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Determinants of Food Security Status and Coping Strategies to Food Insecurity among Rural Crop Farming Households in Ondo State, Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

This study examined the food security status and coping strategies to food insecurity of rural arable crop farming households in Ondo State, Nigeria. Primary data were used and a multistage sampling procedure was used to select 150 respondents. Food Security Index (FSI), Probit regression model and Coping Strategy Use Index (CSUI) were employed to carry out the analysis. The empirical findings revealed that (54%) of rural arable crop farming households in the study area were food secure based on the recommended minimum calorie of 2260Kcal. Furthermore, the empirical analysis revealed that gender of the household head, household size, farm size and farm income of the household head had significant influence on the household food security status. The most widely employed coping strategy was withdrawal from personal savings as indicated by 14.82 percent of household and while reliance on less expensive food and purchasing food on credit

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were ranked second and third respectively with 13.66 and 12.85 percent by the food insecure households. In other to ensure sustainable food security among the households, the study recommended effective household size management, and enlightenment programmes on family planning in the study area. Farmers should increase their farm sizes. Farmers should use more inputs and technologies to increase output. Farmers should also be encouraged to have additional source of income towards attaining food security in the study area.

Keywords: Arable farmers; coping strategies; food security; probit regression; Nigeria.

1. INTRODUCTION

The problem of food insecurity especially during the hungry period among rural households in Nigeria is long standing [1]. This is because during harvesting most rural households are food secure as they have enough food from their own production. However, owing to inadequate processing and storage facilities and the fact that these households have other important needs, they usually end up selling their excess produce at low prices during the harvesting period [2]. Most times, they rely on market purchases since they do not have enough to subsist on throughout the year. This leads to inconsistent food availability thus contributing to food insecurity during the period. Also, food crops such as rice, maize, cowpea, melon, groundnut, cassava, sweet potatoes, millet, sorghum and so on are some of the crops that contribute to food security to meet the consumption needs of the households, and as a source of livestock feeds. Its production is therefore important in meeting the food need of the poor rural households in particular and Nigeria in general. African Water Development Report (2008) indicated that, household food security will only be stable when there is good food availability at relatively low prices. Combined impact of low prices, lack of access to food and income earning opportunities are contributing to the reinforcement of food insecurity conditions of poor household in Nigeria [3]. Food crops make significant contributions to food security of rural population by providing a vast array of foods that supply essential nutrients to them [4]. Also, World Bank [5] identified three pillars underpinning food security. These are food availability, food accessibility and food utilization. This infers from the concept that food security is not just a production issue. Food availability for the farm household means ensuring sufficient food is available for them through own production. Food access refers to ability to obtain an appropriate and nutritious diet and it is linked to resources at the household level and food utilization means ensuring a good nutritional outcome, which is nutrition security.

In Nigeria, the production of food has not increased at the rate that can meet up with the food demand of the increasing population [6] while food production increases annually at the rate of 2.5 percent, food demand increases annually at the rate of more of 3.5 percent due to high rate of annual population growth of 2.83 percent [7]. Also, Idachaba [8] noted that the growth rate of population is higher than the growth rate of food production thereby creating a shortage of food supply. The apparent disparity between the rate of food production and demand for food in Nigeria has led to a demand-supply gap, leading to a widening gap between the food available and the total food requirement and hence, posing a threat to national food security.

Several studies have been carried out in Nigeria and other part of the world in examining the food security status of the people [9-11,2,12] but only few studies have empirically investigated food security among arable crop farmers in the rural settings most especially in the study area. The present study contributes to the body of knowledge by finding out the available per capita daily calories of the crop farmers and their food security status in comparison with the recommended requirement. It assists to ascertain the level of food security status as it reported in the previous studies in the literature with the factors responsible to be food secure in the study area. Again, narrowing down and identifying the specific coping strategies for the food insecure households in the area as against the ways they were generalized in the previous studies, would generate relevant information in policy making. On this note, the study deems it very germane to critically examine the food security status and coping strategies to food insecurity among rural arable crop farming households in Ondo State, Nigeria.

The rationale behind this study is that it will suggest solutions to the constraints encountered by the rural farming households in the study area on their involvement/contribution in ensuring household food security, and also help the

policy-makers to make recommendations on how farming households contribute to household food security. The study will enable farm household at grass root level and development programme on food security targeted towards them and incorporated in the economic, political and social spheres of individual household and community level. Therefore, it will provide basic information about the food security status of the farm households which will be of great use to the consultants in the fields of agricultural science, nutrition and food policy.

2. RESEARCH METHODOLOGY

2.1 Study Area

The study was carried out in Ondo State, Southwest Nigeria. The State lies between longitudes 4° 30^{1} and 6^{1} East of the Greenwich Meridian, 5° 45^{11} and 8° 15^{11} North of the Equator. The State has a land area of about 14,793 Square Kilometers (km^2) (Ondo State Government, 2016) and its population is about 3,460,877 (National Bureau of Statistics [13]. The vast of the population are peasant farmers cultivating food and cash crops such as rice, maize, beans and cocoa. Livestock is a minor occupation of the population of Ondo State dealing on goats, sheep rabbits and fish farming which most people do as secondary occupation. Other activities include trading and civil service [14].

2.2 Data Collection and Sampling Procedure

Primary data were collected through administration of a well-structured questionnaire and interview schedule on the selected respondents. Multistage sampling procedure was used to select the household heads. In the first stage, three (3) Local Government Areas were purposively selected in the State considering the level of urbanization and food crop production level. In the second stage, five (5) communities were randomly selected from each selected Local Government Areas. In the third stage, ten (10) arable crop farmers were randomly selected from each of the communities summing to One hundred and fifty (150) respondents.

2.3 Data Analytical Procedure

Descriptive Statistics, Food Security Index, Probit Regression Model and Coping Strategy Use Index were used for the analysis of data. Food Security index (Z) was used to determine the extent of food insecurity status of various households. This classifies the arable crop farming households into food secure and food insecure. This was analyzed by the method used by Babatunde et al. [15] and Ajayi and Olutumise [2] where the food security status of each household based on the food security line (Z) was determined using the recommended daily calorie approach. A household whose daily per capita calorie intake was up to 2260kcal was regarded as food secure and those below were regarded as food insecure households. The household's calorie intake was obtained through the household's consumption. The quantities were converted to gram and the calorie content was estimated by the commonly eaten food in Nigeria.

The function forms were as follows:

$Zi=Yi/R$

Zi= food security status of i^{th} households takes values 1 for food secure households or 0 for food insecure households.

Yi=Daily per capital calorie intake of i^{th} household

R=Recommended per capita daily calorie intake (2260kcal)

Zi=1 for Yi greater than or equal to R

Zi=0 for Yi less than R.

The adult equivalent scale for calculating to adult equivalent of each household member is presented in Table 1. The age category in which a household member falls and summed up with other members of their household that has same or different age category. The value was later used to divide the calorie eaten for each household as depicted in the Table.

Table 1. Adult equivalent scale

Age Category (Years)	Male	Female
0-1	0.33	0.33
1-2	0.46	0.46
2-3	0.54	0.54
3-5	0.62	0.62
5-7	0.74	0.70
7-10	0.84	0.72
10-12	0.88	0.78
12-14	0.96	0.84
14-16	1.06	0.86
16-18	1.14	0.86
18-30	1.04	0.80
30-60	1.00	0.82
> 60	0.84	0.74

Source: Stefan and Pramila (1998)

Table 2. Calorie value of commonly eaten food

Food Items	K/cal/kg	Food items	Kcal/items
Staple foods		Mango	590
Cassava tubers	1500	Pawpaw	300
Cassava flour	3870	Pineapple	320
Cassava chips	3000	Apple	570
Garri	3840	Coconut	580
Yam tuber	1100	Guava	730
Yam flour	3810	Sugar cane	360
Yam chips	3000	Meat and animal products	-
Sweet potato tuber	1100	Cow meat	2370
Sweet potato chips	900	Goat meat	2370
Irish Potato	1200	Sheep meat	2370
Cocoyam tuber	3830	Pork	2370
Maize green	3100	Bush meat	2370
Maize grain	4120	Chicken	2380
Maize flour	4120	Turkey	2380
Sorghum grain	3500	Fish	2230
Sorghum flour	3500	Snail	2245
Millet grain	3500	Shrimps	2230
Millet flour	3500	Crayfish	2200
Rice	1230	Crabs	2200
Wheat grain	3400	Eggs(pieces)	1400
Wheat flour	3300	Dairy products	-
Cowpea(beans)	5920	Milk	4900
Groundnut	5950	Cheese	4000
Soyabeans	4050	Youghurt	4100
Soyabean flour	2600	Ice cream	4100
Melon(Shelled)	5670	Beverages	-
Plantain	770	Cocoa	1200
Banana	960	Tea(leaves)	1200
Vegetable	-	Tea(liquid)	1200
Okra	4550	Coffee(powder)	1340
Tomato	880	Coffee(liquid)	1340
Pepper	3930	Drinks	-
Onion	440	Soft drinks	620
Carrot	400	Orange juice	400
Egg Plant	440	Apple juice	550
Cucumber	270	Pineapple juice	560
Cochorus/Ewedu	500	Local beer	740
Spinach	220	Bottled beer	460
Bitter leaf	220	Wine	330
Water leaf	180	Condiments and spices	-
Cabbage	230	Maggi	220
Pumpkin	440	Salt	180

Source: Stefan and Pramila (1998).

The nutrients content of both produced and purchased food were used to derive calorie supplied. A daily recommended level of 2,260kcal per capita per day defines the food security line [15] [2].

$$Z_C = \frac{A_C}{I_C}$$

Where Z_C = Food Security Index
A_c = Household's daily per capita calorie supply
I_c = Household's daily per capita calorie requirements

Surplus/Shortfall index: The tool was used to measure the extent to which a household is food secure or insecure. P is given as:

$$P = \frac{\sum_{J=1}^{M} 1}{M} \; G_j$$

$$G_j = \frac{(X_j - L)}{L}$$

G_j=Calorie deficiency or surplus faced by jth household
X_j = per capita food consumption available to jth household
M = Number of households that are food secure (for surplus index) or food insecure (for shortfall index).
L = Recommended daily per capita requirements

Probit Model: This was employed in determining the factors affecting food security status in rural farming households. Based on the household food security index (Z_i). The model is specified as follows: The explicit form of the model is expressed as:

$Z_i = \beta Xji + U$
Z_i = Household food security status (food secure households =1, food insecure households = 0
X_j= Vector of explanatory variables
U = Error term
β = Vector of the parameter estimates
Xj are explanatory variables and are defined as follows:
X_1 = Farming as main occupation (1 = yes, 0 = no);
X_2 = Marital status of respondent (1 = married, 0 for otherwise);
X_3 = Gender of respondent (1= male, 0 = female);
X_4 = Household size (numbers);
X_5 = Years of formal education;
X_6 = Farming experience (years);
X_7 = Age (years);
X_8 = Household income (₦);
X_9 = Farm size (hectares);
X_{10} = Belonging to social group (yes = 1, no = 0);

It should be noted that household food security is an important dimension of well- being. Although it may not cover all dimensions of poverty, the inability of households to obtain access to enough food for an active, healthy life is surely an important component of their poverty. In this study, devising an appropriate measure of food security outcomes will be useful to capture the food-insecure farming households in the study area.

Coping Strategy Use Index (CSUI): This was used to identify the coping strategies for food insecurity, for food insecure households in the study area. This allows for a better understanding of the likely areas where the Government or stakeholders can come in. In identifying the coping strategies by the farming households, a coping strategy index (CSI) was developed by ranking. The first stage is the listing of all the coping strategies. This was done by first collecting information on coping strategies from the food insecure respondents. Thereafter, coping strategies use index was then developed. The extent of use of the CSI was expressed using a four-point likert scale with the scoring order of 3,2,1 and 0 for frequently used, occasionally used, rarely used and not used respectively. The formula that was used to obtain the CSI score was adapted from Islam and Kashem [16] where they estimated the use of Ethno-veterinary medicine in livestock management and rearing.

This was modified to obtain the CSI as: $CSUI=N_1X_3+N_2X_2+N_3X_1+N_4X_0$

Where:
CSUI=Coping Strategies Use Index
CSI=Coping Strategies Index
N_1=Number of households using a particular CSI frequently.
N_2= Number of households using a particular CSI Occasionally.
N_3=Number of households using a particular CSI rarely.
N_4= Number of households not using any of the coping strategies.
X_3=Frequently used coping strategy
X_2= Occasionally used coping strategy
X_1= Rarely used coping strategy
X_0= Not used coping strategy

The CSUI was used in ranking order to know the position of each of the CSI in terms of their use. The extent of use of the CSI was then obtained for all households in the study area.

3. RESULTS AND DISCUSSION

3.1 Food Security Status of Rural Arable Crop Farming Households in the Area

According to Table 3, results of food security in the study area were presented. It was revealed that the estimated available mean daily kilocalorie for the food secure households was 14,724.91kcal, while the mean per capita daily

calorie available was 3603.53kcal.The results also revealed that the mean daily calorie available for the food insecure households in the study area was estimated to be 8498.78kcal, while the mean per capita calorie is 1562.17kcal.This shows that food insecure households consume less calorie of what is considered as minimum required calorie (2260kcal), while the food secure households consume minimum required calorie on average that is higher for human development. From the analysis, it is possible to classify the status of the respondents in the study area as either food secure or food insecure. The number of food secure households was about 54%,while nearly 46% were food insecure in the study. This percentage shows that few above average could meet up with the daily calorie, while about 46% could not meet the minimum daily calorie for their development. This suffices to say that some of the farmers did not cultivate enough land and did not have enough income to meet the food needs of their household members. It could also deduce that the household head can either not procure the food required or don't have other means to cope with shortage of food that should be consumed to satisfy their daily minimum requirements for proper development (Despite food insecurity is expected among rural households but the food secure household is still higher than the food insecure households as Tantu et al. [17] also found out about 37.6% households that were food insecure in their study carried out in Wolaita Sodo town. Also, the result was in line with the findings of Mango et al. [11] who recorded 46.9% food insecure household in the study carried out in central Malawi. Similarly, Olayiwola et al. [18] found out 58.7% food secure households (41.3% food insecure households) in their study carried out among rural households in Oyo State, Nigeria. In contrary, Agidew and Singh [10] found out a value above average (79.1%) as food insecure households in their study carried out in South Wollo Zone of Ethiopia, while Ajayi and Olutumise [2] in their study conducted in Ondo State, Nigeria reported about 64% and 48% for food insecure and food secure households, respectively. Again, the mean household size of the adult equivalent was 4.20 for the food secure households and about 5.48 for the food in-secure households. The surplus/shortfall index (p) which measures the extent of deviation from the food security line showed that food secure households had a daily/capita calorie consumption of 3603.53Kcal which exceeded the daily calorie. This implies that they could meet the minimum and also exceed the recommended calorie level of 2260kcal per day by 60%.However, the food insecure households had a daily capita calorie consumption of 1562.17Kcal fallen short of the minimum calorie requirement by 30%. The food security index for the food secure households in the study area was calculated to be 1.60, while it is 0.69 for the food insecure households. The result corroborated with the findings of Kuwornu et al. [19] who found out mean food security index of 1.42 and 0.69 for food secure and insecure households, respectively with per capita daily calorie of 2,275.13Kcal. The figure of the per capita daily calorie in this study was less than the official national value of 2,710 Kcal as reported by Food and Agriculture Organization in 2009 which has experienced a deficit of 42% as at 2016.

Table 3. Summary of food security statistics of rural arable crop farming households in the Study Area

Variables	Households	
Food Security indices	**Food Secure**	**Food Insecure**
Recommended/Capita CalorieIntake (I) 2260Kcal		
No of household	81	69
Percentage of household	54	46
Mean of Household size (adult equivalent)	4.20	5.48
Mean Household daily calorie consumption (Kcal)	14724.91	8498.78
Food Security Index	1.60	0.69
Mean Household daily per capita Calorie consumption (Kcal)	3603.53	1562.17
Shortfall	------	0.30
Surplus index (P)	0.60	--------

3.2 Factors Affecting Food Security Status of the Rural Arable Crop Farming Households

Table 4 shows various variables which determine the factors affecting rural arable crop farming household food security status using the Probit regression model. The results of the probit regression analysis are presented in the Table. From the Probit analysis, the likelihood ratio statistics as indicated by χ^2 statistics (38.94) are strongly significant (P< 0.0001), suggesting the model has a strong explanatory power in which four variables were found to be statistically significant at P<0.05 out of nine (9) variables incorporated to the model.

Gender: The coefficient of this variable is statistically significant at 1% level, which reveals that male headed households are more likely to be food secured than female headed household. The probable reason, according to Adereti and Fasina [20] is that women have limited access to local and global markets, productive resources, and decision-making power in Nigeria. Therefore, the result is in agreement with the findings of Niles et al. [12] who reported that women were 42% more likely to experience household food insecurity compared to men in their study on the early food insecurity impacts of COVID-19. Despite the fact that literature showed the immense contributions of women to agriculture and development [21-25,2], they still form majority of the world's poor in rural and urban sectors most especially in Africa and the study area inclusive.

Household Size: The coefficient of the variable is statistically significant at 1% level, and it has a negative sign. This shows that household with larger sizes had lower probabilities of being food secure than those with smaller sizes, and vice versa. *Ceteris paribus*, each additional member of a household increases the probability of food insecurity by 14.4%. That is, household size is a negative factor in determining the food security status of a household in the study area. Large household size exerts more pressure on food consumption as reported by Ajayi and Olutumise [2]. The per capita food availability declines as family size increases due to pressure on available food, hence large family size is more to be food insecure in a household [26-. 27]. The negative association of household size was also observed by Bashir et al. [28-29] and Agidew and Singh [10] who all reported that the probability of food security decreases with the increase in family size.

Farm Size: It has a positive and statistically significant coefficient at 5% level, suggesting that the larger the farm size of the household head, the more likely to be food secure and vice versa. This implies that a unit increase in farm size would result to an increase in the probability of being food secured by 16.4%, *ceteris paribus*. The positive relationship of farm size with food security status might be because farm size is associated with greater wealth [30]. The result was in support of the findings of Ajayi and Olutumise [2] who also found out that increase in farm size would increase the probability of being food secure in their study carried out among cassava farmers in Ondo State, Nigeria. Otunaiya and Ibidunni [9] also reported that as farm size increases, more food is produced both for consumption and sale to earn more money, resulting in increased food security.

Farm Income: Income is important factors that determine the well-being of a farmer. This variable is an important factor affecting food security in the study area. The coefficient of the variable is statistically significant at 5% level and it carries a positive sign. This implies that the higher the income, the lower the probability of the household being food in-secure. This is also in line with the study of Oluwatayo [31] which stated that an increase in income increases the food security status of the farmers. The findings of Otunaiya and Ibidunni [9] showed a negative relationship which was contrary to the results of this study. According to Mango et al. [11] and Olutumise et al. [32] household income indicates adequate financial wellbeing and it has positive association with the adoption of agricultural technologies and in turn increase food security positively.

3.3 Test of Hypothesis

The tool used for testing the first hypothesis was Chi-square, which states that; there was no significant relationship between some selected socio-economic characteristics and food security status. The result presented in Table 5 shows that age, marital status, highest educational level, cooperative society and farming experience were found not significant, thereby accepting the null hypothesis. While only the gender was found to be significant at 1%, thereby rejecting the null hypothesis and did not reject the alternative hypothesis. It implies that

there is a significant difference between gender and food security status of the respondents.

Again, Mann-Whitney U-test was used to test if there was no significant relationship between household income and their food security status. The result in Table 6 revealed that household income was significant at 1%, thereby rejecting the null hypothesis in favour of the alternative hypothesis. This implies that there is a significant difference between household income and food security status of the respondents as depicted in Table 6.

3.4 Ranking of Food Insecure Households based on their Coping Strategies

The ranking of food insecurity coping strategies for food insecure households (Table 7) was analysed using a 4 - Likert scale the households' responses. These scores are 3, 2, 1 and 0 for frequently used, occasionally used, rarely used and not used, respectively. Generally, about 12 different coping strategies were very prominent among the available strategies employed. The study indicates, among the food insecure households, that withdrawal from personal savings is the most widely used of all the coping strategies in the study area. It was reported that most of them could not save as they live from hand to mouth. This is closely followed by reliance on less preferred food and purchase on credit as they are ranked first, second and third, respectively. Most of the food insecure households depend on their left-over crops met for the next season while some purchase food on credit. The results corroborate the findings of Olayiwola [18] which was carried out in Ibadan, Oyo State, Nigeria. However, a reasonable number of food insecure households cut down their expenditure on non-food items such as clothing, provisions, house rent etc., followed by

Table 4. Result of the probit analysis of rural farming households

Independent Variable	Coefficient	Standard Error	P-Value
Age	-0.0149608	0.0135414	0.269
Gender	1.058033***	0.318946	0.001
Highest Educational Qualification	0.4002157	0.2792632	0.152
Marital Status	-0.4515722	0.4130757	0.274
Household Size	-0.1435908***	0.0523645	0.006
Farming Experience	0.0065755	0.0147481	0.656
Farming Size	0.1637513**	0.0738278	0.027
Farm Income	3.75e-07**	1.62e-07	0.021
Cooperative	0.3330979	0.2342939	0.155
Constant	1.307638	0.7239879	0.071

Source: Computed from field Survey, 2015
*Log likelihood= -83.846349, *** 1%, ** 5% significant level*
LR Chi2 (9) = 38.94
Prob>Chi 2= 0.0001
Pseudo R^2= 0.1885.

Table 5. Result of Hypothesis Testing (H_{01})

Variable	Value	DF	Significance	Remark
Age	36.9	41	0.655	Not Significant
Gender	8.33	1	0.004	Significant
Marital Status	4.32	3	0.229	Not Significant
Highest Education Level	5.47	3	0.141	Not Significant
Cooperative Society	2.36	3	0.501	Not significant
Farming Experiences	24.55	28	0.652	Not significant

Table 6. Result of Hypothesis testing (H_{02})

Variable	Z	Significance	Remark
Household Income	0.20	0.041	Significant

Table 7. Ranking of food insecurity coping strategy on insecure households based on their frequency of use

Coping strategy	Frequently used (3)	Occasionally Used (2)	Rarely Used (1)	Not Used (0)	CSUI	Rank
Withdrawal from personal savings	23	25	9	11	128	1st
Relied on less preferred food	18	22	20	8	118	2nd
Purchase food on credit	14	27	15	12	111	3rd
Cut down Expenditure on non-food items	16	17	21	14	103	4th
Borrow from relatives	11	29	11	17	102	5th
Reduce meal taken	8	24	15	21	87	6th
Result to prayer and fasting	5	17	11	35	60	7th
Sell asset	2	11	8	47	36	8th
Begging for alms	4	10	4	50	36	9th
Send out children for paid jobs	2	8	10	48	32	10th
Withdraw children from school	0	8	13	47	29	11th
Migrate to cities	1	7	5	55	22	12th

borrowing from friends and relatives as a means of coping. This is common especially in a situation where there are either rich members among friends and relations or asking for assistant from those ones in the city. Similar findings were reported by Farzana et al. [33] and Dahiru (2017) that were carried out among farming households in Bangladesh and Nigeria, respectively. The overall distribution explains clearly the importance of scale of preference of insecure rural household farmers in the choice of coping against food insecurity. Also, of reckoning in the study was the importance of credit as an important means of coping with food security risk. Credit is an important means of coping with food insecurity risk and this has been confirmed in a study in Northern Nigeria by Udry [34] who reported that "Credit as insurance in a rural Economy". The least used of all the coping strategies employed is the migration of household heads from the rural area to cities to make ends meet as the respondents indicating its usage.

4. CONCLUSION AND RECOMMENDA-TIONS

Food insecurity situation in Nigeria is worsening with the passage of time due to the wide-gap between the national supply and demand for food. Despite the increase in agricultural and food policies in Nigeria, it has strongly hard to reduce the number of food insecure households, therefore, making it a priority in Nigeria's government agenda. Therefore, this study examined the determinants of food security status among rural arable crop farming households. The study shows that majority of rural arable crop farming households in the study area were found to be food secure with about 54% based on the recommended minimum calorie requirement of 2260kcal. The variables such as gender, household size, farm size and household income are the main determinants of factors influencing the food security status of the crop farmers in the study area. It means that male-head household with moderate family size and a large farm size couple with substantial house income will be more likely to be food secure in the area. Again, the farmers often resort to their usual practices and strategies in an attempt to ensure food security which is done through various farming activities. Despite several constraints, farmers are still doing their best in contributing to household food security. They are actively involved in farm and non-farm income generating activities which helps to cater for themselves and their families. Based on the findings, it is recommended that the female headed households should be encouraged by the government and non-governmental organizations, via awareness creation, to be more involved in income generating activities that can make them to be food secured in the study area. This can be achieved if the discrimination of the girl child can be abolished by giving both genders equal chance. Again, since food insecurity increases with increase in household size, concerted efforts should be made at improving programmes and policies that will ensure a proper family planning which will reduce the number of children to that which the household can adequately cater for. Also, Government should put in place holistic measure that can solve the problem of land tenure in other to allow farmers to have access to more land for agricultural activities in the area. Finally, farmers should be encouraged to have additional source of income towards attaining food security by engaging in non-farming and off-farming activities.

Limitation: The use of Geographic Information System (GIS) and remote sensing to capture location-specific farm-level data would have formed more quantitative data and as well allow for comparison across different geographical areas. This will involve getting farm coordinates of each of the respondents, which will make it more capital intensive. This unaffordable by the authors as this study is self-sponsored. Therefore, further studies that collect data on the coordinates of each of the respondent's farms and extend the scope of the research to cover the whole of Nigeria should be conducted.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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