

Factors Influencing Food Security Situation among Farming Household Heads in Niger State, Nigeria

Mukhtar Mustapha

Department of Economics, Ibrahim Badamasi Babangida University Lapai, Niger State

Correspondence Email: mustaphamukhtar@gmail.com

Abstract

The objectives of this study are to determine the household food security status and factors affecting the food security status in Niger State, Nigeria. A sample size of 140 farming household heads were drawn from four local government areas among the three agricultural zones in the state. The study used food security index to determine the household status and binary regression analysis to determine the factors affecting household food security in Niger State, Nigeria. Result from the food security index indicated that 59% of the household in Niger State, Nigeria were food secured, while 41% were food insecure. Out of the twelve variables used, eight variables were found to be significant factors influencing food security status in Niger, Nigeria, including household monthly income, household family size, household heads' level of education, monthly expenditure, household head age, household livestock ownership, farm size and extension service agent contract. The research suggested that, government should intervene in empowering farming households, extension service agents need to improve on methods use in teaching and creating awareness among farming households with recent and improve methods of farming. Household heads should try and curtail the number of household size through family planning.

Keywords: Binary, Index, Extension, Zones, Empowering, Family Planning

JEL Classification: D13, H55, J13, Q18

1. Introduction

Chronic hunger and food security challenges constitute one of the major predicaments, facing the world today. Food Agricultural Organization (FAO) projected that by the end 2016 there will be about 795 million individuals trapped in serious food security challenges in the world, with about 780 million domicile in developing countries, representing 98% of the total number of people faced with such challenges. This translates into one out of nine individuals or one in every eight persons, suffers from chronic malnutrition daily in the world and in Africa respectively (FAO, 2015). However, the projected figure witnessed an increased from 775 million in 2015 to 777 million that same year and by the end of 2016 the actual people faced with serious food security problems jumped to 815 million translating into an increased of additional 38 million people up from the projected number (FAO, 2017).

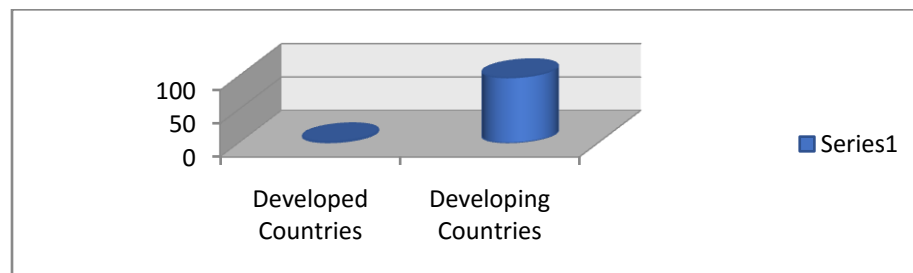


Figure 1.1: Chronic malnutrition in the world 2014/2016

Source: FAO 2015.

Recent data collected by FAO from about 150 countries in the world between 2014, 2015 and 2016 indicated that nearly 1 out of 10 people globally (9.3%) is faced with serious chronic food security challenge, this translates to about 689 million individuals (FAO, 2017). The Continent of Africa is identified to constitute the highest level of food security challenges, with about 27.4% of its total population suffering from such problem, this is four times more than any other regions in the world facing similar problem, in particular the situation is so serious in Sub Sahara Africa which witnessed an increase of about 3% between 2014 – 2016. Latin America also witnessed an increased number of people faced with serious food security problem 2014 – 2016 from 4.7% to 6.4%. However, the problem witnessed a slight decrease in Asia between 2014 – 2016 as a result of decrease witnessed in Central Asia and Southern Asia.

Table: 1.1 Prevalence of Undernourishment in the world

	Prevalence of Undernourishment in the World by Regions - 2000 – 2016									
	Percentages									
	2000	2005	2010	2011	2012	2013	2014	2015	2016	
World	14.7	14.2	11.5	11.2	11	10.8	10.7	10.6	11	
Africa	24.3	20.8	18.3	17.9	17.8	17.8	18.1	18.5	20	
Sub-Sahara Africa	28.1	23.7	20.6	20.2	20	20	20.4	20.8	22.7	
Eastern Africa	39.3	34.3	30.9	30.2	30.6	30.6	30.9	31.1	33.9	
Middle Africa	37.4	29.4	23.8	23.1	22.5	22.3	24	24.4	25.8	
Southern Africa	7.1	6.4	6.7	6.3	6.2	6.2	6.5	6.6	8	
Western Africa	15.1	12	10	9.9	9.9	9.8	9.8	10.4	11.5	
Northern Africa	6.8	6.3	5.1	4.8	8.5	8.4	8.3	8.3	8.3	
Asia	16.7	17	13.2	12.8	12.5	12.2	11.9	11.6	11.7	
Latin America/Caribbean	12	9.1	6.8	6.6	6.4	6.3	6.3	6.3	6.6	
Oceania	5.3	5.3	5	5.2	5.3	5.7	6	6.4	6.8	

Source: FAO, 2017 – State of food insecurity in the world 2016. * Projections figure.

Global stagnation in PoU as observed from Table 1.1 indicated that from 2013 to 2016 was caused by regional differences especially between Sub-Saharan Africa that witnessed an increase in the number of people suffering from serious food security problem and an improvement or reduction in the number of people that suffer from food insecurity in Asia at the same time (FAO, 2017).

All the regions witnessed an increase in the percentage PoU with exception of Northern America, Southern Asia, Eastern Asia, Central America and the Caribbean. SSA remains the hardest hit region with severe food security challenges followed by South-Eastern Asia. An alarming 22.7% of the population of SSA has been affected by food security challenges in 2016. The situation is extremely critical in Eastern Africa where estimated 1/3 of the total population are suffering from serious food security problem (FAO, 2017). Food security situation is also observed to be deteriorating in Middle Africa and Southern Africa from 22.5% and 6.2% in 2013 to 25.8% and 8% respectively.

Food security according to FAO is defined as a condition when all individuals in a household are physically and financially, under any circumstance have adequate and protected nutritious foods that meet up with their regulated diet requirement and meet dynamic and healthy lifestyle.

2. Literature Review

Various empirical researches were conducted on food security status of households all over the world, notable Arimond and Ruel (2002) in Ethiopia; Taruvinga, Muchenie and Mushunje (2013) South Africa; Olafin and Babatunde (2007) Nigeria; Makombe et al (2010); Kuwornu, Suleyman and Amegashie (2013). Recently in Nigeria the following researches were carried out to determine food security status in different parts of the country including the work of Olayiwola, Tashikalma and Giroh (2017); Agulanna, Ikpi, Okoruwa and Akinyosoye (2013).

Arene and Anyaeji (2010) investigated the food security status of households using food security, results revealed that 60% of the households were food insecure due to low monthly per capita food expenditure which is below two-third (2/3) of the mean monthly per capita food expenditure. Other studies that used this model include Adebayo (2010), Fakayode, Rahji, Oni and Adeyemi (2009).

Olayiwola et al. (2017) investigated the food security and coping strategies adaptation among rural household in rural Oluyole area of Oyo State, Nigeria. The results outcome indicated that majority of households were classified as food insecure and selling livestock, purchasing food on credits, skipping meals and children eating first were the coping strategies adopted by rural households.

Abur (2014) investigated food security status among rural household in Guma, Benue in Nigeria using food security index, the results indicated that food insecurity was higher among household heads in the age group (40 – 45 years) with 27.5%, while the severity is extremely higher among the age group of (50 years – Above) with 24% and 41% respectively.

Ifeoma and Agwu (2014) observed food security status using binary logistics among rural farming households in Kano. Results indicated that 74% were food secured. Education, sex, family size and access to credit facility were the major determinant of food security among the rural household in Kano, Nigeria.

Ivanda, Igbokwe and Olatunji (2015) investigated food security condition among Tiv farming households using food security index. Result revealed that 46.9% of the farming households were food insecure and in order to fight food insecurity, farming households used mixed cropping and high yield agricultural inputs.

Various literatures indicated that, there is little or no information concerning food security situation among the farming households in Niger, Nigeria, therefore this study bridge the gap.

3. Methodology

3.1 Data and Sample

Questionnaire was used to obtain the information among the 140 household heads sample. A stratified sampling method was used and four local government areas were drawn randomly, one each from the three agricultural zones in Niger State and one control sample. Descriptive analysis and food security index were used to determine the status of food security among households and its major determinants.

3.2 Food Security Index

According Maxwell (1996) food security index can be determined using two basic approaches namely; consumption patterning using a recall process for each households food intake to determine the calorie or using expenditure of the households overtime to determine increase or decrease in the household food stocks.

The study used the consumption pattern approach, where household food security status is determine after converting each food items consumed by each household into grams (matching it with calorie content) and then divide it by daily recommended energy intake by each individual depending on the age and sex with table provided by Stefan and Pramila (1998) in appendix (2) and converted into an average by Kuwornu et al. (2013) in appendix (3).

A table of common food items consumed in Nigeria with calorie content of each was adopted as given by Oguntona and Akinyele (1995) in appendix (1). Base on recommended calorie intake provided by FAO to be 2, 470 kcals for adult and adult equivalent in Nigeria, the index is given as follows:

$$\pi_i = \frac{\eta_i}{R} \dots \dots \dots 2$$

π Indicates food security status for i^{th} household, η indicates daily per capita calorie of household i^{th} and R indicates daily per capita calorie requirement.

Surplus/shortage index determine the extent to which individual household either exceeded food security line or the extent of shortage. The surplus/shortage index is given as follows:

$$S_i = \frac{1}{\alpha} \sum_{i=1}^{\alpha} \delta_i \dots \dots \dots 3$$

Where δ_i is given as $\frac{\pi_i - R}{R}$

$$S_i = \frac{1}{\alpha} \sum_{i=1}^{\alpha} \frac{\pi_i - R}{R} \dots \dots \dots 4$$

α Indicates household identified as food secure, δ indicates per capita calorie surplus.

Food security is measured as a binary, taking (1) for food secure household and (0) for food insecure household.

3.3 Logistic Regression Model

The study also used the Logistic Regression Model to determine factors influencing food security status of the households'. The Logistic Model used coefficient, odds ratio and marginal effect to provide explanation of each variable in the model. The implicit model is given as follows:

$$\pi_i = \phi\chi_i + q_i \dots\dots\dots 5$$

ϕ Indicates vector of the parameter estimates, χ_i vector of the explanatory variables and q_i indicates the error terms.

Age of the Household head: This represents number of years spent by the household head in the study area. A prior of household head age is positive depending on factors prevailing in the study area.

Size of the Household: Household size indicates the number of adult equivalent consuming from the same pot in a household. The a-prior is that, household with high number of household could be food insecure especially if the household comprises of unproductive household member, than a household with small size members.

Farming experience by Household Head: Experience in farming activities indicated in term of the number of years involved in agricultural activities. The a prior expectation is that household head with large number of experience especially under the age of highest productivity, the higher the household will be in term of food secure as compared to household with small number of years of farming experience.

Ownership of land by the head of the household: Land ownership structure of household head could be family inherited, individually owned or rented. Household head's land ownership through private ownership and rented is expected to be used maximally with the aim of producing so much, than household owned by means of family inheritance.

Farm size: Household head's farm size plays an important role in determining food security status of household. The expectation is that, household head with large farm size tend to be more food secure than household head with small farm size, all things being equal.

Expenditure: Household expenditure indicates the Naira amount spent by households monthly. Household with high monthly expenditure spent on food item, is expected to be food secured than households with lower monthly expenditure on food items.

Access to credit facility by household head: This refers to loan facility availed to household head toward farming activities measure in Naira amount. Household head who benefitted from credit facility assigned (1) and if otherwise assigned (0).

Extension service: Extension service agent contact: The more frequent the contacts with farming household heads, the higher the output expected and consequently the more food secure the households.

Household head earning: Measure in Naira value on monthly basis. The expectation is with high earning by household head, food security is supposed to be guarantee, than with lower earning.

Average family size among household is 11 individuals, in term of classification 52% are with the range of 1 – 10 individuals; 37% are within 11 – 20 individuals and 11% within 21 – above individuals. Household head level of education from Table 4.1 shows that 33% have tertiary education qualification, 30% have primary education, 19% have adult education and 18% have secondary education.

Average household head farming experience from Table 4.1 shows 11 years as average among the respondents. Classification of the years of experience shows that 27% have 1 -10 years farming experience, while 60% have 11 – 20 years and 13% have 21– above years experience. Table 4.1 shows that farm size ranging 1 – 5 ha account 85% and about 15% are 6 – 10 ha. In term of land ownership from Table 4.1 shows that 75% of the land ownership is through family inheritance, about 18% are owned through rent and only 7% owned through outright purchase. In term of establishing contact between farming households and extension service agent, indication from Table 4.1 shows that 47% have not establish any contract, about 27% established a contract of once in a month while 26% established twice a month contact with extension service.

Economic profile from Table 4.1 shows that average monthly income N60, 800 among household head. In term of classification about 62% are within N10, 000 – N100, 000, about 25% are within N101, 000 – 200, 000 and 13% within N201, 000 – Above. In term of household monthly expenditure, Table 4.1 shows that the average monthly expenditure is N43, 000, while in term of classification, about 93% are within N10, 000 – N100, 000 while 22% within N101, 000 – N200, 000 and 25% within N201, 000 – above. In term of access to credit facility among farming household head shows that about 27% of the farmers benefitted from credit facility, while 73% were unsuccessful.

Table: 4.1 Socio-economic Characteristics of Household Heads

Variables	Frequency	Percentage	Means
<i>Household Age</i>			46
18 - 20 Years	4	2.9	
21 - 30 Years	20	14.3	
31 - 40 Years	38	27.1	
41 - 50 Years	56	40	
51 - Above Years	22	15.7	
<i>Household Head Gender</i>			
Female	9	6.4	
Male	131	93.6	
<i>Household Marital Status</i>			
Single	0	0	
Married	131	98	
Widowed	4	1	
Divorced	5	1	
<i>Level of Education</i>			
Adult Education	27	19	
Primary	42	30	

Variables	Frequency	Percentage	Means
Secondary	25	18	
Tertiary	46	33	
<i>Farming Experience</i>			22
1 - 10 Years	38	27	
11 - 20 Years	84	60	
21 – Above	18	13	
<i>Household Size</i>			11
1 - 10 Individuals	73	52	
11 -20 Individuals	52	37	
21 – Above	15	11	
<i>Farm Size</i>			
1 - 5 ha	119	85	
6 - 10 ha	21	15	
11 – Above	0	0	
<i>Land Ownership</i>			
Inheritance	105	75	
Purchased	10	7	
Rent	25	18	
<i>Extension Visitation</i>			
None	66	47.1	
One a month	38	27.1	
Twice a month	36	25.8	
<i>Credit Source</i>			
Yes	38	27.1	
No	102	72.9	
<i>Household Head Income</i>			N65, 000
N10, 000 - N100, 000	87	62	
N101, 000 - N200, 000	35	25	
201, 000 – Above	18	13	
<i>Household Head Expenditure</i>			N71, 000
N10, 000 - N100, 000	93	66	
N101, 000 - N200, 000	22	16	
N201, 000 – Above	25	18	

Source: Field Survey, 2017

4.2 Household Food Security Status

Table 4.2 shows the percentage of households identified as food secure and food insecure among the farming households in Niger, Nigeria. Evidence from the Table 4.2 indicates that 59% of the households are food secure, while an estimated 41% are classified food insecure. The result was

obtained after converting household's size into adults equivalent. A total of 445 adults equivalent were obtained from the total of 140 households in the study area. Daily Calorie Consumption (DCC) for household classified as food secure from Table 4.2 is 754,047 kcals, while Calorie Requirement is 654,356 kcal. The Per capital daily calorie consumption (PCC) among the food secures households (Adults equivalent = 263) is 2,868.27 kcals, while Per capital calorie requirement is 2,488.04 kcals. Applying equation (1) will give us a food security status of 1.17. Applying similar equation (1) will give 0.79 for the household food insecure as indicated by Table 4.2. Overall Daily Calorie Consumption (DCC) among the households is 1,110,819.29 Kcals, while overall Calorie Requirement is 1,104,284.00. Overall per capita daily calorie is 4,828.56 and overall per capital calorie requirement is 4,959.17. Applying equation (1) will give overall food security status of 0.97.

The implication of the overall food security index result of 0.97 indicates that Niger State, Nigeria is still not food secured because the index fall shy of 1 and above. Food secure households with index of 1.15 indicate that these households have exceeded the cut-off with 0.15 indicating 15% excess achievement after applying equation (2). In the same vein households classified as food insecure, have fall short of 1 since their index is 0.79 by 0.21 when translated further, after applying equation (2) is 21% shortfall. Overall, the study area has a shortfall of 0.03 indicating 3% shortfall.

Table.4.2 Food Security Status of Households in Niger State

Factor	Pooled (n = 140)		
	Food Secure	Food Insecure	All
%	58.6	41.4	100
DCC	754047.00	356772.29	1110819.29
CR	654356.00	449928.00	1104284.00
PCC	2868.27	1960.29	4828.56
PCR	2488.04	2471.13	4959.17
π	1.15	0.79	0.97
Head Count	0.59	0.41	1.00
Shortfall (Pi)	0.00	0.21	0.21
Surplus (Ps)	0.15	0.00	0.15
HH AE	263.00	182.00	445.00

Source: Field Survey, 2017

Where DDC represents daily calorie consumption, CR represents calorie requirement, PCC represents per capital calorie consumption, PCR per capital requirement, π represents food security index, HH AE represents adults equivalent.

Various empirical studies adopted food security index in determining food security status of households in Africa, especially in Nigeria where the issue of food security is taking a dangerous turn. Some of the notable among them includes Babatunde, Omotesho and Sholotan (2007); Abu and Soom (2016); Ifeoma and Agwu (2014).

4.3 Factors Influencing Farming Households Food Security Status

Table 4.3 shows factors affecting food security status, the report indicate 92.86% correct classification estimation, indicating that 93% of the independent variables accounted for changes in the dependent variable (food security status). Out of the twelve variables employed, eight are statistically significant; in term of magnitude one variable is significant, while three have insignificant effects due to low magnitude. The result of the coefficient, odds ratio and marginal effect are under the assumption that other variables in the model are held constant.

Table 4.3 shows that the coefficient of household head earning is positive 0.813 and statistically significant at 5%, with odds ratio of 2.254. This indicates positive relation between food security and household head level of income. This also means that, the odds ratio of a household headed by household head with higher income to household headed by household head with low income to be food secure is 2.254. Therefore the probability of household headed by household head with higher monthly income to be food secure is 2 times more than a household headed by household head with lower income. In the same vein, the result suggests that being household headed by household head with high income make a household to 5 percent points more likely to be food secured all thing being equal. The work of Omotayo, Ijatuyi, Olorunfemi and Agboola (2017) discovered a negative relation between food security and household head income, which is contrary to the finding of the research.

Table 4.3 also shows that the coefficient of household head level of education is positive and statistically significant at 1%, with odds ratio of 8.490. This indicates a positive relationship between food security status and household head level of education. The result indicates that odds ratio of household head with higher educational requirement compared to household head with lower education qualification to be food secure is 8.490. This suggests that, the probability of household headed by household with higher educational qualification to the household headed by household head with lower educational qualification is 9 times more. Hence there is 13 percentage points more likely that household head with higher educational qualification to be food secure, all thing being equal. The work of Babatunde et al. (2007) is in conformity with outcome of the research, that education has a positive relationship with food security status.

The coefficient of extension service agent contact from is positive and statistically significant at 1% with odds ratio of 45.002 as shown in Table 4.3. This indicates a positive relationship between food security and household head contact with extension service agent. This also means that the odds ratio of household headed by household head who established a contact with extension service agent to the household headed by household head without contact with extension service agent is 45.002. In the same vein the probability of household head who establish extension service contact compared to household head without contact are food secured. There is a 22 percentage points more likely for a household head that established extension service contact to be food secure, all thing being equal. Ifeoma and Agwu (2014) also established a positive relationship between food security and extension service agent contact and visitation.

Table 4.3 further reveals that the coefficient of household age is negative (1.049), but statistically significant at 5% with odds ratio of 0.350. This means that there is a negative relationship between food security and household head age. This also means, the odds ratio of older

household head to younger household head to be food insecure is 0.350 times more likely. In other words, the results indicates that being household headed by older household head make household to be 6 percent points more likely to be food insecure, all things being equal. However, the work of Adeniyi and Ojo (2013) established a positive relationship between food security and household head age, which is contrary to the finding of this research.

The coefficient of household family size from Table 4.3 is negative (2.983) but statistically significant at 1% with odds ratio 0.0506. This means that there is a negative relationship between food security status of household with household family size. In other words, the odds ratio of household with large family size to a household with small family size, to be food insecure is 0.0506. Similarly the result shows that being household with large family size make a household to be 17 percent points more likely to be food insecure, all thing being equal. The work of Jabo, Ismail, Abdullah and Shamsudin (2016) established a positive relationship between food security and family size, which is against the finding of this research.

Table 4.3 also indicates that the coefficient of farm size by household head is negative (1.527) and statistically significant at 10% with odds ratio of 0.217. The result signifies that there is a negative relationship between food security status and farm size. In other words, being headed by household head with small farm size, make household 9 percent more likely to be food insecure, all things being equal. The work of Jabo et al. (2016) also established a negative relationship between food security status and farm size.

Household head monthly expenditure from Table 4.3 shows a negative coefficient (1.086) and statistically significant at 10% with odds ratio of 0.337; suggesting a negative relationship between household food security status and monthly expenditure. Similarly, the result indicates that being household headed by household head with less monthly expenditure give the household 6 percent more likely to be food insecure all thing being equal. The work of Omotayo et al. (2016) also established a negative relationship between food security status and monthly expenditure.

Result from Table 4.3 further shows that the coefficient of household head ownership of livestock is negative (1.089) and statistically significant at 10% with odds ratio of 0.336. This indicates a negative relationship between food security status and ownership of livestock. This similarly means that, being headed by a household head with livestock ownership make household 6 percentage points more likely to be food insecure, all things being equal.

Table 4.3 shows that the coefficients of access to credit facility, household on production and household head involvement in farming activities are positive by 1.595, 0.221 and 0.299 respectively, but statistically insignificant, even though the variables indicate a positive relationship with food security status, while household member earning indicate a negative coefficient of 0.409, although statistically insignificant.

Table: 4.3 Binary Regression Analysis for Socio-economic variables

Variable	Coefficient	Std.Error	Z	P>/Z	Odds Ratio	Marginal Effect
Household Head Monthly Earning	0.81	0.43	1.89	0.06	2.25	0.05
Household Head Age	-1.05	0.53	-1.99	0.05	0.35	-0.06
Household Size	-2.98	0.94	-3.19	0.00	0.05	-0.17
Household Head Level of Education	2.14	0.47	4.52	0.00	8.49	0.13
Household Members Earning	-0.41	0.45	-0.90	0.37	0.66	-0.02
Household Head Involved in Farming	-0.30	1.56	0.19	0.85	1.35	0.02
Household Own Production	0.22	0.39	0.57	0.57	1.25	0.01
Household Farm Size	-1.53	1.02	-1.50	0.13	0.22	-0.09
Household Monthly Expenditure	1.09	0.64	-1.71	0.09	0.34	-0.06
Household Head Livestock Ownership	-1.09	0.63	-1.72	0.09	0.34	-0.06
Household head Access to credit	1.60	1.62	0.99	0.32	4.93	0.09
Extension Service Agent Contact	3.81	1.40	2.72	0.01	45.00	0.22
Constants	3.49	3.03	1.15	0.25	32.85	0.00

Source: Field Survey, 2017

Various researches adopted regression models especially binary regression to identify factors affecting household food security, this include the work of Jabo et al. (2016); Ifeoma and Agwu (2014); Valyala et al. (2015); Oluwaseun (2015); Abu and Soom (2016)

5. Conclusions and Recommendation

Major factor affecting household food security status in Niger State, Nigeria have been identified in this paper. Result further indicates that 92% of the variation is explained by independent variable. Food security index further revealed that 59% of the household heads are food secure, however overall analysis revealed that household in Niger, Nigeria are food insecure, because food security index fall short of desire 1 by 0.03%. Descriptive analysis revealed that 94% of the household heads are male, with average age of 46 years. The result further indicates that 98% of the household heads are married and 33% have tertiary education in the study area and average household size is 11 individuals. In term of farming activities, the average year of farming experience among household head is 22 years, while majority of the household head have a farm size of 1 – 10 ha, with most farm land ownership emanating from family source about 75%. About 47% of the farming household heads had no contact with extension service agent.

An estimated 73% of the household heads have no access to loan facility, while average monthly income among the household heads is ₦60, 800, this translate into less than US\$2 per day signifying high level of poverty among households, while average monthly expenditure is estimated at ₦43, 000, which is also consider extremely low hence the high level of food insecurity among household heads.

Outcome of food security results, in this study represent fair view of food security among farming household in Niger State, Nigeria and can be used for further investigation of food security or as reference benchmark for measuring food security among household in other States of the country, especially North Central region.

The study therefore recommended that farming household heads should diversify into income generating activities apart from farming, which has the tendency of increasing their monthly income and hence household food security status. Government should also set-in in order to reduce the level of poverty among the household heads, especially those located in rural area. Also policies that can directly benefit the common farmers need to be introduced, especially in agriculture like subsidy, provision of more skills extension service agents and mechanical power provision. Other recommendations include curtailing the number of household size through birth control, and basic nutritional skills among the housewives, while health environment is maintained.

References

- Abu, G. A., & Soom, A. (2016). Analysis of factors affecting food security in rural and urban farming households of Benue State, Nigeria. *International Journal of Food and Agricultural Economics*, 4(1), 55
- Abur, Cyprian Clement (2014). Assessment of Food Security Status among Rural Farming Households in Guma Local Government Area of Benue State, Nigeria. *International Journal of Research in Humanities and Social Studies*. Volume 1, Issue 2, December 2014, PP 34-42
- Adebayo, A.A., (2010.) Food security status in Nigeria: pre and post economic deregulation review. *International journal of Economic Development Research and Investment*, 1(1), 132–150.
- Adeniyi, O. R., & Ojo, O. A. (2013). Food security status of rural farming households in Iwo, Ayedire and Ayedaade local government areas of Osun State, South-Western Nigeria. *African Journal of Food, Agriculture, Nutrition and Development*, 13(5), 8209-8223.
- Agulanna, F. T., Ikpi, A. E., Okoruwa, V. O., & Akinyosoye, V. O. (2013). A synergetic linkage between agricultural productivity, nutrition and health. *African Journal of Biomedical Research*, 16(1), 1-9.
- Arene, C. J., & Anyaeji, R. C. (2010). Determinants of food security among households in Nsukka Metropolis of Enugu State, Nigeria. *Pakistan Journal of Social Sciences*, 30(1), 9-16.
- Arimond, M., & Ruel, M. T. (2004). Dietary diversity is associated with child nutritional status: evidence from 11 demographic and health surveys. *The Journal of nutrition*, 134(10), 2579–2585.
- Babatunde, R. O., Omotesho, O. A., & Sholotan, O. S. (2007). Socio-economic characteristics and food security status of farming households in Kwara State, North-Central Nigeria. *Pakistan Journal of Nutrition*, 6(1), 49-58.
- Fakayode, S. B., Rahji, M. A. Y., Oni, O. A., & Adeyemi, M. O. (2009). An assessment of food security situations of farm Households in Nigeria: A USDA approach. *The social sciences*, 4(1), 24-29.
- Food and Agriculture Organization of the United Nations; International Fund for Agricultural Development; United Nations Children Emergency Fund; World Food Programme & World Health Organization. (2017). *State of food security and nutrition in the world 2017. Building Resilience For... Peace and Food Security*. Food & Agriculture Org. <http://www.fao.org/3/a-I7695e.pdf>

- Food and Agriculture Organization of the United Nations. (2015). *Achieving Zero Hunger: The Critical Role of Investments in Social Protection and Agriculture*. <http://www.fao.org/3/a-i4951e.pdf>.
- Ifeoma, I., & Agwu, A. (2014). Assessment of food security situation among farming households in rural areas of Kano state, Nigeria. *Journal of central European agriculture*, 15(1).
- Ivanda, D. P., Igbokwe, E. M., & Olatunji, O. M. (2015). Assessment of food security situation of Tiv Farming households in Nigeria. *Journal of Agricultural Extension*, 19(1), 77-92.
- Jabo, M. S. M., Ismail, M. M., Abdullah, A. M., & Shamsudin, M. N. (2017). Measurement and determinants of rural food poverty in Nigeria: recent evidence from general household survey panel. *International Food Research Journal*, 24(3), 1011.
- Kuwornu, J. K., Suleyman, D. M., & Amegashie, D. P. (2013). Comparative Analysis of Food Security Status of Farming Households in the Coastal and the Forest Communities of Central Region of Ghana. *Asian Journal of Empirical Research*, 3(1), 39-61.
- Makombe, T., Lewin, P., & Fisher, M. (2010). The determinants of food insecurity in rural Malawi: Implications for agricultural policy (No. 4). *International Food Policy Research Institute (IFPRI)*.
- Maxwell, S. (1996). Food security: a post-modern perspective. *Food policy*, 21(2), 155-170.
- Oguntona, E. B., & Akinyele, I. O. (1995). Nutrient composition of commonly eaten foods in Nigeria-Raw, processed and prepared
- Olayiwola, S. A., Tashikalma, A. K., & Giroh, D. Y. (2017). Analysis of Food Security Status and Coping Strategies among Rural Households in Oluyole Local Government Area of Oyo State, Nigeria. *Trends in Science and Technology Journal*, 1(2), 28-32.
- Olofin, S., & Babatunde, M. A. (2007). *Estimating price and income elasticities of Sub-Saharan African exports*. A Paper Presented in the 12th Annual Conference on Econometric Modeling for Africa held from the 4th until the 6th of July 2007. Cape Town, South Africa.
- Omotayo, A. O., Ijatuyi, E. J., Olorunfemi, O. D., & Agboola, P. T. (2017). Food Security Situation among South African Urban Agricultural Households: Evidence from Limpopo Province. *Acta Universitatis Danubius. economica*, 14(1), 60-74.
- Stefan, D. and K. Pramila, (1998). *Changes in Poverty in Rural Ethiopia 1989-1995. Measurement, Robustness Tests and Decomposition*. Center for the Study of African Economics, Working Paper Series.
- Taruvinga, A., Muchenje, V., & Mushunje, A. (2013). Determinants of rural household dietary diversity: The case of Amatole and Nyandeni districts, South Africa. *Int J Dev Sustainability*, 2(4), 2233-2247.

APPENDICES

Appendix 1: common food items eaten

Food items	Kcal/kg	Food items	Kcal/Kg
<i>Staple food</i>		<i>Fruits</i>	
Cassava Flour	3870	Plantain	770
Gari	3840	Banana	960
Soy flour	2600	Pineapple	320
Wheat Grain	3400	Apple	570
Cowpea (Beans)	5920	Coconut	580
Sweet Potato Tuber	1000	Guava	730
Maize Grain	4120	Sugarcane	360
Maize Flour	3500	Mongo	590
Sorghum Grain	3500	Pawpaw	300
Millet Grain	3500	<i>Meats & Animal prod</i>	
Groundnuts	5950	Cow Meat	2370
<i>Vegetables</i>		Chicken	2380
Okro	4500	Fish	2230
Tomato	880	Eggs (pieces)	1400
Pepper	3930	<i>Drinks</i>	
Onion	440	Soft drink	620
Egg plants	440	Orange Juice	400
Cucumber	270	Apple Juice	550
Pumpkin	440	Pineapple	560
<i>Beverages</i>		<i>Dairy Products</i>	
Cocoa	1200	Milk	4900
Tea	1200	Cheese	4000
Coffee	4100	Yoghurt	4100

Source: Oguntona and Akinyele (1985)

Appendix 2: Adults equivalent

Age category in (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)

Appendix 3: Recommended Daily Energy intake and Equivalent Scale

Age category (yrs)	Average energy per day	Factor equivalent
Children less than 6 yrs	741	0.3
Children (6 – 18) yrs	1,729	0.7
Adults (> 18) yrs	2,710	1.0

Source: Kuwornu et al., (2013).