

ANALYSIS OF HOUSEHOLD FOOD SECURITY AMONG RICE FARMING COMMUNITIES IN SOKOTO STATE: A GUIDE FOR FOOD SECURITY POLICY IN NIGERIA

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Abstract

Rice is an essential and strategic commodity in the Nigerian economy, and Nigeria has ecologies that are suitable for rainfed rice which can be harnessed to enhance rice production to meet the food and dietary requirements of its population, and even to produce surplus for export. This informed the need to examine household food security among rainfed lowland rice communities in Sokoto state, Nigeria, with a view to identifying the influence of rice outputs and other relevant factors on food security status. Using a multistage random sampling technique, 300 farmers were randomly selected from six purposively selected local government areas noted for rainfed lowland rice production in Sokoto state. The data collected were analyzed using descriptive statistics, Food Security Core Module (FSCM) categorical measure and the Logit regression model. The result demonstrates that rainfed lowland rice production in the study area was dominated by middle aged (31-40 years) and ageing males (41-50 years). The farmers had an average family size of between 6 and 10 members with 59.67% having Qur'anic education. The result also revealed that 76.33 percent of the rainfed rice households were food insecure, and only 23.67 percent of the rainfed rice farmers were food secure. Result of the logit regression analysis shows that rice output ($p < 0.01$), education ($p < 0.05$) and off-farm income ($p < 0.01$) positively and significantly influenced the food security status of the rainfed rice farmers in the study area. On the other hand, family dependents ($p < 0.05$) had a negative influence on food security status of the farmers. The study admonished farmers to increase their output by adopting yield boosting technologies, diversify their source of income and raise their level of education in order to improve their food security statuses.

Keywords: food security, rainfed-rice, Sokoto

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1. INTRODUCTION

Food insecurity is widespread in the country and rural areas are especially vulnerable to chronic food shortages, malnutrition and even total lack of food. This phenomenon cuts across all categories of individuals in the rural areas. Statistics from the National Bureau of Statistics (NBS, 2014) indicates that poverty incidence in Nigeria rose from 28.1 percent in 1980 to 54.4 percent in 2004 and to 60.9 percent in 2013, involving 112,518,507 Nigerians. 63 percent of this figure lives in the rural areas and are predominantly farmers (NBS, 2014). Despite the growth in the Nigerian economy, the proportion of Nigerians living below US\$1 Dollar is increasing every year (Gbola, 2012). Food security exists when all people, at all times, have physical and

economic access to sufficient safe and nutritious food to meet their dietary needs and food preferences for a healthy and active life (Pinstrup-Andersen, 2008). The addition of "safe and nutritious" emphasize food safety and nutritional composition while the addition of "food preferences" changes the concept of food security from mere access to enough food, to access to the food preferred. This implies that people with equal access to food, but different food preferences, could show different levels of food security (Pinstrup-Andersen, 2008). Achieving food security and high incomes in rural households therefore, is a useful goal towards which Nigeria should strive. This is because rural households in Nigeria face a high level of food security variability due to factors beyond their control; such as poor storage and infrastructural

facilities, income inadequacies, limited access to resources, underemployment, and many barriers to self-sufficiency (Obamiro, 2005). Earlier studies also indicated that the socio-economic characteristics of members of a household and resources available for production exert substantial influence on the food security status of the household (Sanusi *et al.*, 2006).

The problem of food and nutrition security in Nigeria has not been adequately and critically analyzed, despite various approaches at addressing the challenge. Absence of reliable information on the exact figure of households who are food insecure in Nigeria poses a serious problem in evolving an all embracing solution to the problem. Previous studies on food security in Nigeria (Goni, 2012; Ngaski *et al.*, 2009, etc) were focused on the analysis of food security using different methods (e.g. Cost of Calories (COC) function; Freedom from Hunger (FFH) scale; Foster, Green and Thorbecke Weighted Poverty Index; Cornell-Radimer Hunger Scale etc). In contrast to other studies, this study used the Food Security Core Module (FSCM) categorical measure. As an advantage over other food security tools, the FSCM essentially measures qualitative and quantitative compromises in food intake with declining household resources, recognizing differences in adults and children's experiences of resource constraint. The main objective of this paper therefore, is to determine household food security status and its determinants among rural rainfed lowland rice farmers in Sokoto state, Nigeria.

2. MATERIAL AND METHODS

The study was carried out in Sokoto state, Nigeria. Sokoto State is located between latitude 13° 03' N and longitude 5° 14' E with a land area of 28,232.37 Square kilometers. It is bordered in the north by Niger Republic, Zamfara State to the east and Kebbi State to the south and west (SOSG, 2015). In terms of vegetation, the State falls within the Sudan savannah zone. Rainfall starts late May and ends late September or early October with an

annual mean rainfalls ranging between 500mm – 700mm (SOSG, 2015). Sokoto state has an average population of 4,116,000 million people made up of two major ethnic groups namely, Hausa and Fulani. Over 80% of the inhabitants of Sokoto State practice one form of agriculture or the other (SOSG, 2015). They produce such crops as millet, guinea corn, rice, cassava, potatoes, groundnuts and beans for subsistence and produce wheat, cotton, and vegetable for cash.

The sampling frame was established by obtaining a list of all rainfed rice producing Local Governments Areas and the respective rainfed rice producing villages from the Ministry of Agriculture and SADP, Sokoto. Thereafter, the names of all rainfed lowland rice producing farmers in the respective villages were obtained from the village heads and leaders of cooperative associations. This provided the bases for sampling. A 3-stage multi-stage random sampling technique was used to draw the sample. The first stage involved a purposive selection of six leading Local Government Areas noted for rainfed rice production in the state; these include Wurno, Goronyo, Rabah, Kware, Kebbe and Silame local government areas. The second stage involved a random selection of two rainfed rice producing villages in each of the selected Local Government Areas. The third stage was a random selection of 25 rainfed rice farmers from each of the sampled communities. A total of 300 rainfed rice farmers were sampled and interviewed. Data were collected using the Food Security Core Module (FSCM) Questionnaire administered by trained enumerators.

The tools of data analysis used were descriptive statistics, the Food Security Core Module (FSCM) categorical measure and the Logit model. The descriptive statistics used were frequency distribution and mean to describe the socio economic characteristics of the rainfed rice farmers. The Food Security Core Module (FSCM) categorical measure (Sullivan, 2000; Hamilton *et al.*, 1997; Derrickson *et al.*, 2000) was used to determine the food security status of the households. The model of qualitative

choice expressed under the Logit regression model (Eboh, 2009) which used the Maximum Likelihood method under the assumption of homoscedastic normal disturbance, was used to determine factors influencing household food security status of the farmers. SPSS Software was used for the analysis of variables. The specification of the tools of analysis is as follows:

The Food Security Core Module (FSCM) categorical measure: The 18-item FSCM Questionnaire is designed to be administered to the household head or person responsible for food and food provision in the household, and to provide insight into household food security (Derrickson *et al.*, 2000). Four-level categorical variables will be derived from the 18-item FSCM, classifying household food security status as Food Secure (FS), Food Insecure Without Hunger (FIWH), Food Insecure with Moderate Hunger (FIMH), and Food Insecure with Severe Hunger (FISH). The actual classification of households into these categories is based on the number of affirmative responses. The number of affirmative responses, scale values, status levels and the conceptual definitions applied to the resultant classifications are given in Table 1. Research findings have indicated that the 18-item FSCM is a uni-dimensional food security

measure that demonstrates adequate fit and an adequate dispersion of items to assess the spectrum of food insecurity experienced in different places (Hamilton *et al.*, 1997).

Logit regression model: The Logit regression model was used to obtain the maximum likelihood estimates of the impact of the explanatory variables on food security status of the households. The model as specified by Eboh (2009) is given as follows:

$$\text{Ln}Y(p_i / 1 - p_i) = \alpha + \beta_i X_i + u_i(1)$$

P = Value of the dependent variable - between 0 and 1,

β_i = Parameters to be estimated,

X_i = Explanatory variables ($X_1 \dots X_7$),

u_i = error term

$\text{Ln}Y_1$ = Food security status (Dummy: food secured = 1, Otherwise = 0)

X_1 = Rice output (kg), X_2 = Farm size (ha), X_3 = Household size (adult equivalent), X_4 = Education (years), X_5 = Off-farm income (₦), X_6 = Number of income earners, X_7 = Dependents

Table 1. Conceptual definitions of levels of household food insecurity identifiable from the 12-month Food Security Core Module

Level of Household Food Insecurity Status	Conceptual Definitions	Affirmative Responses(No)	Scale Values
Food Secure (FS)	Households show no or minimal evidence of food insecurity	At most 2 affirmative responses	0 – 2.2
Food insecure without hunger (FIWH)	Food insecurity is evident in households concerns and adjustments to households food management, including reductions in diet quality, but with no or limited reductions in quantity of food intake	At most 7 affirmative responses	2.4 – 4.4
Food insecure with moderate hunger (FIMH)	Food intake for adults in the households is reduced to an extent that implies that adults are experiencing hunger due to lack of resources	8 to 12 affirmative responses	4.7 – 6.4
Food insecure with severe hunger (FISH)	Households with children reduce the children’s food intakes which implies that children experience hunger as a result of inadequate household resources. Adults in households with or without children experience extensive reductions in food intake (e.g., going whole days without food)	13 to 18 affirmative responses	6.6 – 9.3

Source: Price *et al.*, 1997; Hamilton *et al.*, 1997

Measurement of variables and expected signs on the coefficients

Output of rainfed rice: This is the total quantity (in kilograms) of rainfed rice produced by households from their farms measured across the sampled farmers in 2015 farming season.

Farm size: Farm size is the total size of land used for production, measured in hectares. Farm size usually influences output positively.

Of f-farm income: This is a dummy variable (farmers having off-farm income = 1, otherwise 0) which indicate whether the family has other sources of income besides rainfed rice farming. Off-farm income may include remittance from family members living away. Off-farm income is assumed to boost the family’s purchasing power and hence is expected to have a positive impact on both income and food security status of the farmers.

Household size: Household size is the number of individuals living in a family. Household size determines labour availability and food requirements in the household. It therefore may either have a positive (if productive) or negative (if unproductive) impact on income and food security status of a family.

Level Education: Education is measured in number of years spent in school. Level of education is expected to positively influence both production and nutritional decisions of the farmers. It’s expected to take a positive sign.

Dependency ratio: This is the number of unproductive individuals (children, old, sick, etc) dependent on the family for shelter and food. The apprior assumption is that the higher the dependency ratio the lesser the income and food security status of the family. The expected sign on the coefficient is negative.

Number of income earners: This is expected to have a positive relationship with both income and food security status of the family.

3. RESULTS AND DISCUSSION

Socio-Economic Characteristics of the Rainfed Rice Farmers: The result of the study on socio-economic characteristics is presented in Table 2. The result shows that rainfed lowland rice production in the study area was dominated by middle aged (31-40 years) and ageing males (41-50 years) with a family size of between 6 and 10 members. These are the economically active age brackets and people in this age brackets are usually self motivated and innovative. The result shows that majority (59.67 percent) of the rainfed rice farmers had non-formal (Qur’anic) education and only 33 percent had formal education. Responses on farming experience shows that 41 percent of the rainfed rice farmers in the study area had been cultivating rice for a period of 16 - 25 years. This implied that rainfed rice farmers in the study area have been in farming profession for quite some period of time and are not novices in rainfed rice farming. The result further shows that 51.67 percent of the rainfed rice farmers were non-members of any cooperative society. This finding may be attributed to a minimal or absence of awareness campaign and/or sensitizations on the importance of cooperative societies to farmers in the study area. Result of the study also shows that majority (55.33 percent) of the farmers had no contact in whatever form with agricultural extension agents, however, 44.67% were at least contacted once.

Table 2. Distribution of the rainfed rice farmers by personal and socio-economic characteristics

Variable	Frequency	Percentage
<i>Age (years)</i>		
20-30	30	10
31-40	89	29.67
41-50	91	30.33
51-60	52	17.33
61 Above	38	12.67
<i>Household Size</i>		
1 – 5	58	19.30

6 – 11	154	51.40
Above 11	88	29.30
Education		
Non Formal	199	66.33
Formal	101	33.67
Farming Experience		
6 – 15	75	25.00
16 – 25	125	41.67
31 – 35	49	16.33
36 Above	51	17.00
Members of Coop-society		
Members	145	48.33
Non members	155	51.67
Contact with Extension Agents		
Contacted	134	44.67
Not contacted	166	55.33

Source: Field Survey, 2015

Food security status

The distribution of the rainfed rice farmers according to household food security status is presented in Figure 1. The result of the study shows that only 23.67 percent of the rainfed rice farmers were food secure while the remaining 76.33 percent were food insecure.

Of the 76.33 percent of the rainfed rice farmers that were food insecure, majority (54.33 percent) were food insecure without hunger (FIWH), 17 percent were Food Insecure with Moderate Hunger (FIMH) while the remaining 5 percent were categorized as Food Insecure with Severe Hunger (FISH). This means that for the FIWH category, food insecurity is evident in their respective households' concerns and adjustments to household food management, including reduction in diet quality, but with no or minimal reduction in quantity of food intake. For the 17 percent FIMH respondents, food intake for adults in the households is reduced to an extent that implied that adult are experiencing hunger due to lack of resources. The situation was so severe with 5 percent of the rainfed rice farmers who were categorized as Food Insecure with Severe Hunger (FISH). For this category, households with children reduce the children's food intake

which implied that children experienced hunger as a result of inadequate households' resources. Moreover, adults in these households experienced extensive reductions in food intake to the extent of going half days without food sometimes. Finding of the study generally shows that majority of the rainfed rice farmers in the study area were food insecure. Although they had physical and economic access to sufficient food, the food was not however nutritious enough to meet their dietary needs and food preferences for a healthy life.

Determinants of Household Food Security Status

The result of the maximum likelihood estimates for the Logit regression analysis is presented in Table 3.

As shown in Table 3, four out of seven predictor variables considered were found to significantly influence food security status of the rainfed farmers in the study area. These are education ($p < 0.05$), off-farm income ($p < 0.01$), dependency ratio ($p < 0.05$) and own farm rice output ($p < 0.01$). However, education, off-farm income and output had positive signs while dependency ratio had negative signs. On the other hand, the coefficients of household size, number of income earners, and farm size were

not statistically significant. The *Omnibus* Test of Model Coefficients (which gives the overall fit-test for the model that includes the predictors) indicates a Chi-square value of

80.21 which is significant ($p < 0.01$). This implies that the model as a whole fit significantly ($p < 0.01$) better than an empty model.

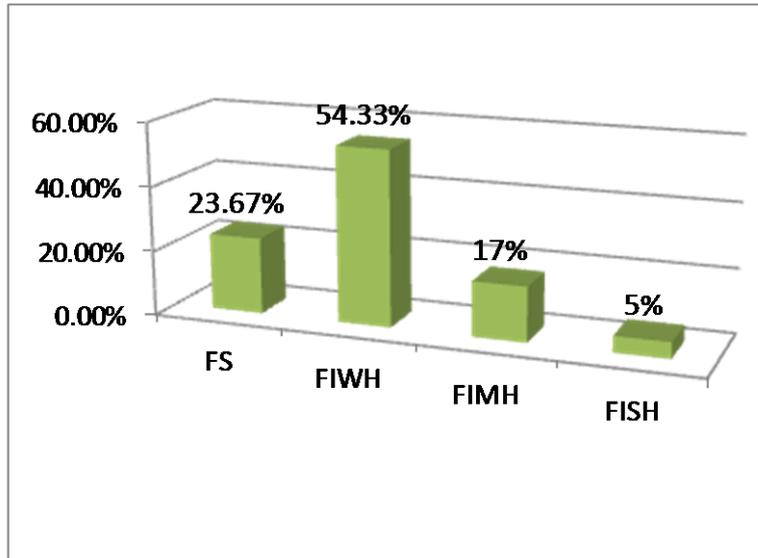


Fig. 1: Food security status of rainfed rice farmers by severity (Field Survey,2015)

Table 3. Maximum likelihood estimates for the Logit model

Variable	ML coefficient	Marginal effect	Standard error	Significance
Constant	- 0.678	63.835	0.392	0.084
Output (X_1)	0.001***	42.53	0.000	0.001
Farm Size (X_2)	0.267	11.1	0.169	0.115
Household Size (X_3)	0.027	0.370	0.048	0.573
Education (X_4)	0.865**	2.397	0.028	0.018
Off-farm Income (X_5)	1.045***	17.183	0.018	0.000
Income Earners(X_6)	- 0.153	0.000	0.128	0.234
Dependents (X_7)	- 0.087**	0,646	0.043	0.044
-2 log likelihood	321.919			
Cox & Sneil R^2	0.235			
Nagelkerke R^2	0.318			
Omnibus Statistic	80.210***			

*** = Significant at 1 percent, ** = Significant at 5 percent

Output: Rainfed rice output is the quantity of rainfed rice produced by households. Table 3 shows that the variable exercised, as expected, a positive and significant ($p < 0.01$) impact on food security status of the farmers. The result shows that for every 10 kg increase in rainfed rice output, the log odd of being food secure increases by 0.01. The finding implies that as the output level of the households' increases, the food security status of the farmers in the study area improves. This finding clearly indicates that increase in rainfed rice yield could be used as a strategy for improving food security in the study area and other areas with similar ecology. Hence, rainfed rice farmers can effectively improve their household food security status by adopting rice yield-boosting technology such as appropriate use of improved varieties, fertilizer application, pest control measures, etc.

Education: Education had a positive coefficient (0.865) that is significant at 5 percent level. This shows that an additional year in the level of education of the rainfed lowland rice farmers increases the log odds (probability) of being food secure by 0.865. This implies that an increase in number of years of education will proportionately improve the food security situation of the farmers. This finding is synonymous to earlier researches because economic theory postulates that the educational attainments of an entrepreneur plays an important role in adopting improved production technology and in decision making, and this is expected to impact on the living standards of the people.

Off-farm Income: Off-farm income is found to have a positive and significant ($p < 0.01$) impact on food security status of the farmers. This implies that for every N1 increase in off-farm income the log odds of being food secure will increase by 1.045. This means that, all things been equal, households with other alternative sources of income are expected to be food secure compared to those without any other alternative sources of income. This finding therefore calls for sensitization to encourage farmers to engage in off-farm income generation activities to complement

their income and improve their food security situation.

Dependents: The number of dependents is found to have a negative and significant ($p < 0.05$) impact on food security status of the farmers. The result shows that an addition of one dependent member to the household, decrease the log odds of being food secure by 0.087. The finding implies that the higher the number of dependents in farmers' households, the poorer the food security situation of the rainfed farmers in the study area. The finding serves to emphasize the need for the adoption of simple family planning techniques and to encourage the family members to be productive and to engage in income generation activities in order to improve their food security status.

4. CONCLUSION AND RECOMMENDATIONS

The study has shown that food insecure households constitute the larger proportion of the rainfed rice farming communities in the study area. Findings of the study had substantiated the significance of rainfed rice output, level of education, off-farm income and dependents as major determinants of household food security status in the study area. The study recommends that farmers should boost their output by adopting yield boosting technologies, diversify their income, raise their level of education and manage their family dependents.

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