



A Comparative Analysis of Household Food Insecurity Status among Rice Farmers in Savanna and the Rainforest Agro-ecological Zones in Southwest States, Nigeria

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ABSTRACT

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The study presents findings on comparative analysis of household food insecurity status among rice farmers in the Savanna and the Rainforest agro-ecological zones in Southwest States, Nigeria. Primary data were used and obtained through the administration of a well structured questionnaire. A multistage random sampling was used to select 577 rice farmers in the study area. Data were analyzed using descriptive statistics, household food insecurity access (HFIA) scale, household food insecurity access prevalence (HFIAP) scale, likert scale and linear regression model. The results revealed that majority of the rice farmer's fall within 31-50 years of age bracket, with household size of 5-8 persons, married, with farming experiences and have small farm size. The findings from average household food insecurity access scale scores in the Savanna and the Rainforest agro-ecological zones were 4.0 (mildly food insecure) and 5.2 (moderately food insecure) respectively. The results of HFIAP indicator revealed that about 39.1% and 33.5% of respondents were classified as food secure, 8% and 13.9% were mildly food insecure, 15.1% and 22.2% were moderately food insecure and 37.8% and 30.4% were severely food insecure in the Savanna and the Rainforest agro-ecological zones respectively. The major coping strategies adopted by the respondents against food insecurity include reduce the quantity of food consumed and eating but not satisfied. The linear regression model revealed that age, sex, years in school, farm size, household size, farming experience, rice farming experience and tenure system significantly affect household's food insecurity status. To transport from food insecure to food secure, age, sex, years in school, farm size, household size, farming experience, rice farming experience and tenure system alleviation policies are imperative.

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Introduction

Nigeria is the most populous nation in Africa with almost 186 million people in 2016 (UNICEF 2017). With a high fertility rate of 5.38 children per woman, the population is growing at an annual rate of 2.6 percent, worsening overcrowded conditions. By 2050, Nigeria's population is expected to grow to a staggering 440 million, which will make it the third most populous country in the world, after India and China (Population Reference Bureau, 2013). A scarcity of resources and land in rural areas has resulted in Nigeria having one of the highest urban growth rates in the world at 4.1 percent (Nigeria Federal Ministry of Health 2014). Currently, Nigeria ranks 145th out of 157 countries in progress toward meeting the Sustainable Development Goals (SDGs) (Sachs et al., 2017). Thus, the aforementioned situations in Nigeria as a country and its economy have the probability of making large number of the populace vulnerable to food insecurity in the country. In Nigeria, about 5.3 million people were food

insecure in 16 states of the country (GRFC, 2019). In addition, not less than 70% of the Nigerian population is surviving on less than a dollar per day while food insecurity prevalence in the low income urban households and rural areas respectively stands at 79% and 71% (Akerle et al.; 2013).

In spite of availability of cultivable land area, the current level of demand for rice in Nigeria is about 5 million metric tonnes which is more than the quantity produced (2.2 metric tonnes) (Ajatomobi et al., 2010). Consumption of rice has already outpaced domestic production and as a result, Nigeria is the leading importer of rice in the world today, with an 8.2 percent share of imports in the global market (Gyimah-Brempong et al., 2016). Rice import represents more than 25% of agricultural imports and over 40% of domestic consumption (Ohaka et al., 2013). Despite the place of rice in contributing to the food supply in Nigeria, its production

is still put at 3.2 million tonnes (Babafada, 2003; Ohaka et al., 2013). This has shown to be far below the national requirement as over 600 million dollars' worth of rice is imported annually into the country (Adeoye, 2003; Ohaka et al., 2013; Raufu, 2014; Abdullahi 2012, Omofesho, 2010). This study therefore investigated comparative analysis of household food insecurity status among rice farmers in Savanna and the Rainforest agro-ecological zones in Southwest States, Nigeria. The specific objectives are to describe the socio-economic characteristics of rice farming households and analyse household food insecurity status of rice farmer's households by comparing their socio-economic characteristics.

Materials and Methods

Study Area

The study area was Southwest Nigeria comprising of Lagos, Ogun, Oyo, Osun, Ondo and Ekiti States. The six States lie between longitude $2^{\circ}31'$ and $6^{\circ}00'$ East and latitude $6^{\circ}21'$ and $8^{\circ}37'$ North with a total land area of 77, 818 km². The study area is bounded in the East by Edo and Delta states, in the North by Kwara and Kogi States, in the West by the Republic of Benin and in the South by the Gulf of Guinea. Two distinct (dry and wet) seasons are dominant in the study area in which subsistence and small scale farming are practiced (Odekunle et al., 2007).

The climate of the study area experiences a double rainfall maxima characterized by bimodal high rainfall peaks, with a short dry season and a longer dry season falling between and after each peaks. The mean annual rainfall is between 1200mm and 1500mm. Atmospheric temperature in Southwest, Nigeria is high throughout the year with an annual mean of 27° (BNRCC, 2011).

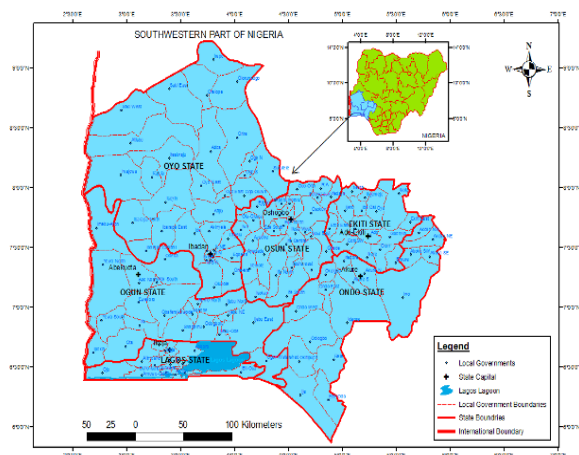


Figure 1. Map of the Southwest States, Nigeria
Source: Agboola and Olurin, 2003

Data and Sampling Procedure

Primary data for this study were collected in 2021 during rice production period through the use of a well-structured questionnaire administered through direct interviews to rice farming households in the study area. A multistage random sampling technique was used for selection of the respondents. The first stage involved a purposive selection of the two dominant agro-ecological zones (that is, Savanna and Rainforest agro-ecological zones) in the Southwest,

Nigeria with about 32.5 million people (NPC, 2006). Ekiti and Oyo States belong mainly to Savanna dominated agro-ecological zone. While Ondo, Ogun and Osun States mainly belong to Rainforest agro-ecological zone. Lagos State was not included because of administrative reason (Otitoju, 2013). The second stage involved purposive selection of Ekiti, Ondo and Ogun out of the six States in Southwest Nigeria because of high rate of rice production (land under rice cultivation is about 2 million hectares) in the three States (Arimi 2014; Osabuohien et al., 2018).

The third stage involved purposive selection of six (6) Agricultural Development Programme (ADP) zones in the three States based on the predominance of rice farmers in these zones (Table 1). The fourth stage involved purposive selection of two (2) extension blocks from each Agricultural Development Programme (ADP) based on the predominance of rice farmers (Table 1) in these extension blocks, making twelve (12) extension blocks in all. At the final stage, respondents were randomly selected from each of the cells proportionate to the population size of the cells. In all, 225 and 352 rice farming households were sampled in the Savanna and Rainforest agro-ecological zones respectively (Table 1).

Analytical Framework

Descriptive Statistics

The data collected from the respondents were analysed using descriptive statistics such as frequency counts, percentages and mean. This tool was used to describe the socio economic characteristics of the respondents in the study area.

Household Food Insecurity Access Score (HFIAS) Model

Food security was measure by HFIAS and it was used to categorized respondents as food secure, mildly food insecure, moderately food insecure, or severely food insecure (Coates et al. 2007). The HFIAS was developed by the USAID Food and Nutrition Technical Assistance project (FANTA 2006) in an increasingly need to have a universally comparable and cost-effective measure of food security (Coates et al., 2007) and have been used in a similar studies by Gabriela and Manfred (2007) and Ibrahim et al. (2009).

The HFIAS module covers a recall period of 30 days, and consists of 18 questions that were grouped into two types of questions - nine "occurrence" and nine "frequency-of-occurrence" questions. The respondent is first asked if a given condition was experienced (yes, no or I don't know) and, if it was, then with what frequency (rarely that is, once or twice in the past four weeks, sometimes that is, three to ten times in the past four weeks or often that is, more than ten times in the past four weeks). The resulting responses were transformed into a continuous indicator and categorical indicator of food security respectively. When calculating as a continuous indicator, each of the nine questions is scored between 0-3, with 3 being the highest frequency-of-occurrence (often). The score for each is then added together. The total HFIAS range from 0 to 27 indicating the degree of insecure food access. While the HFIAP indicator (Table 2) was used to categorized households as food secure, mildly food insecure, moderately food insecure, or severely food insecure (Coates et al. 2007).

Table 1. Distribution of the Research Sample of Rice Farmers in Southwest, Nigeria

Agro-ecological zones	States	ADP Zones	Extension Blocks	Farming Community	Sampling Frame	Sampled Farmers
Savanah	Ekiti	Zone I	Aramoko	Aramoko	22	20
				Ora	20	19
				Ido-ile	18	17
			Igede	Ensure	19	18
				Awo	22	20
		Zone II	Igbemo	19	18	
			Ayedun	22	20	
			Ikole	Ipao	19	18
			Itapaji	22	20	
			Oye	Ire	18	17
Rainforest	Ogun	Iaro	Imeko	Iba	17	16
				Ijagba	16	15
				Fetedo	17	16
			Igbogila	Egwua	15	14
				Shangisha	16	15
		Abeokuta North	Igan-alade	16	15	
			Ijale papa	16	15	
			Anigbado	15	14	
			Tibo-Akungun	16	15	
			Ipakodo	15	14	
Rainforest	Ondo	Ondo North	Akoko north	Ikaramu	22	20
				Ute	20	19
				Uso	18	17
			Ose/Owo	Ogbeese	22	20
				Owode	15	14
		Ondo Central	Alayere	22	20	
			Iju Odo	20	19	
			Ikoya	15	14	
			Ode aye	22	20	
			Uloein	25	23	
Ileoluji	Ileoluji	20	19			
	Bamikemo	22	20			
Total	3	6	12	36	676	577

Source: Author Construct, 2021.

Table 2. Household Food Insecurity Access Prevalence

HFIAP category
The Household Food Insecurity Access category for each household was calculated as follows: HFIAP category = 1 Food Secure, 2=Mildly Food Insecure Access, 3=Moderately Food Insecure Access, 4=Severely Food Insecure Access
HFIAP category = 1 if [(Q1a=0 or Q1a=1) and Q2=0 and Q3=0 and Q4=0 and Q5=0 and Q6=0 and Q7=0 and Q8=0 and Q9=0]
HFIAP category= 2 if [(Q1a=2 or Q1a=3 or Q2a=1 or Q2a=2 or Q2a=3 or Q3a=1 or Q4a=1) and Q5=0 and Q6=0 and Q7=0 and Q8=0 and Q9=0]
HFIAP category= 3 if [(Q3a=2 or Q3a=3 or Q4a=2 or Q4a=3 or Q5a=1 or Q5a=2 or Q6a=1 or Q6a=2) and Q7=0 and Q8=0 and Q9=0]
HFIAP category = 4 if [Q5a=3 or Q6a=3 or Q7a=1 or Q7a=2 or Q7a=3 or Q8a=1 or Q8a=2 or Q8a=3 or Q9a=1 or Q9a=2 or Q9a=3]

Source: Coaste et al. 2006.

Linear Regression Model

Linear regression model was used to test the relationship between socio economic characteristics of the respondents and their food insecurity status. The model is stated thus:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + \epsilon$$

Y = Food Insecurity status of the respondents

X₁ = Age

X₂ = Sex

X₃ = Marital status

X₄ = Years in school

X₅ = Farm size

X₆ = Household size

X₇ = Extension service

X₈ = Farming experience

X₉ = Rice farming experience

X₁₀ = Tenure system

X₁₁ = Income

ε = error term

Results and Discussion

Table 3 revealed that about 80.5% and 75.6% of the rice farmers in the Savanna and the Rainforest agro-ecological zones respectively fall within 31-50 years of age bracket with an average age of the rice farmers in Savanna and Rainforest agro-ecological zones (SRAEZs) were 45.4 and 44.7 years respectively, implying that the rice farmers in these zones are in their economically active age. This was similar to the mean age of 49.8 years of crop farmers reported by Ogunniyi et al. (2021). Majority (77.8% and 83.8%) of the rice farmers in the SRAEZs respectively were male, indicating that most communities in the study area are traditionally patriarchal in nature. The results further revealed that about 26.2% and 28.4% of the respondents in the SRAEZs respectively had 6 and below years of formal education with an average year of schooling of 12 and 10 years respectively, implying a low level of education among rice farming households.

The findings also showed that majority of the respondents (57.3% and 54.8%) in the SRAEZs have household size of 5-8 persons with an average household size of 7 and 5 persons respectively, suggesting that rice farming households have relatively large members, which could possibly be available as family labor against short fall of hired labor. These results corroborate the findings that a relatively large household size (especially of working age) reduces the constraint on labour demand in production, processing, and marketing (Opondo et al., 2017). The result in Table 3 shows that majority (91.6% and 93.5%) of the rice farmers in the SRAEZs were married. It was revealed that about 56.5% and 45.5% of the rice farmers in the SRAEZs respectively had above 15 years of farming experience, suggesting that majority of

the rice farmers are well knowledgeable about rice production in the study area.

Food Security Status of Rice Farmers in the Study Area

The responses from the nine questions of the HFIAS questionnaire was used to compute HFIAS score presented in Table 5. The HFIAS score was used to generate the minimum, maximum, average values and categorizes households into four levels of food insecurity. These four categories are food secure, mildly food insecure, moderately food insecure and severely food insecure. The household food insecurity score ranges from 0 to 27, with a high score indicating greater vulnerability to food insecurity.

Average Household Food Insecurity Access Scale

The findings of the food security status of the rice farmers compute from average HFIAS score in Table 4 revealed that the average scores measuring vulnerability to food insecurity of rice farmers in the Rainforest and the Savanna agro-ecological zones were 4.0 (mildly food insecure) and 5.2 (moderately food insecure) respectively with the minimum score was 0 and the maximum score was 27. The standard deviation values of 4.9 and 4.6 for Rainforest and the Savanna agro-ecological zones respectively which implies that there was a high variation between the individual score ranging from 0 to 27. However, for the total sample in the study, the average score HFIAS measuring vulnerability to food insecurity was 4.3 (moderately food insecure), the minimum score was 0 and the maximum score was 27. The standard deviation of 4.8 implied that there was also a high variation between the individual scores ranging from 0 to 27.

Table 3. Frequency Distribution of Respondents by their Socio-Economic Characteristics in the Savanna and the Rainforest Zones in Southwest, Nigeria

Variables	Savanna (n=225)		Rainforest (n=352)		Total sample (n=577)	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Age (years)	Mean = 45.4		Mean = 44.7		Mean = 45.3	
≤ 30	5.0	2.2	21.0	6.0	26.0	4.5
31-40	78.0	34.7	83.0	23.6	161.0	27.9
41-50	103.0	45.8	183.0	52.0	286.0	49.6
51-60	29.0	12.9	60.0	17.0	89.0	15.4
> 60	10.0	4.4	5.0	1.4	15.0	2.6
Sex						
Female	50.0	22.2	57.0	16.2	107.0	18.5
Male	175.0	77.8	295.0	83.8	470.0	81.5
Education (years)	Mean = 12.1		Mean = 10.4		Mean = 11.8	
≤ 6	59.0	26.2	100.0	28.4	159.0	27.6
7-12	91.0	40.4	178.0	50.6	269.0	46.6
≥ 13	75.0	33.3	74.0	21.0	149.0	25.8
Marital Status						
Single	11.0	4.9	11.0	3.1	22.0	3.8
Married	206.0	91.6	329.0	93.5	535.0	92.7
Widow/Widower	8.0	3.6	12.0	3.4	20.0	3.5
Farm Size (ha)	Mean = 4.6		Mean = 3.7		Mean = 4.0	
≤ 2	11.0	49.3	192.0	54.5	290.0	50.3
2.1- 4	37.0	16.4	115.0	32.7	162.0	28.1
4.1 and above	76.0	33.8	45.0	12.8	124.0	21.5

Source: Computed from field data, 2021.

Table 4. Frequency Distribution of Respondents by their Socio-Economic Characteristics in the Savanna and the Rainforest Zones in Southwest, Nigeria

Variables	Savanna (n=225)		Rainforest (n=352)		Total sample (n=577)	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Farming experiences (years)	Mean = 20.7		Mean = 16.3		Mean = 18.0	
≤ 5	21.0	9.3	21.0	6.0	42.0	7.3
6-10	57.0	25.3	97.0	27.6	154.0	26.7
11-15	20.0	8.9	74.0	21.0	94.0	16.3
> 15	127.0	56.4	160.0	45.5	287.0	49.7
Rice farming experiences (years)	Mean = 9.7		Mean = 8.7		Mean = 7.3	
less than 5	21.0	9.3	21.0	6.0	42.0	7.3
6-10	57.0	25.3	97.0	27.6	154.0	26.7
11-15	20.0	8.9	74.0	21.0	94.0	16.3
Above 15	127.0	56.4	160.0	45.5	287.0	49.7
Distance (km)	Mean = 7.5		Mean = 5.6		Mean = 6.4	
1-2	67.0	29.8	114.0	32.4	182.0	31.5
3-4	81.0	36.0	139.0	39.5	219.0	38.0
Above 5	77.0	34.2	99.0	28.1	176.0	30.5

Source: Computed from field data, 2021.

Table 5. Household Food Security Status of Rice Farmers in Savanna and the Rainforest Agro-ecological zones Southwest, Nigeria.

Scores	Savanna	Rainforest	Total sample
Minimum score	0.00	0.00	0.00
Maximum score	27.00	27.00	27.00
Mean	5.16	4.01	4.37
Standard deviation	4.96	4.67	4.79

Source: Computed from field data, 2021.

Table 6. Household Food Insecurity Access Prevalence (HFIAP) of Rice Farmers in Southwest, Nigeria.

Food Security Status	Savanna		Rainforest		Total Sample	
	Frequency	percent	Frequency	percent	Frequency	percent
FS	88	39.1	118	33.5	206	35.7
MFIA	18	8.0	49	13.9	67	11.6
MFI	34	15.1	78	22.2	112	19.4
SFI	85	37.8	107	30.4	192	33.3
Total	225	100.0	352	100.0	577	100.0

Less than or equal to 1= food secure (FS), between 1.1- 4 = mildly food insecure access (MFIA), between 4.1-6 = moderately food insecure (MFI) and greater than 6 = severely food insecure (SFI). Source: Computed from field data, 2021.

Household Food Security Levels

This section depicts the categorisation of household food security status of the rice farmers by using the HFIAP indicator which is a subset of HFIAS model (Table6). The HFIAP indicator was used to observe household food security; and food insecurity prevalence (Coates et al., 2007). In this study, the HFIAP indicator categorised rice farmers' households into four main levels of food security status (food secure, mildly, moderately and severely food insecure) depending on how rice farmers responded to the nine-frequency-of-occurrence questions (Table 6). Based on the HFIAP classification measure of food security, about 39.1% and 33.5% of rice farmers in the Rainforest and Savanna agro-ecological zones were classified as food secure respectively while the remaining 60.9% and 66.5% were food insecure in the study area respectively. Thus, the findings reveal that rice farming households in Rainforest agro-ecological zone were more food secure when compared with rice farming households' in Savanna agro-ecological zone (Table 9).The finding for the pooled sample shows that about 35.7% of the rice farming

households' in Southwest was food secure while 64.3% were food insecure. This implies that only 35.7% of the household's member interviewed have access to safe and sufficient food and were not worry about food access. In order words, only 35.7% of the respondents rarely experienced anxiety about not having enough food and have a full meal three times in a day without food running out, in the past 30 days. The findings of food security status of the rice farmers in the Savanna and the Rainforest agro-ecological zones further revealed that 8% and 13.9% were mildly food insecure respectively. Thus, the findings reveal that households in Savanna agro-ecological zone were more mildly food insecure when compared with Rainforest agro-ecological zone. The finding for the pooled sample shows that about 11.6% of the rice farmers in Southwest were mildly food insecure. This implies that about 11.6% households were anxious about not having sufficient food. They usually consumed inadequate diet, or ate food that they did not prefer. However these households did not experience the three severe conditions of going a whole day without eating, going to bed hungry or running out of

food in the last 30 days. Furthermore, the findings of food security status of the rice farmers in the Savanna and the Rainforest agro ecological zones revealed that 15.1% and 22.2% were moderately food insecure. Thus, the findings reveal that respondents in Savanna agro-ecological zone were more moderately food insecure when compared with Rainforest agro-ecological zone. The finding for the pooled sample shows that about 19.4% of the rice farmers in Southwest were moderately food insecure. This implies that about 19.4% of the households do not have access to safe and sufficient food and they began sacrificing quality on a continuous basis by consuming inadequate diet and eating less preferred food. They started reducing the quality of food intake by decreasing meal sizes and by only eating once or twice in a day in the past 30 days. The findings of food security status of the rice farmers in the Savanna and the Rainforest agro-ecological zones also revealed that 37.8% and 30.4% respectively were severely food insecure. Thus, the findings reveal that respondents in Savanna agro-ecological zone were more severely food insecure when compared with Rainforest agro-ecological zone. The finding for the pooled sample shows that about 33.3% of the rice farmers in Southwest were severely food insecure. This implies that about 33.3% households experienced high incidences of food insecurity. The condition of reducing meal sizes and the number of meals worsened each day. The three most severe conditions of going a whole day without eating, going to bed hungry and running out of food in the past 30 days occurred 'often' in the study area.

A possible explanation that can be used to explain observed differences in food security status in the two selected zones has to do with variation in temperature in these two agro-ecological zones. The scale of temperature variation in the Savannah zone is more severe than that in the Rainforest agro-ecological zone. Additionally, temperature increases in the Savannah agro-ecological zone can impede soils from being productive through increased levels of nitrate leaching and the lack of nitrates in the soil because of the heightened turnover rate of soil organic matter, which is a building block for soil fertility, sustainability and productivity in food production (Olesen and Bindi, 2002). Continuous temperature increases, coupled with limited rainfall, produce drier soil conditions through the high evaporation rates, resulting in the risk of wind erosion that undermines the topsoil and increases the possibility of salinity (Yeo, 1998). This resultant condition can jeopardize the production of food items in the Savannah agro-ecological zone due to their rooting mainly anchored in the topsoil layer. Consequently, increasing temperatures in Savannah agro-ecological zone could intensify respiration processes, accelerate development and hasten maturation without the plant completing proper growth processes, thereby reducing food production (Rötter and Van de Geijn, 1999; Olesen and Bindi, 2002).

Results of Linear Regression Model

The results of linear regression model were presented in Table 7 and it shows that there is significant relationship between socio-economic characteristics and food insecurity status of the respondents. The coefficients of respondents age in the Savanna and Rainforest agro-ecological zones (SRAEZs) were significant ($P < 0.05$) and

had a negative relationship with food security. This implied that increasing age of the respondents is associated with a decreasing probability of being food secure. This further implied that rice farmers are less likely to be food secure as they advance in age. As the rice farmers grows older, the energy and vigor to engage in rigorous farm activities reduces, leading to lower income and making them prone to food insecurity (Obayelu et al., 2021). The coefficient of the gender of the respondents was positive and significant at $P < 0.01$ in the Rainforest agro-ecological zone. This shows that respondents who are male in the study area had higher probability of being food secure. This was in line with several other studies such as Oluyole et al. (2009), Omonona and Agoi (2007) used a household-based survey, COC and logit model to both classify cocoa farming and urban households to food security status and factor influencing them respectively.

Also, the coefficients of years of educational status in the Savanna and Rainforest agro-ecological zones were significant ($P < 0.05$) and had a positive relationship with food security. This implied that increasing years of educational level is associated with an increasing probability of being food secure. Several previous studies also showed that the educational level of the household head is negatively related to household food insecurity (Amaza et al., 2009; Bashir et al., 2017; Gezimu Gebre, 2012; Idris & Gwary, 2008; Mango et al., 2014). The coefficient of household size in the Savanna agro-ecological zone was significant ($P < 0.05$) and had a negative relationship with food security. This implied that decreasing household size is associated with an increasing probability of being food secure. Thus, households with a fixed income must distribute the available food among household members. Moreover, managing the food supply for all members of a household becomes more difficult when an additional member is introduced into the family while its income remains fixed. Jacobs (2009) found that larger households consume more food and thus need to increase their food expenditure and compete for scarce resources (Ndobo & Sekhampu, 2013), which makes them more likely to be food insecure compared to smaller or more nuclear households (Babatunde et al., 2007). The coefficient of farm size in the Rainforest agro-ecological zone was significant ($P < 0.05$) and had a positive relationship with food security. This implied that increasing farm size is associated with an increasing probability of being food secure. Rahman and Islam (2013) showed that a positive relationship exists between households' food intake and farm size. Mannaf and Uddin (2012) also showed that large-farm owners are more likely to be food secure than small farm owners. This implies that large-farm owners are able to consume more food. The coefficient of rice farming experience in the Rainforest agro-ecological zone was significant ($P < 0.05$) and had a positive relationship with food security. This implied that increasing rice farming experience is associated with an increasing probability of being food secure. Similarly, these findings indicated that as the rice farmers have more farming experience, as reflected in the increase in the number of years engaging in rice farming, the more likely the rice farmers become food secure. The coefficients of land tenure system in the Savanna and Rainforest agro-ecological zones were significant ($P < 0.05$) and had a

positive relationship with food security. This implied that increasing ownership of rice farm land in the study area is associated with an increasing probability of being food secure. This result is also in line with Pankomera et al. (2009) and Bamire (2010) who observed that increase in the land holdings size of farm households in the dry Savannas of Nigeria improves probability of a household being food secure by 0.07 units. The F-ratio which determines the overall significance of the regression model is statistically

significant at the 1% level in the Savanna and Rainforest agro-ecological zones. It therefore revealed that the independent variables significantly affect food insecurity. Also, socio-economic characteristics were not independent factors. Sixteen of the coefficients of Pearson correlation were significantly correlated, indicating Socio-economic characteristics are often, though not always, implemented in combination (Table 8).

Table 7. Results of Linear regression Model

Variables	Savanna agro-ecological zone			Rainforest agro-ecological zone		
	Coefficients	Standard error	P>t	Coefficients	Standard error	P>t
Age	-0.0376***	0.0147	0.00	-0.1036***	0.0114	0.00
Sex	-0.5299**	0.2215	0.03	0.1814***	0.0468	0.79
Marital status	-0.2186	0.3254	0.50	0.0471	0.2743	0.86
Years in school	0.0358**	0.0177	0.04	0.0140	0.0176	0.42
Farm size	0.0297	0.0308	0.33	0.2130**	0.1022	0.02
Household size	-0.0561**	0.0247	0.02	-0.0503	0.0564	0.37
Extension service	0.3387	0.2682	0.20	0.3255	0.2214	0.14
Farming experience	-0.0238**	0.0123	0.05	0.0023	0.0137	0.86
Rice farming experience	0.0133	0.0167	0.42	0.0603**	0.0239	0.01
Tenure system	0.2262**	0.0904	0.01	0.3786**	0.1664	0.02
Income	5.53e-08	1.86e-06	0.97	4.07e-06	3.66e-06	0.26
Constant	2.5808**	0.7874	0.00	0.8756	0.8135	0.283
No. of observation	225			352		
Adjusted R ²	0.2950			0.3722		
F ratio	19.181			16.903		

Source: Computed from field data, 2021.

Table 8. Correlation coefficients for linear regression equations

	S	MS	YS	FS	HS	E	FE	RE
S	0.041(0.32)							
MS	0.257**(0.00)	0.027(0.52)						
YS	-0.005 (0.90)	0.008(0.86)	-0.022(0.59)					
FS	0.031(0.46)	-0.034(0.41)	0.033(0.45)	0.132**(0.00)				
HS	0.134**(0.00)	-0.055(0.00)	0.058(0.16)	0.126**(0.00)	0.255**(0.00)			
E	0.137**(0.00)	0.077(0.06)	-0.004(0.93)	-0.068(0.10)	0.028 (0.49)	-0.317**(0.00)		
FE	0.524**(0.00)	-0.023(0.58)	0.067(0.11)	-0.063(0.13)	0.107*(0.01)	0.200**(0.00)	0.063(0.13)	
RE	0.480**(0.00)	-0.054(0.19)	0.0048(0.24)	0.117**(0.00)	0.256**(0.00)	0.219**(0.00)	0.130**(0.00)	0.786**(0.00)

S: Sex; MS: Marital status; YS: Years in school; FS: Farm size; HS: Household size; E: Extension; FE: Farm experience; RE: Rice experience

Table 9. Analysis of T-Test of Food Security Status among Rice Farmers in the Savanna and Rainforest Agro-ecological Zones

Variables	Obs.	Mean	Difference	Standard deviation	t-value
Food security status					
Savanna zone	252	4.01	0.39***	4.96	2.94
Rainforest zone	352	5.16		4.67	

The Coping Strategies Respondents Adopt to Combat Food Insecurity

As shown in Figure 2, the coping strategy that is mostly adopted by the rice farmers in the study area is spending the whole day without food; this implies respondents skipping a whole day without eating as a result of food insecurity. This is followed by eating once per day, which implies to cut down the numbers of times food items consumed. So, as to cope with their shortage in food, the respondents tend to reduce the number of times food items they consumed per day. The next strategy is eating but not satisfied, it implies some of these respondents are just eating what is available not want they desire to eat in term

of quality and quantity as a result of lack of food items. Also, borrow from friends and relatives is another strategy adopted by the respondents to cope with food insecurity. The least adopted coping strategies include spend on savings for other food project; send their children to look for food somewhere else; reduce the quantity of food consumed and change the type of food they eat and go for the less quality food items. This finding shows that majority of the respondents adopted different coping strategies to mitigate against food insecurity. This is similar to the study of Babatunde et al. (2018) who reported that various coping strategies were adopted by the farmers to cut down on the numbers of food items consumed.

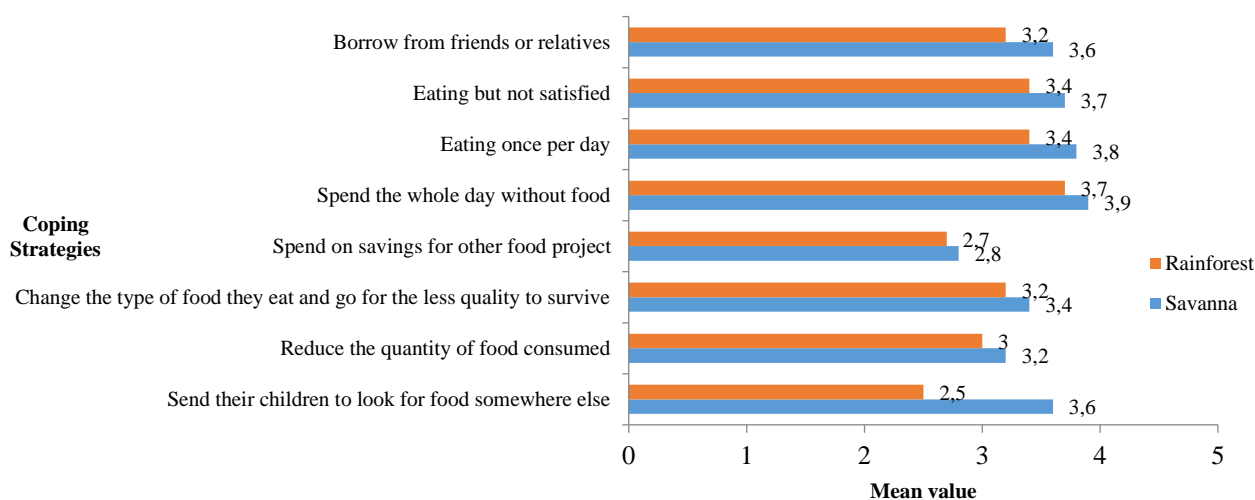


Figure 2. The coping strategies respondents adopted to combat food insecurity

Conclusion

The study assessed the comparative analysis of household food insecurity status among rice farmers in Savanna and the Rainforest agro-ecological zones in Southwest States, Nigeria. Majority of the rice farmers in the SRAEZs have household size of 5-8 persons, married, have good farming experiences, have small farm size and educated. The respondents in the SRAEZs were mildly food insecure and moderately food insecure respectively. Only 39.1% and 33.5% of respondents were classified as food secure, while others were food insecure in the SRAEZs respectively. The major coping strategies adopted by the respondents against food insecurity include reduce the quantity of food consumed and eating but not satisfied. The socio-economic characteristics that drives food insecurity includes age, sex, years in school, farm size, household size, farming experience, rice farming experience and tenure system. It therefore recommended that age, sex, years in school, farm size, household size, farming experience, rice farming experience and tenure system are important drivers of household food security status that have to be taken into consideration by governments and development agencies wishing to promote the food security status of households in the study area.

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