

Food Insecurity Dynamics and its Correlates among Rural Households in South-Western Nigeria

Ayantoye, K¹, S.A Yusuf¹, B.T Omonona¹ And J.O Amao²

¹Department of Agricultural Economics, University of Ibadan

²Department of Agricultural Economics and Extension, Ladoké Akintola University of Technology, Ogbomosho.

e-mail: ayantoyek@yahoo.com

Abstract: This study examines the dynamics of food insecurity (FI) transitions among rural households in Southwestern Nigeria. The data were collected over two-time period from 292 rural households from September to December 2006 during food crops harvesting season (HS) and from March to May 2007 during food crops planting season (PS). Data were analysed using Markov Probability Chain (MPC) and probit regression. Results indicate movements into and out of FI during the two seasons. However, more rural households (71.8%) moved into FI during PS. In the long-run, 86.1% of households would transit to FI during PS. Household size, educational status of head, age, asset ownership, remittances, occupational status of head, access to credit and access to extension services are factors that significantly determine these movements.

Keywords: Transition, determinants, correlate, food security, food insecurity and Southwestern Nigeria

INTRODUCTION

It is an indubitable fact that adequate quantity and quality of food is a basic need that affects our ability to survive, thrive and learn (Morduch, 1995). Given the numerous negative outcomes associated with poverty and hunger, food insecurity is a serious threat to the well-being of our society. Thus, achievement of food security is a significant victory over poverty in any given country. It is in recognition of these facts, that the Universal Declaration on the Eradication of Hunger and Malnutrition (1974), declares that “every man, woman and child has an inalienable right to be free from hunger and malnutrition. Nigeria’s appalling food insecurity situation has degenerated to a level that it is listed among the 42 countries tagged “low-income food deficit countries” (Okunmadewa, 2003).

Food insecurity disproportionately affects rural people particularly rural women, minorities and children (London et al, 2005). Studies (World Bank, 2001; Ribar and Hamrick, 2003 and London et al, 2005) have revealed that rural people face a high risk of food insecurity due to poverty, income inadequacies, limited access to resources, underemployment, and unemployment, and many barriers to self-sufficiency, which create family frailty and crisis.

A nexus between food insecurity and poverty has been established. According to Sen (1981) poverty is a major determinant of chronic household food insecurity. The poor do not have adequate means or “entitlement” to secure their access to food even when food is available in local or regional markets. Poverty in Nigeria is increasing in hyper-geometrical rate since 1980 (Okuneye, 2002). Statistics from the National

Bureau of Statistics (NBS, 2007) indicates that poverty incidence in Nigeria rose from 28.1 percent in 1980 to 54.4 percent in 2004. With the estimated population figure of 140 million, this translates to 74 million Nigerians living below poverty line. While 63 percent of this figure lives in the rural areas, 43 percent of this number resides in the south west, Nigeria (NBS, 2007). Similarly, Okunmadewa, (2001) reveals that one major characteristics of the farming populace of Nigeria is food insecurity, specifically in 2004, NBS in its study on the relative poverty by occupation of household heads indicates that 67 percent of households whose heads engage in agriculture are poor and by implication lack the means to secure access to sufficient food at all time.

Furthermore, this problem of food insecurity especially during the hungry period among farming households in Nigeria is long standing (Obamiro et al, 2005). This is because rural households in Nigeria face a high level of income variability (access to food variability) due to factors beyond their control such as poor storage and infrastructural facilities couple with their poverty, that make them particularly vulnerable to shocks such as seasonal changes in food production (Riber and Harmrick, 2003 and Obamiro et al, 2005). Hence rural households have access to food produce in the area; their food insecurity status especially farming households depend on the season of the year. At the beginning of the rain this insecurity is higher than the late rains.

Importantly, an understanding of the dynamics of food insecurity is critical to the formulation of appropriate policy towards addressing the problem of food insecurity in

Nigeria. The main objective of this study therefore, is to analyse rural households' food insecurity dynamics and its correlates among rural households in the South Western Nigeria.

LITERATURE REVIEW

Despite apparent empirical strength, the operationalization of the food security concept still presents many challenges. The concept of food insecurity has evolved, developed, multiplied and diversified since the World Food Conference of 1974. The main focus has shifted from global and national to household and individual food insecurity and from food availability to food accessibility and the security of access (Maxwell and Smith, 1996). Hence, this study which is focused on the food insecurity status, transitions and its correlates among rural households in south west, Nigeria is aimed at achieving this goal.

It has equally been observed that the issue of not knowing the exact figure of households who are food insecure in Nigeria poses a serious problem in evolving an all embracing solution to the problem. This is due largely to definitional, measurement problems and inadequate data Olayemi (1996). Also, FAO (1986) observed that many anti-poverty and food security policies and projects in Nigeria had failed largely because these policies and projects were conceptualized and formulated using reports of the more robust and influential organisations such as the World Bank, United Nation Development Programme (UNDP), United Nation International Children Emergency Fund (UNICEF) among others, which are based on studies in which aggregated data were used. These aggregate data often conceals the very extreme poor or the ultra-poor, those classified as destitute

or most disadvantaged or critically poor. This submission is equally true for the food insecurity status analysis of the households thereby neglecting the local peculiarities. It is therefore, advised that such food insecurity studies be done in clusters and be grouped targeted. Furthermore, national aggregates may not necessarily reflect local peculiarities in structure, extent, pattern and profile of food insecurity (FAO 1986). This study is therefore targeted at the rural households in the south west, Nigeria.

Also, previous studies on food insecurity in Nigeria (Olayemi 1996, Agboola et al., 2005, Okuneye, 2002; and Adejobi, 2004) are centered on the status and correlates of food insecurity rather than the correlates of food insecurity transitions. These studies did not take into cognisance that food insecurity is a stochastic phenomenon and that the food secure today may not be tomorrow or vice versa. These studies according to Bauchh (1998) are like treating the symptoms not the cause of food insecurity. What is therefore, desirable for policy intervention is to know those factors that will affect the likelihood of entering or exiting food insecurity rather than measuring the correlates of food insecurity status alone if the aim is to eliminate food insecurity. Finding this will assist in the formulation of policies that will improve exit rate from food insecurity and decrease entry rates into food insecurity. However, there is a limited data in the literature on food insecurity transitions and changes over time, particularly among Nigeria households. This is because of the non availability of panel data to capture the trend over time. Hence the study of chronic food insecurity and its determinants have not been possible in Nigeria.

Measurement of food insecurity

Maxwell and Frankenberger (1992) list 25 broad indicators and a host of other indicators related to the different aspects of food security. Following FAO (2003), five general types of methods/indicators are identified. These are undernourishment measure, food intake measures, anthropometric measures, food accessibility measure and Household Food Security Scale (HFSS) module. Among the methods of measuring households' food insecurity highlighted above, Food-Energy intake approach as used by Greer and Thorbecke (1986) was adopted for the study because of its effectiveness, simplicity and ease of computation.

METHODOLOGY

This study was carried out in the Southwestern Nigeria, with Ondo and Ekiti states randomly selected from the six states that make up the zone. Data were collected from 292 rural households over a two-time period: during the harvesting season of 2006 (September to December) and during the planting season of 2007 (between March and May) when farmers prepare their land for planting and planting of food crops. The primary data were collected through the aid of a well-structured questionnaire with rural households as target population.

Method of Data Analysis

Estimating Food Insecurity Line

Various methods have been used in calculating the food insecurity line (Ravallion and Bidani, 1994; Aigbokhan, 2000; Okurat *et al*, 2002). The Cost of Basic Needs (CBN) approach, the Food-Energy Intake (FEI) method and the Cost-of-Calorie (COC) function. However, the Food-

Energy Intake used by Greer and Thorbecke (1986) was adopted for this study to estimate the food insecurity line due to its simplicity and ease of computations in the following specific steps.

(a) The Value of Food (F^*_j) consumed by each household, which is equal to the sum of the value of purchased food (V^*_j) and the value of own production consumed (C^*_j) was determined as

$$F^*_j = V^*_j + C^*_j \quad (1)$$

The value of purchased food consumed V^*_j by each household was established by multiplying the quantities of different food types purchased (D_i) by the prices per unit (P_i)

$$V^*_j = \sum D_{ij} P_i \quad (2)$$

Where

V^*_j = Value of purchased food consumed by the j th household

D_{ij} = The quantity of i th food item purchased by j th household.

P_{ij} = The local price paid by the j th household for the i th food item

The value of own output or donated food consumed by the household K^*_j is the product of own production (including donations) (M_i) and the local prices (P_i). The quantity M_i is the imputed value of consumption.

$$K^*_j = \sum M_{ij} P_{ij} \quad (3)$$

(b) The adult equivalent H_j for each household was proxy by the household size.

(c) Total value of food consumed per adult equivalent (F_j) was derived by dividing the total value of food by household adult equivalent:

$$F^*_j = F_j \quad (4)$$

H_j

Where

F_j = Total value of food consumed by j th household

H_j = Adult equivalent for j th household

F^*_j = Total value of food consumed per adult equivalent units.

(d) The different types and quantities of foods consumed by the different households were converted to calories (C_j) using the calorie equivalents presented in appendix 1&2.

It is important to note that in order to remove the effect of changes in prices that might have taken place between the two periods of data collection, food consumed per adult equivalent by each household was standardized by deflating it using the rural price index to obtain the food consumed per adult equivalent for each household. This was used for subsequent analysis.

(e) A regression model was fitted to estimate parameters to be used in determining food insecurity threshold (line).

$$\ln F^*_j = a + bC_j \quad (5)$$

Where

F^*_j = Total food expenditure per adult equivalent by household j

C_j = Total calorie consumption per adult equivalent by household j

a and b are parameters to be estimated

(f) The food insecurity line, Z , which is the estimated cost of acquiring the calorie recommended daily allowance (RDA) was estimated as

$$Z = e^{(a + bR)} \quad (6)$$

Where

Z = Food Insecurity threshold (line)

R = Recommended daily allowance of calories per adult equivalent of 2900 (World Bank 2001)

Food Insecurity Transitions among Rural Households,

To investigate food insecurity transitions, the technics used by Baulch et al (1998) to measure the dynamics of poverty transitions in rural Pakistan was modified and adopted along with the works of Nord et al (1998), Ribar and Hamrick (2003) and London and Scott (2005). The items in the transition matrix as shown in simple first-order Markov model in Table 1 are converted into probability values of entering and exiting food insecurity by dividing each item by the corresponding row total to give the transition probability matrix below:

$$\begin{matrix} X_{11} & X_{12} \\ X_{21} & X_{22} \end{matrix}$$

Also, the vector of initial probability P (o) was obtained by dividing each column total by the grand total.

Thereafter, we tried to see the proportion of households that will be in each category in the subsequent periods by using

$$P(k) = P(o) P^k \quad (7)$$

Where k is the time period in seasons.

The long term equilibrium (when the proportion of households entering food insecurity equals the proportion exiting it) was obtained by using

$$eP=e \quad (8)$$

$$(e_1, e_2) \begin{bmatrix} X_{11} & X_{12} \\ X_{21} & X_{22} \end{bmatrix} = (e_1, e_2) \quad (9)$$

The solution to the above matrix produced e_1, e_2 , which are the proportion of households that will be food secure, and food insecure at equilibrium in the long run.

Where e_1 = probability of households that will be food secure at equilibrium

e_2 = probability of households that will be food insecure at equilibrium

Table 1: First-Order Markov Model of Food Insecurity Transitions

Period 1- Harvesting Season	Period 2- Planting Season		Total
	Food secure	food insecure	
Food secure	n11	n12	n1
Food insecure	n21	n22	n2
Total	n1	n2	

Source: Field surveys 2006 and 2007

Correlates of Food Insecurity Transitions

To examine the determinants of food insecurity transitions, a probit model was used to determine the factors influencing entering or exiting food insecurity. The model was adopted for its suitability in capturing the various degree of

food insecurity among the food insecure households.

$$Y_{ij} = B_0 + B_1 X_i + E_i \dots \dots \dots (10)$$

Where: Y_{ij} = the dependent variable for the various food insecurity transitions

$i=1, \dots, 292$

$j=1, \dots, 4$ categories of food insecurity transitions

$$Y_{ij} = f(X_1, X_2, \dots, X_{15})$$

The four categories of food insecurity transitions are as stated below:

$Y_{11} = 1$ if remaining food secure 0 if otherwise

$Y_{12} = 1$ if moving into food insecure 0 if otherwise

$Y_{13} = 1$ if exiting food insecure 0 if otherwise

$Y_{14} = 1$ if always staying food insecure 0 if otherwise

b_0 = constant term

X_i = the independent variables

The independent variables, which are the socio – economic and demographic variables, are captured as:

X_1 = Household size

X_2 = Primary education dummy (D =1 if Household head has primary education, 0 if otherwise 0)

X_3 = Secondary education dummy (D =1 if Household head has secondary education, 0 if otherwise 0)

X_4 = Tertiary education dummy (D =1 if Household head has tertiary education, 0 if otherwise 0)

X_5 = Age of household head (year)

X_6 = Marital status of the household head (D=1 if married, 0 if otherwise)

X_7 = Gender of the household head (D=1 if male, 0 if otherwise)

X_8 = Years of farming experience

X_9 = Dependency ratio

X_{10} = Farm size

X_{11} = Access to extension services (1 if yes, 0 if otherwise)

X_{12} = Access to credit facilities (1 if yes, 0 if otherwise)

X_{13} = Occupations status of the head (D=1 if household head is into farming as primary occupation, 0 if otherwise)

X_{14} = Access to Remittance (D=1 if household has access to remittance, 0 if otherwise)

X_{15} = Assets Ownership D=1 if household own assets, 0 if otherwise)

Table 2: A priori expectation of the independent variables with respect to the food insecurity status

Variable	Households entering food insecurity	Households never food insecure	Households always food insecure	Households exiting food insecurity
Households size (X ₁)	+	-	+	-
Primary education (X ₂)	-	+	-	+
Secondary Education (X ₃)	-	+	-	+
Tertiary Education (X ₄)	-	+	-	+
Age ((X ₅)	+	-	+	-
Marital status (X ₆)	+	-	+	-
Gender (X ₇)	+	-	+	-
Farming Experience (X ₈)	-	+	-	+
Dependency Ratio (X ₉)	+	-	+	-
Farm size (X ₁₀)	-	+	-	+
Access to Extension (X ₁₁)	-	+	-	+
Access to credit (X ₁₂)	-	+	-	+
Occupational Status (X ₁₃)	+	-	+	-
Access to Remittance (X ₁₄)	-	+	-	+
Asset ownership (X ₁₅)	-	+	-	+

RESULTS AND DISCUSSION

Food Insecurity Transitions

Table 3 shows the result of the transition matrix and their probabilities. The result is in line with the works of Baulch et al (2003), Ribar and Hamrick (2003) that households move in and out of poverty and food insecurity. It reveals that 28.8 percent of those who were food secure during harvesting season in 2006 remained food secure during the planting season of 2007, while 71.8 percent of those who were food secure during the harvesting season in 2006 transitioned to food insecurity during the planting season of 2007. Similarly, 13.1 percent of those who were food

insecure during the harvesting season in 2006 transitioned to food security during the planting season in 2007, while 86.8 percent of those who were food insecure during the harvesting season of 2006 remained food insecure during the planting season in 2007. Further analysis of the probability transition matrix reveals that at the short run, the probability that a rural household in the study area will be food secure is 22.2 percent, while the probability that rural household will be food insecure in the short run in the Southwest Nigeria is 77.7 percent.

At equilibrium, that is, in the long run, the probability that the household will be food secure

is 13.89 percent, while the probability that rural household will transit to food insecurity in the South West Nigeria is 86.1. This result shows that many households will be sliding into food insecurity during the planting season in the study area in the nearest future. This may be attributed to the poor storage facilities of food crops, food scarcity and high level of poverty. This result is in consonance with Truman and Daphne (1990) that today's food secure may not be tomorrow food secure as a result of food insecurity risk arising from shortages prior to harvest.

Table 3. Food Insecurity Transition Matrix

2006	2007	
	Food Secure	Food Insecure
Food Secure	49 (0.2882)	121 (0.7118)
Food Insecure	16 (0.1311)	106 (0.8689)
Total	65	227

Source: Computed From Field Surveys 2006 and 2007. (Figures in parenthesis are probability Transition matrix)

Factors Influencing Food Insecurity Transitions in the South Western, Nigeria

This section presents the results of the determinants of food insecurity transition among rural households in South-west, Nigeria. In general, the model as revealed by the Chi square values in Table 4 has a good fit to the data.

Determinants of Households Moving Into Food Insecurity

In column 4 of Table four, the probability of moving into FI decreases by -0.0084 ($p < 0.01$), -0.0205 ($p < 0.05$) and -0.0330 ($p < 0.01$) due to assets

ownership, attainment of secondary education and access to credit respectively. It increases by 0.1238 ($p < 0.01$) with a unit increase in household size. This agrees with Riber and Harmrick (2003) that the larger the household size the higher the probability of moving into food insecurity. This could be as a result of the fact that increased household size is synonymous with higher dependants that hardly contribute to the income of household. Also, column 1 of Table four reveals that the probability of exiting FI increases accordingly by 0.1276, 0.5969 and 0.8682 with access to extension, access to remittances and asset ownership at ($p < 0.01$). A unit increases in household size and being engaged in farming decreases exiting FI by -0.0073 and -0.127 respectively at ($p < 0.05$). (This is agreement with Ribar and Hamrick (2003). Also, the probability to remain food secure as shown in column 2 of Table four reveals that the probability to be never food insecure increases with attainment of tertiary education (0.0683), access to credit (0.0143) and asset ownership (0.3150) at ($p < 0.01$), and decreases by -0.0130 ($p < 0.05$), and -0.0473 ($p < 0.01$) with a unit increase in dependency ratio, and being engaged in farming respectively. Finally, column 3 of Table four reveals that a unit increase in household size, age, farming experience and dependency ratio lead to an increase in the probability to always stay FI by 0.0321, 0.0048, 0.2915 and 0.0866 accordingly at ($p < 0.01$) However, this decreases by -0.3465 with attainment of primary education at $p < 0.05$

Table 4: Maximum Likelihood Estimate of Probit Regression of Households in Transition into Food Insecurity

Variable	Households exiting food insecurity	Households never food insecure	Households always food insecure	Households entering food insecurity
Constant	-0.0084 (0.0859)	0.0342 (0.0557)	-0.6726 (0.4946)	-0.0654 (0.2455)
Household size (X ₁)	-0.0073**	-0.0269* (0.0162)	0.0321*** (0.0054)	0.1238*** (0.0426)
Primary education (X ₂)	(0.0034)	0.0460 (0.0422)	-0.3465** (0.1586)	0.2635* (0.1580)
Secondary Education (X ₃)	0.0175 (0.0143)	0.0146 (0.0157)	-0.3035 (0.3147)	-0.0205** (0.0109)
Tertiary Education (X ₄)	0.0760 (0.0646)	0.0683*** (0.0257)	-0.0554 (0.1341)	-0.1481* (0.0874)
Age (X ₅)	-0.0606 (0.0607)	0.0017 (0.0021)	0.0048** (0.0025)	0.0150* (0.0078)
Marital status (X ₆)	-0.0169 (0.268)	-0.0074 (0.0160)	0.0985* (0.0547)	-0.0607 (0.0821)
Gender (X ₇)	-0.0085 (0.0155)	-0.0018 (0.0095)	0.1204 (0.1276)	0.734 (0.0591)
Gender (X ₇)	0.0109 (0.253)	0.0020 (0.0088)	0.2915** (0.1336)	0.0081 (0.0164)
Farming Experience (X ₈)	0.0055* (0.0033)	-0.0130** (0.0054)	0.0866** (0.0341)	0.0019 (0.0250)
Dependency Ratio (X ₉)	-0.0073 (0.0312)	0.0004 (0.0006)	0.0005 (0.0022)	-0.0010 (0.0015)
Farm size (X ₁₀)	0.2067* (0.1257)	0.0227 (0.0180)	-0.0833* (0.0479)	-0.1745 (0.2247)
Access to Extension (X ₁₁)	0.1276*** (0.0444)	0.0143** (0.0061)	0.1597 (0.1385)	-0.0330*** (0.0111)
Access to credit (X ₁₂)	0.0616* (0.0325)	0.0473*** (0.0157)	0.0026 (0.0180)	0.0529* (0.0303)
Occupational Status (X ₁₃)	-0.1279** (0.0593)	0.0159 (0.0123)	0.0163 (0.0122)	0.1347 (0.7460)
Access to Remittance (X ₁₄)	0.5969*** (0.0109)	59648.692	453	(0.0031)
Asset ownership (X ₁₅)	0.8682*** (0.0112)	453	0.00	59648.692
Chi square		0.00		453
DF	53034.884			0.00
Prob	453			
	0.00			

Source: Computer Print out of Probit Regression

The coefficients and marginal effects***-denotes significance at 1%, ** at 5% and * at 10%

CONCLUSION AND POLICY IMPLICATION

There is high level of food insecurity transitions in the study area particularly from

food secure in the late rain (harvesting period) of 2006 to food insecure in the early rain (planting period) of 2007. Safety net in form of provision of subsidized food during the planting period is

therefore advocated. The identified chronically food insecure households (always food insecure) should also be specially targeted by the government for safety net such as provision of subsidized food crops, distribution of food crops as relief materials and special nutrition programme involving the provision of free meal for the malnourished households.

This study suggests that efforts should be made to sensitize and encourage households to have children they can really cater for. As the study revealed that household with large size and high dependency ratio are worst hit by foods insecurity transitions. The very few that had fairly small household sizes are always food secure.

The study has found out that majority of households who slide into food insecurity are headed by low educated persons who engage in farming as primary occupation, this calls for an improving access to education particularly, the identified food insecure households. In addition, special training to enable them acquire skills fully at government expense is being advocated. This will guarantee them more income to meet food needs during the planting period.

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APPENDIX 1

Nutrition (Calorie based) Equivalent Scales

Years of Age	Male	Female
0-5	0.4875	0.4875
6-15	0.896	0.7800
16-64	1.060	0.8267
ABOVE 65	0.840	0.7400

Calculated from Omonona, 2001

APPENDIX 2

Nutrients Composition of Commonly Eaten
Foods in Nigeria- Raw, Processed and Prepared

Food item	Kcal/kg
Gari	3840
Cowpea	5920
Rice	1230
Soybean	4050
Melons(shelled)	5670
Groundnut	5950
Bread	2330
Sugar	3750
Orange	440
Mango	590
Powdered milk	4900
Agric egg	1400
Fish	2230
Meat	2370
Maize	4120
Okra	4550
Pepper	3930
Tomatoes	880
Plantain	770
Yam	3810
Cocoyam	3830
Cassava flour	3870
Leafy vegetable Oil	4210
	8750

Source: Omonona, 2001