ORIGINAL ARTICLE

Assessing Farmers' Household Food Insecurity Access Prevalence and Food Security Status in Southwest Nigeria

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Abstract

A household is considered to be food secure when its occupants do not live-in hunger or fear of starvation. Prevalence of food insecurity is a major concern in Southwest Nigeria, most farm households live below the international standard. This study, therefore, assessed the household food security status of farmers in Southwest Nigeria. Primary data were obtained from 800 registered farmers selected through multi-stage sampling process in Ogun and Oyo States of Southwest Nigeria. Survey data were obtained with the use of Household Food Insecurity Access Scale (HFIAS) questionnaire. Data were analyzed using descriptive statistics and Factor analysis. Two main factors were retained with 65.9% of the total variance explained. The mean food insecurity score was 2.03±SD 0.95. Overall food security of 33.6% and 66.4% of food insecurity was recorded. Conclusively, the HFIAS measurement portrays assessment of farmers' household in Southwest Nigeria as food insecure due to low income from production. Hence, the need to formulate effective food security programmes, new farming techniques and methods to increase production to reduce food insecurity are vital remedies.

Keywords: *Food demand, HFIAS, Food security, food insecurity*

1. Introduction

New evidence continues to point to the rise of world hunger in recent years. An estimated 821 million people, approximately one out of every nine people in the world are undernourished. Undernourishment and severe food insecurity appear to be increasing in almost all regions of Africa. Food insecurity contributes to undernutrition, and high rates of these forms of malnutrition coexist in many countries (WHO/FAO, 2018).

Food security is a multi-dimensional concept that is based on various scopes such as physical, social, and economic access, availability, amount, preferences for certain foods, security, and time (Coates et al., 2007). The measurement of food insecurity captures one

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or more of the three dimensions of food security that is availability, utilization, and access. The food insecurity assessment which is based on the availability dimension is widely used to guide the responses to food insecurity (Barret, 2010). However, it does not capture the unequal distribution of food and the utilization of food in a given population. An assessment of food insecurity based on the second dimension, utilization, is well captured through various anthropometric indicators, e.g., underweight, stunting, and wasting.

This study focusses on food access, which reflects the demand side of food security as one of the major contributors to food insecurity (Sen, 2014). In 2006, the USAID-funded Food and Nutrition Technical Assistance Project, in conjunction with the Academy for Educational Development, published a tool that measures the access component of household food insecurity. The tool was developed to be simple, easy to use, and applicable, with only minor adaptations to different sociocultural contexts. The tool captures three domains: i) anxiety and uncertainty about food access, ii) insufficient quality (variety, preferences, and social acceptability), and iii) insufficient food intake and the physical consequences (Swindale & Billinsky, 2006).

The HFIAS has been shown in various study to measure food insecurity with an acceptable standard in developed and a few developing countries (Becquey et al., 2010; Knueppel et al., 2010; Maes et al., 2009; Mohammadi et al., 2012; Gundersen, 2013). The authors reported that the tool performed well in capturing the access component of food insecurity among the study participants. However, few applications of the tool are being explored in Nigeria. The results of this study will thus help to strengthen the application of the tool and its performance for measuring progress in order to monitor and evaluate different programs on household food insecurity.

Food security is achieved when all people at all times have economic and physical access to sufficient, healthy and nutritious food to meet dietary needs and food preferences for having an active and healthy life (Haen et al., 2003). Conversely, limited access to sufficient and safe nutrients or the inability to eat appropriate foods through acceptable ways can cause food insecurity (Hasan-Ghomi et al., 2012). The Food and Agriculture organization (FAO) report (2018) on the state of food insecurity in almost 150 countries showed that nearly one out of ten individuals of the world population (9.3%) suffered from severe food insecurity, which is equivalent to about 689 million individuals. The food security situation visibly has been worsened in sub-Saharan Africa, South Eastern and Western Asia (WHO/FAO, 2018).

A statistical report on severe food insecurity in Nigeria showed that the prevalence of food insecurity has been increasing. According to the 2019 survey report by the Nigeria National Bureau of statistics the percentage of households reporting food shortage has increased exponentially from 11.1% in 2012/13 to 31.6% in 2018/2019 (NBS, 2018).

The food security status of each household lies somewhere along a continuum extending from high food security to very low food security. This continuum is divided into four ranges, characterized as: First, high food security stating that the households had no problems or anxiety about consistently accessing adequate food. Second, marginal food insecurity showing that households had problems at times, or anxiety about accessing adequate food, but food intake quantity, quality, and variety were not substantially reduced. Third, low food security revealed that the quality, variety and desirability of the food consumed by these households were disrupted, but the quantity and eating patterns were not substantially disrupted. Forth, very low food security indicated that the eating patterns of one or more household members were disrupted at times and the quantity of food also reduced due to lack of resources or money for food (USDA, 2020).

The nine HFIAS questions are placed in order of increasing severity and each of the questions have a frequency of occurrence question that are coded. The HFIAS categories are calculated based on the answer to the nine questions and the occurrence. Households are placed on the HFIAS scale based on the sum of their responses to the frequency of occurrence questions.

The HFIAS module is used to capture household food insecurity occurrence, prevalence and severity (Webb, 2006). Its ability to group households into food security categories makes it suitable for developing programme targets. It is used in assessing programme impacts and monitoring food assistance programmes as it is sensitive to changes over time (Coates et al., 2007). The HFIAS is commonly used to report prevalence of national household food insecurity (Webb, 2006). Several studies have been done on national and local levels. The determinants of food security have been investigated for various countries including Ethiopia (Bogale, 2012), Ghana (Owusu et al., 2011), Zimbabwe (Mango et al., 2014), Kenya (Kassie et al., 2014), Brazil (Felker-Kantor & Wood, 2012) and Nigeria where it was found that about 60% of the households were food insecure (Arene & Anyaeji, 2010). The factors influencing household food security in Nigeria were examined by Amaza et al. (2006). Results of the study revealed that household size is the key determinant of food security. Food insecurity increases with the increase in the number of family members and vice versa. Ngema et al. (2018) & Abubakar (2013) examined the causes of household food security. A study examining the food security status using the HFIAS classification with respect to Southwest Nigeria is missing, therefore, this research is planned to fill this gap. Hence, this research was conducted to assess the household food security status of farmers in Southwest geo-political zone of Nigeria.

2. Methodology

2.1 Study area

The study was carried out in South west, Nigeria. Nigeria is located in Western Africa with a land mass of 923,768 square kilometers of both land and water. Nigeria is divided into six geopolitical zones i.e., North-west, North-central, North-east, South-east, South-south and South-west geopolitical zones. The South west zone comprises of six states namely; Ekiti, Lagos, Ogun, Ondo, Osun and Oyo. The land mass of the area is 76, 852 square kilometers with a population of about 205, 515,889 million. The region lies between latitude 7011 and 8014l and longitude 2045l and 4015l. Those not employed by the government (civil service) engaged in farming and other businesses. The state was purposively selected for a better sampling frame and large numbers of farming household. The following approach was adopted in order to determine the sample size. Given that Ogun state has 67,850 registered farmers while 415,030 are registered farmers in Oyo state for the farming enterprises. The sample size for this study was calculated using the formular propounded by Yamane (1973)

$$n = \frac{N}{1+N(e)^2} \quad \text{Yamane's formula} \quad \ldots \text{(i)}$$

$$n = \frac{67,850}{1+67850(0.05)^2} \qquad n = \frac{415030}{1+415030(0.05)^2}$$

n=397.7 n =399.6

where:

n = sample size

N = total population (registered farmers: Ogun 67,850 and Oyo 415, 030)

e = level of significance

2.2 Sample Size and Sampling Procedures

A multistage sampling technique was used in the selection of respondents for the study. The first stage involved a purposive selection of one-third of the six states in the South-West Nigeria on the bases of population and number of registered farmers and rural households. The two states selected were Oyo and Ogun States. The second stage involved the use of all the four agricultural zones of Ogun State Agricultural Development Programme (OGADEP) namely Ilaro, Ijebu ode, Abeokuta, Ikenne and all the four agricultural zones of Oyo State Agricultural Development Programme (OYSADEP) namely Ibadan/Ibarapa, Oyo, Saki and Ogbomoso. The third stage involved a purposive selection of 50.0% of the blocks in Ogun state, 2 out of 4 in Ilaro, 3 out of 6 in Ijebu-ode, 3 out of 6 in Abeokuta and 2 out of 4 blocks in Ikenne zones respectively; with random selection of four cells each from the ten blocks selected. The four blocks in Oyo state were adopted while 25 cells were selected for Oyo State. The basis of selection was due to large number of farmers across sector in these cells. The agricultural enterprises selected was based on the most prominent crop production (cassava and cocoa) and livestock (poultry and fishery) production. The fourth stage of the sampling involved a random sampling of 10 farm households from the 40 cells selected out of 64 cells in Ogun state giving 400 respondents for Ogun state and 16 households each randomly selected of all the 25 cells in Oyo state resulting in 400 respondents. Thus, the total sample size was 800 respondents.

2.3 Method of Data Analysis

Questionnaire was designed and administered to farmers to collect data. The data obtained from the farmers include the socio-economic characteristics of respondents such as age, sex, level of education, marital status, major occupation and type of agri-business as well as HFIAS tool (nine occurrence questions item). The data obtained were analyzed using descriptive statistics and Factor analysis.

Frequencies, means and standard deviations were used to describe characteristics of the study participants. Construct validity was assessed using rotated principal component factor analysis with a varimax rotation. Factors with an eigenvalue of approximately one or more were retained. Subscales were developed using items that consistently grouped together and had factor loading with an absolute value of 0.5 or more. Internal consistency of the scale was assessed using Cronbach's alpha. A scale with a coefficient of 0.7 or higher was considered reliable. Higher HFAIS scores indicated greater food insecurity levels. Another indicator of food insecurity used in the study was the Household Food Insecurity Access Prevalence (HFIAP). Households were categorized into four levels of food insecurity (food secure, mildly insecure, moderately insecure and severely food insecure). Household food insecurity scores ranged from 0 to 27.

To determine the household food security status, the Household Food Insecurity Access Scale (HFIAS) was used. This scale reflected the feelings of the head of household about food insecurity of his/her family. In the HFIAS, questions did not refer directly to the nutrition quality, but it covered the household's perception of changes in food quality, regardless of actual food compositions. The HFIAS consist of 9 questions with a 4-item Likert scale measured as rarely; sometimes; often and no. The mentioned responses were scored as 3, 2, 1, 0 respectively. The maximum score for a household was 27. When the household response to all nine questions was "often", the response score was 3, but the minimum score was 0 when the household responded 'no' to all questions. Higher scores in the HFIAS meant the worse status of food insecurity for household. In this scale, food insecurity was divided into

four groups namely: food secure (0 - 1 point), mildly food insecure (2 - 7 points), moderately food insecure (8 - 14 points) and severely food insecure (15 - 27 points). FANTA, (2018).

Factor analysis is an interdependency technique in which there is no division of variables into dependent variables and independent variables. The aim is to define the structure between variables in analysis in order to describe the relationship structure between variables and the correlation between those variables.

To do this, a popular diagnostic measure to test whether the partial correlations among variables are small is necessary. Hence, Kaiser-Mayer Olkin (KMO) which is a measure of a homogeneity of variables is computed. (Sharma, 1996). The value of KMO measures the adequacy of sampling thoroughly and measures the sampling adequacy for each variable. The value of KMO is computed using the following formula (Kaiser, 1970):

$$KMO = \frac{\sum\sum r_{ij}^2}{\sum\sum r_{ij}^2 + \sum\sum a_{ij}^2} \quad \ldots \text{(ii)}$$

Where:
rij = simple correlation between i-th and j-th variable
αij = partial correlation between i-th and j-th variable
For a factor analysis to be considered feasible, the value of KMO is ≥ 0.5.
After considering the value of KMO and the value is greater than 0.5 and the Bartlett's test of sphericity indicates the item correlation is not an identity matrix, then the research can move forward with the factor analysis (Netemeyer, 2003).
Thus, Factor analysis model was used to describe the covariation in observed variables and is given by:
$X = \mu + LF + \varepsilon$ … (iii)
where:
X = random vector with mean vector and covariance matrix
L = matrix of factor loadings,
F = vector of latent factor scores,
ε = vector of latent error terms.

3. Result and Discussion

The socio-economic profile of the 800 farmers in South West, Nigeria is summarized in Table 1. The results indicated that most (80.25%) of the farmers in the study area were within the age bracket of 25-54 years while 11.38% were within ages 55-64 with a mean age of 44 years. Few (1.87%) of the total respondents were less than or exactly 24 years of age while 6.5% were 65 years old or more. The implication is that most of the respondents were those in their prime working lives. This may be due to high population of youth among the farmers because Ogun state especially is reputed to have a youthful population with over 50,000 registered as farmers under the Agricultural Commission of the Ogun State Government. (Ogun News, 2020). There were more male farmers (86.6%) than female (13.4%) in the study area which means that the agricultural sector of the study area was male dominated. This implies that the farmers in the study area were male dominated. An examination of the level of educational attainment of farmers in the study area revealed that 37.7% had secondary education, 24.5% had primary education, while 7.3% had adult/informal education with a mean of 9 years of schooling. This implies that all the respondents are literate. Literacy level has implication on choice of healthcare. The mean education of 9 years indicated educational level above primary education. Majority (85.1%) of the farmers were married while 14.9% were single. The majority of the respondents were married. Majority 71.5% had a household size

of 1 – 5 members, 26.6% had 6-10 members with a mean household size of 4. This mean household size of 4 showed that the farmers had small household size. Majority (78.2%) of the farmers had farming as major occupation, 14.3% were into private business, 6.0% were Civil servants while 1.5% claimed to have some other forms of occupation. Cassava farmers were 89.8% of the total respondents, 5.5% were fish farmers, while 3.1% of the total respondents were Poultry farmers and 1.6% of cocoa farmers.

The total monthly income of 18.2% is between 0 - N20,000, 39.0% had N20,001 - N40,000, 28.8% had N40,000 - N60,000, 7.0% had N60, 001 - N80, 000 while a few 7.0% had more than N80,000. However, the income of the respondents was grouped based on the total income. The average income was N44, 092.27. Majority (59.1%) of the farmers were below average, 4.0% were at the medium the average level and 36.9% were above the average level. The lowest income group earned an average of N27,917.16k while the highest income group earned an average of N69,928.81k.

Description		**Frequency**	**Relative Frequency (%)**
Age (years)			
≤ 24		15	1.87
25 – 54		642	80.25
55 – 64		91	11.38
≥ 65		52	6.5
Mean	**44**		
Sex			
Male		693	86.6
Female		107	13.4
Education level			
Informal		58	7.3
Primary		196	24.5
Secondary		302	37.7
Tertiary		178	22.2
Others (Arabic, None)		66	8.3
Mean	**9**		
Marital status			
Single		89	11.1
Married		681	85.1
others (Widow, separated)		30	3.8
Household Size			
1-5		**572**	**71.5**
6 – 10		**213**	**26.6**
11 – 15		**13**	**1.6**
≥ 16		**2**	**0.25**
Mean	**4**		
Major occupation			
Farming		626	78.2

Civil Service		48	6.0
Self-employment		114	14.3
Others		12	1.5
Type of agri-business			
Poultry		25	3.1
Aquaculture		44	5.5
Cassava		718	89.8
Cocoa		13	1.6
Monthly Income (N)			
0-20000		**189**	**23.6**
20001-40000		**283**	**35.4**
40001-60000		**239**	**29.9**
60001-80000		**45**	**5.6**
> 80000		**44**	**5.5**
Total		**800**	

Source: Field survey, 2018

Farmer's Household Food Insecurity Access Scale (HFIAS) in South West Nigeria

Table 2 showed the Factor Analysis result. The HFIAS had a very high reliability with Cronbach's Alpha of 0.876-0.895. The items total correlation is 0.44 indicating a good correlation. It shows that both the Cronbach's Alpha and the item Correlation were found valid and reliable proxy indicator for measuring household food insecurity status.

The internal reliability of the HFIAS is very similar to that of the Radimer/ Cornell scale used by Leyna et al. (2008) with Cronbach's α 0.83-0.89. It also has the similarity with that of Knueppel et al. (2010), in fact both studies demonstrated the same internal reliability of Cronbach's α 0.83-0.89.

To establish if the use of factor analysis is justified. The dataset was further evaluated using Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (Kaiser, 1970) and Bartlett's test of sphericity (Bartlett, 1950). KMO measure of sampling adequacy is a test to assess the appropriateness of using factor analysis on the data set. Bartlett's test of sphericity is used to test that the variables in the population correlation matrix are uncorrelated. Factor analysis allows using information about interdependencies between observed variables in large data sets to reduce a large set of measured variables into a smaller set of factors.

The Value of Kaiser-Meyer-Olkin measure of sampling adequacy (KMO = 0.9079) and Bartlett's test of sphericity ($p < 0.001$). The results indicated that the data set is adequately sampled and the factor analysis of the data is appropriate. Hence, the use of factor analysis.

HFIAS results presented in Table 2 indicated that 43.0% of the farmers worried about food shortage during the last four weeks; 43.0% had inability to eat preferred food; 44.0% ate limited variety of food; 40.0% ate food that they really do not want to eat and were unable to eat the preferred variety of food due to lack of adequate resources respectively; 43.0% ate smaller amount of food; 31.0% had no food of any kind to eat; 36.0% slept without eating food; and 1.0% slept the whole day without eating any food.

SN	Variable	Category	Frequency	%	Mean (SD)	Conf. Interval
1	Worry about food	No Rarely Sometimes Often	454 230 107 9	57.0 29.0 13.0 1.0	0.59(0.76)	0.05
2	Unable to eat preferred food	No Rarely Sometimes Often	457 187 129 27	57.0 23.0 17.0 3.0	0.66(0.87)	0.06
3	Eat just a few kinds of food	No Rarely Sometimes Often	452 184 142 22	56.0 23.0 18.0 3.0	0.67(0.86)	0.06
4	Eat food they really do not want to eat	No Rarely Sometimes Often	481 181 120 18	60.0 23.0 15.0 2.0	0.59(0.82)	0.06
5	Eat a smaller meal	No Rarely Sometimes Often	485 167 128 20	60.0 21.0 16.0 3.0	0.60(0.84)	0.06
6	Eat fewer meals in a day	No Rarely Sometimes Often	460 185 125 30	57.0 23.0 16.0 4.0	0.66(0.87)	0.06
7	No food of any kind in the household	No Rarely Sometimes Often	553 150 82 15	69,0 19.0 10.0 2.0	0.45(0.75)	0.05
8	Go to sleep hungry	No Rarely Sometimes Often	553 187 97 6	64.0 23.0 12.0 1.0	0.49(0.73)	0.05
9	Go a whole day without eating	No Rarely Sometimes Often	799 1 0 0	99.0 1.0 0.0 0.0	0.00(0.35)	0.00
Source: Field Survey, 2018						

Farmers' Household by rotated factor loading of items of the HFIAS

Two main constructs (factors) emerged from the rotated factor analysis of the nine HFIAS items. (Table 3). Items 1 to 8 loaded as the first factor, with loadings ranging from 0.69 to 0.85. Item 9 loaded as the second factor, with loading of 0.98. The items were above the 0.5 cut-off for both factors. The first factor explained 54% of the total variance while the second factor explained 12% of the total variance. Uniqueness shows the variance that is unique to the variable and not shared with other variables. 49.75% of the variance in item 1 is not shared with other variables in the overall factor model. On the contrary, item 9 has low variance not accounted by other variables (3.29%). The greater the uniqueness the lower the relevance of the variables in the factor model. The two factors explained 65.9% of the total variance observed. The pattern matrix shows the relevance of each variables in the factor. Factor 1 is defined by all the variables except item 9. Factor 2 is mostly defined by item 9. The sum of the eigenvalues is equal to the number of variables. The first factor retained the information contained in 4.90 of the original values while the last value retained contained information of about 0.59 of the original values.

Table 3: Distribution of rotated factor loading of items of the HFIAS

	HFIAS Items	**Factor**	**Factor**	
	In the past four weeks,	Factor 1	Factor 2	Uniqueness
1	Did you worry that your household would not have enough food?	0.69	-0.15	0.4975
2	Were you or any household member not able to eat the kinds of foods you preferred?	0.79	0.10	0.3542
3	Did you or any household member have to eat a limited variety of foods?	0.83	0.07	0.3058
4	Did you or any household member have to eat some foods that you really did not want to eat?	0.79	0.01	0.3718
5	Did you or any household member have to eat a smaller meal than you felt you needed?	0.83	-0.14	0.2887
6	Did you or any other household member have to eat fewer meals in a day?	0.85	-0.04	0.2744
7	Was there ever no food to eat of any kind in your household?	0.74	-0.02	0.4426
8	Did you or any household member go to sleep at night hungry?	0.71	0.09	0.4908
9	Did you or any household member go a whole day and night without eating anything?	0.06	0.98	0.0329
	Eigen value: **Proportion of variance:** **Kaiser-Meyer-Olkin measure: 0.9079**	**4.90** **0.54**	**1.03** **0.12**	

Source: Field survey, 2018

Farmers' Household by Food Insecurity Access Prevalence in Southwest Nigeria

Table 4 showed that 66.4% of the farming households experienced varying degrees of food insecurity in the one month preceding the survey. The mean food insecurity score was 2.03±0.95 and an overall food security of 33.6% was recorded. The household food insecurity access scale (HFIAS) calculations show that, 39.6% of were mildly food insecure, 17.0% were moderately food insecure and 9.8% were severely food insecure. This result further portrays that the study area is likely food insecure since the number of food insecure respondent households 533 (66.4%) are more than the food secure households 267 (33.6%). This finding is consistent with that of Nwnakwe & Onyemaobi (2013); Kuwornu et al., (2013); and Ibok, et al., (2014) that two third of the farming households' study were not food secured. Also, Ivanda et al., (2015) investigated food security condition among Tiv farming households using food security and found out that 46.9% of the farming households were food insecure. But the present finding is contrary to Ifeoma & Agwu (2014) study among rural farming households in Kano that 74% were food secure.

Table 4: Distribution of Farmers' Household by Food Insecurity Access Prevalence

Status	Frequency	Relative Frequency (%)	Mean (SD)
Food Secure	267	33.6	1.67 (0.47)
Mild Food Insecure	318	39.6	1.60 (0.48)
Moderate Food Insecure	137	17.0	1.83 (0.38)
Severe Food Insecure	78	9.8	1.90 (0.30)

Source: Field survey, 2018

4. Conclusion

The result portrays that farmers in the study area are likely food insecure since the number of food insecure households is greater than food secure households. The respondents being farmers produced most of the food the household consumed, yet they are not food secured. This may be due to low production resulting in low income. Based on the foregoing there is urgent need to boost investment in agricultural productivity and adapt to climate change sustainability so as to boost production and hence, food security.

This study found out that the majority of farming households in Southwest Nigeria were food insecure. This finding can be beneficial to policy makers as it would enable them to formulate effective policies for ensuring adequate food security and identify the food insecure as target groups and hence design effective food security programmes to focus not only on currently food insecure groups but also to provide mechanisms in preventing households who are now food secure from falling deeply into food insecure categories in the future.

The designed policy will also be useful for extension agents to disseminate useful information to farmers in adopting new farming methods and techniques for new varieties of crops and improved breeds of livestock to boost production, increase income and thus reduce the level of food insecurity.

Conflict of Interest

Author declare no conflicts of interest.

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