**
Labour hours use (hour)	2568.5	3060	2077	2.03**
Food expenses (naira)	200893.5	246915	154872	1.99**

Source: Survey data, 2005.

Note: Official exchange rate in 2005: 1 US dollar = 120 naira.

* ** ***, indicate that the mean differences between male and female-headed households are significantly different from zero at 10, 5, and 1 per cent level, respectively.

There is a significant difference in the average size of land operated by both households. On the average the male-headed households operated 2.19 acres of land compared to the female-headed households which operated about 1.10 acres of land. The findings of the study showed that there was a significant difference in the value of crop output by both households; the male headed households had a higher value of 229,926 Naira while the female headed households had a lower value of 184,881 Naira. This could be influenced by the difference in the size of land cultivated. The analysis of household income earned showed that there was a significant difference between male-headed and female-headed households in terms of the off farm income and total income. The male-headed households had higher off-farm income and total household income than the female-headed households. Off farm income was the main source of income for both male and female-headed households. Off farm income is very important for the well being of both the households because income generated from the sales of farm produce alone could not be enough for the upkeep of the family.

IV

ANALYSIS OF HOUSEHOLDS COPING STRATEGIES

Table 2 presents the results of analysis of household use of coping strategies. The results indicate that both the weighted sum reflecting the index of using coping strategies and the weighted sum reflecting frequency and severity of using coping strategies were higher among the female-headed households. This implies that the female-headed households are more vulnerable to food insecurity than the male-headed households, because according to Hoddinott, (1999), indices of household coping strategies, directly capture notions of adequacy and vulnerability of households. Households using a larger number of coping strategies or using more severe strategies are likely to be poor and more vulnerable to food insecurity; hence the higher the sum of the coping strategies the more food-insecure the household.

Furthermore, we found that female-headed households used a significantly higher number (average of five) of household coping strategies to food shortage compared to male-headed households who used an average of four. There was no significant difference in the use of skipped meals a whole day, reduced quantity to children, men and women as coping strategies to food shortages. There was however significant difference between the female and male-headed households in terms of use of skipped meals in the last seven days and the consumption of less preferred foods as coping strategies. The female-headed households used more of this severe coping strategy of skipping meals which indicates that female-headed households were more likely to be poor and more vulnerable to food insecurity than the male-headed households.

TABLE 2. COMPARISONS OF USE OF COPING STRATEGIES BY HOUSEHOLD'S TYPES

(1)	Male-headed households (2)	Female-headed households (3)	t-value (4)
Weighted sum reflecting index of using coping strategies	13.3 (2.3)	14.9 (1.5)	2.98***
Weighted sum reflecting frequency and severity of using of coping strategies	32.6 (5.9)	36.2 (4.4)	1.99**
<i>Coping strategies</i>			
Number of coping strategies	3.90 (0.31)	5.28 (0.23)	2.33**
Skipped meals a whole day	1.10 (0.29)	1.12 (0.31)	1.00
Skipped meals in the last seven days	2.03 (0.56)	3.13 (0.96)	1.69*
Reduced quantity of food to children	2.41 (0.57)	2.44 (0.51)	0.80
Reduced quantity of food to women	2.60 (0.62)	2.73 (0.52)	0.37
Reduced quantity of food served men	2.57 (0.50)	2.77 (0.50)	0.13
Consumption of less preferred	2.77 (0.50)	3.13 (0.68)	2.15**

Source: Survey data, 2005. *, **, ***, indicate that the mean differences between the male and female-headed households are significantly different from zero at the 10, 5, and 1 per cent level, respectively. Figures in parentheses are standard deviations.

V

DETERMINANTS OF VULNERABILITY OF HOUSEHOLDS TO FOOD INSECURITY

Table 3 shows the regression estimates of determinants of vulnerability to food insecurity among male and female-headed households. With the R-squared ranging from 0.55 to 0.67, the model predicts vulnerability to food insecurity fairly well. The result indicates that in the male-headed household, vulnerability to food insecurity would increase as the household size increases but it would decrease as the value of crop output, food expenditure, farm size and the number of labour hour increases. In

the female-headed households, vulnerability to food insecurity increases as the household size and age of head increases, while it decreases as the education of head, off-farm income, food expenditure and number of labour hour increases. The prominent difference in the determinants of vulnerability between both groups is that the value of crop output and farm size were significant in male-headed but not in the female-headed households. Likewise, age of head, education of head and off-farm income were significant in the female but not in the male-headed households. In both the types of households, reducing the population growth, increasing food expenditure and labour hour could help to reduce vulnerability to food insecurity.

TABLE 3. DETERMINANTS OF VULNERABILITY TO FOOD INSECURITY (OLS ESTIMATES)

1)	Male-headed households		Female-headed households	
	Coefficients (2)	t-value (3)	Coefficients (4)	t-value (5)
Age of household head (years)	0.071	0.12	0.03***	3.59
Household size	0.64***	2.67	0.431***	2.92
Education of household head (years)	- 0.012	- 1.22	- 0.05***	- 2.81
Farm size (acres)	- 0.18**	- 2.18	- 0.06	- 0.12
Off-farm income (naira)	- 0.137	- 0.93	- 0.11***	- 3.46
Value of crop output (naira)	- 0.33***	- 3.77	- 0.04	- 1.62
Food expenses (naira)	- 0.12***	- 3.25	- 0.51***	- 2.83
Labour hour use (hours)	- 0.002***	- 2.73	- 0.004***	- 2.58
Access to extension services (yes =1)	0.021	0.51	- 0.06	- 0.29
Susceptibility to sickness (yes =1)	0.014	0.22	0.091	1.10
Constant	0.203***	3.42	0.12***	3.08
R-squared	0.55		0.67	
Adjusted R-squared	0.502		0.61	
F-stat	11.23		18.41	

Source: Survey data, 2005.

Note: *, **, and *** indicate coefficients are significant at 10, 5 and 1 per cent level, respectively. The dependent variable is the weighted sum reflecting frequency and severity of use.

VI

CONCLUSION

This paper examined the determinants of vulnerability to food insecurity among male and female-headed farm households in Nigeria. Apart from the descriptive statistics, the paper used the subjective approach of measuring vulnerability to food insecurity based on respondent's frequency and severity of using coping strategies. It also compared the anthropometric measurement of pre-school children as indicators of calorie intake adequacy among male and female-headed households. The following conclusions emerge from the paper.

One, there is gender inequality in terms of resources available to male and female-headed households in the study area. Male-headed households possess more resources than female-headed households. Crop output, off-farm income, total household income and available labour hours were significantly higher in male than female-headed households. This result like many other studies confirms the presence

of gender difference in household's resource availability and allocation in Nigeria. Specific policies providing increased access to education, land and off-farm activities for the female-headed households would be needed to remove this gender disparity.

Second, directly linked to the one above, we found that female-headed households were more vulnerable to food insecurity than male-headed households. The frequency and severity of using the coping strategies were more in female than in male-headed households. Similarly, anthropometrics measurement indicates that children from female-headed households show more stunting (low height-for-age) as compared to those from male-headed households. This result calls for conscious effort to increase women nutrition education and provision of opportunity for employment and income for the female-headed households.

Third, we found that farm size and crop output were significant in determining vulnerability to food insecurity in male-headed households. This implies that increasing the farm size and crop output would reduce the risk of male-headed households falling into food insecurity in the future. In the female-headed households, age, education of household's head and off-farm income were the significant determinants. In both the types of household, food expenditure, household's size and number of labour hours were identified as significant determinants of vulnerability to food insecurity. Following from this, we suggest the adoption of policies that would improve and stabilise the market situation so that households could sell their produce and earn income which they could use to hire more labour for increased food production. Improved health care facilities should also be provided in the rural areas within the reach of farm households, so as to reduce the number of man-hours lost to sickness. We also advocates for radical transformation of the rural areas so as to create opportunities for off-farm employment and targeting female-headed households for more intervention programmes that would reduce vulnerability to food insecurity.

Finally, we want to end by expressing a caveat here. Although this paper is based on a sample survey of farm households, the data set is neither nationally representative nor large enough to generalise the findings. Similarly, gender inequality was treated at the household's level but intra-household issues, for example between male and female within the same household were not subject of this discussion. What is required therefore is for other researchers to collect nationally representative and large sample data to test the robustness of our findings concerning the impact of gender on vulnerability to food insecurity.

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