Ife Journal of Agriculture, 2020, Volume 32, Number 3

EFFECTS OF FADAMA III USER GROUP PARTICIPATION ON FOOD SECURITY OF RURAL HOUSEHOLDS IN BENUE STATE, NIGERIA.

***ADEYEMI E. B., ADEYEMO R., KEHINDE A. D, AND FAMUYINI C. A**

Department of Agricultural Economics, Obafemi Awolowo University, Ile Ife, Nigeria.
elizadeyemi025@gmail.com

ABSTRACT

The study determined the food security status and analysed the influence of Fadama III project on food security of the rural households in Benue State. Multistage sampling technique was used. Data were collected using structured questionnaires. Data obtained were analysed using foster, greer and thorbecke index (food expenditure approach) and double hurdle model. The mean age of the participants and non-participants were 42 years and 48 years respectively. Participants (71%) and non-participants (62%) were male and majority of participants (72%) and non-participants (70%) were married. The average household sizes were 7.1 and 6.5 for participants and non-participants respectively. The severity of food insecurity among the participants of Fadama III project was 0.04 while among the non-participants was 0.06. The result of the double hurdle showed at the first hurdle that farming experience ($p<0.05$), non-farm income ($p<0.01$), participation ($p<0.1$) and household size ($p<0.01$) were significant factors affecting the food security status in the study area. The result of the second hurdle revealed that age ($p<0.05$), household size ($p<0.01$), farming experience ($p<0.01$), participation ($p<0.1$) and access to credit ($p<0.01$) were the significant factors influencing the severity of food security in the study area. In conclusion, participation in Fadama III project had a positive and significant influence on food security. Therefore, farmers should be encouraged to participate more in the project in order to improve the level of food security in Nigeria.

Keyword: double hurdle model, Fadama III, food security, participation and rural household

INTRODUCTION

One of the major challenges facing developing countries around the world is food insecurity (FAO, IFAD and WFP, 2014). It was reported that, about 13.5% global population which translates to 805 million people were unable to meet their nutritional energy supplies between the year 2012 to 2014 while 791 million (11.3%) of the global population are malnourished (FAO, 2014). As is the case with many developing countries, Nigeria faces the problem of food security such that it cannot feed its steadily growing human population of 179 million (NBS, 2016). According to the Food and Agriculture Organization of the United Nations (2011), food security is a state of people's physical, social and economic accessibility at all times to healthy, adequate and nutritious foods that meet their nutritional needs and dietary preferences for a healthy life. Jrad, Nahas and Baghasa (2010) highlighted food security indicators as including availability, accessibility, adequate use of food and stability of food supply. The availability of food is defined as the existence of food for consumption, while the availability of material and financial resources determine access to food (Gregory *et al.*, 2005; Kuwornu *et al.*, 2011). Adequate use of food refers to the consumption and digestion of quality and sufficient food for

health maintenance, while the constant supply of sufficient food throughout the year without deficiency is critical to food stability (Kuwornu *et al.*, 2013).

Food security in Nigeria is tragic, as above 70 percent of rural households are very poor with no constant access to the amount of food required to maintain a productive and healthy life (Babatunde *et al.*, 2007). Statistics has shown that the rate of poverty among Nigerian population increased from 54.7% in 2004 to 60.9 percent in 2011 (NBS, 2012). In addition, the incidence of food insecurity among rural households in Nigeria accelerated from 18 percent in 1986 to 40 percent in 2005 (Sanusi *et al.*, 2006). Kurwonu *et al.* (2013) attributed food insecurity in rural areas to inadequate access to food required for a healthy life. Therefore, focusing on improving access to food through sustainable agriculture and rural development programmes remains the effective way to reducing food insecurity (Obisesan *et al.*, 2016).

In view of the above stated, the federal government of Nigeria has carried out various agricultural programmes over the years (Metu *et al.*, 2016). These programmes aimed at improving the food status of rural households by increasing farmers' incomes and livelihood (Oriola, 2009). According to Tiri *et al.*, (2014), some of the agricultural programmes include; National Accelerated Food Production Programme (1972-1976), River Basin Development Authority (1975), Operation Feed the Nation (1976-1979), Green Revolution (1980-1984), Agricultural Development Programmes (1985) and National Directorate of Employment (1986-1993). Despite this, many of these programmes have not been able to totally eradicate food insecurity problem due to increase in population and escalating demand for food which created a gap that needed to be filled by the introduction of a participatory food security programme with three phases; National Fadama Development Project (NFDP) I (1993-1999), NFDP II (2000-2007) and NFDP III (2009-2013). The activities of Fadama projects centered on those having common economic interest termed Fadama User Groups (FUG). The project provided the basis for supporting farmers, youths and women (especially the widows), in terms of funding of value-added outputs (BNARDA, 2005).

The Federal Government of Nigeria introduced Fadama III project in 2008 which provided a platform for farmers to have access to subsidized productive resources in order to ensure food security among rural households. The Fadama III project was targeted at improving rural household's food security by raising income level of the participating FUGs through Fadama Community Associations (FCAs) (Osondu, Ezeh, Emerole and Anyiro, 2014). Fadama III project used an approach called the Community Demand-Driven (CDD) approach focusing on the participation and monitoring of beneficiaries' sub-project from implementation to monitoring and evaluation (Innih and Dimelu, 2013). Founded on the above premises, this study examined the food security status of participants and non-participants of the programme and also analyzed the effect of participation in Fadama III on household's food security status in the area of study.

METHODOLOGY

The study was conducted in Benue State, Nigeria. Benue state is located in the North-Central (middle belt) geopolitical zone of Nigeria. The state has a total population of 4,219,244 (National Population Census, 2006) and a land area of 34,095 km^2. The state lies between longitude 8°E and 10°E, Latitude 6°3°N and 8 °N. Agriculture is the occupation of over 70 percent of the labor force in Benue State. This made Benue the major source of food in terms of production in the nation. The crops grown in the state include cassava, yams, sweet potatoes, citrus, mango, oil palm, rice, maize, millet, sorghum, sesame, fruits and vegetables (Dauda, 2009). A multistage sampling procedure was employed for this study. The first stage involved purposive selection of two (2) Local Governments Area (LGAs) out of the twenty (20) participating LGAs; Makurdi, and Buruku based on significant number engaged in agricultural activities. The second stage involved purposive selection of five (5) communities from each LGA based on a significant number of rural communities engaged in Fadama III project. The third stage involved stratification into participants and non-participants of Fadama III. The fourth stage involved simple random selection of 10 farmers from each stratum. One hundred participants and 100 non-participants were selected making a total of 200 respondents for the study. Primary data was used for the study.

Data collected were analyzed using descriptive statistics, Foster, Greer and Thorcbecke index, and double hurdle model. The models are explicitly stated as follows:

Foster, Greer and Thorcbecke index (household food expenditure approach)

Household food security index was used to measure their food security status using Foster, Greer and Thorcbecke index. The model estimated indices such as food insecurity gap (FIG), incidence and severity of food insecurity among households (Adepoju and Adejare, 2013). Explicitly,

$$FSI = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{G-R}{G}\right)^{\alpha}$$

Where;

FSI = Food security index; G= Food security line (estimated to be 2/3 of the mean per capita food expenditure); R = Per-capita food expenditure for all households (₦); q = number of household who falls below the food security line; n = total number of households in the sample; α = the aversion parameter taking the values of 0, 1 or 2.

Double hurdle model

The model was employed in this study because it examined the food security status and the severity of food security. Other studies have used the tobit model to analyze the food security status and the severity of food security by determining outcomes by the same underlying process (Cragg, 1971). However, the food security and the severity of food security may not be determined by the same parameters.

The food security status which takes a dummy variable, 1 for food secure and 0 for non-food secure was used as the dependent variable in the first hurdle. The per capita food expenditure was used as the dependent variable in the second hurdle. On clearing the first hurdle by determining the factors affecting the food security status, factors that determine the severity of food security (per capita food expenditure) was also considered.

Factors influencing the food security status and the severity of food security were conditioned on the socioeconomic, demographic, institutional and participation factors.

This research employed the double hurdle model which allows outcomes to be determined by two separate stochastic processes through the combination of a probit regression on food security status (all observations) followed by a truncated regression on the severity of food security (per capita food expenditure which is non-zero observations) (Cragg, 1971).

First hurdle: Probit Model

The probit regression model was used to determine the food security status. The dependent variable was the probability of whether a household is food secure or not and the explanatory variables include socioeconomic, demographic, institutional and participatory variables assumed to influence the food security status. The estimated model was specified explicitly as follows:

$$Y_I = \beta_0 + \beta_1 AGEHD + \beta_2 HHSIZ + \beta_3 FARMEXP + \beta_4 MEMOASS + \beta_5 NONFARMINC + \beta_6 PARTFADAMA + \beta_7 ACCEXT + \varepsilon_I$$

Where;

Y_I= Food security status (1=food secure, 0= otherwise) *AGEH*= Age of household head (years)

HHSIZ = Household size (#), *FARMEXP* = Farming experience (years), *MEMOASS*= Membership of other association (1= yes, 0= otherwise), *NONFARMINC* = Non-farm income (₦), *PARTFADAMA* = Participation in Fadama III (1=yes, 0= otherwise), *ACCEXT* = Access to extension services (1=yes, 0= otherwise), ε_i = error term.

Second hurdle: Truncated Regression model

The truncated regression model was employed to determine the severity of food security. The dependent variable in this case was the per capita food expenditure of food secure households only (continuous variable) The dependent variable was truncated at a lower limit of 3649.84 (food security line) and modelled against factors expected to influence the severity of food security. The truncated linear regression model was used because the dependent variable was a continuous variable which was given by;

$$Y_I = \beta_0 + \beta_1 AGEHD + \beta_2 HHSIZ + \beta_3 FARMEXP + \beta_4 MEMOASS + \beta_5 PARTFADAMA + \beta_6 ACCEXT + \beta_7 ACCREDT + \varepsilon_I$$

Where;

Y_I = Severity of food security (continuous variables), *AGEHD*= Age of household head (years), *HHSIZ* = Household size (#), *FARMEXP* = Farming experience (years), *MEMOASS*= Membership of other association (1= yes, 0= otherwise), *PARTFADAMA*= Participation in Fadama III (1=yes, 0= otherwise), *ACCEXT* = Access to extension services (1=yes, 0= otherwise), *ACCREDT* = Access to credit (1=yes, 0= no), ε_i = error term.

TABLE 1: "A PRIORI" EXPECTATIONS OF THE DOUBLE HURDLE MODEL

Variables	Measurements	Expected signs	References
Age of household head	Years	+	Oyebanjo *et al.* (2015)
Household size	Number of members	-	Oyebanjo *et al.* (2015)
Farming experience	Years	+	Oluyole *et al.* (2009) Oyebanjo *et al.* (2015)
Membership of other cooperatives	1= yes, 0= otherwise	±	Bamire (2010)
Participation in Fadama III	1=yes, 0= no	+	Imoh *et al.* (2009)
Access to credit	1=yes, 0= no	+	Mitiku and Legesse (2014)
Access to extension services	1=yes, 0= otherwise	±	Bamire (2010)

RESULTS AND DISCUSSION

Socio-economic characteristics of respondents

The analysis of the socio-economic characteristics of the respondents (table 2) showed that the mean age of the participants and non-participants were 42 and 48 years respectively. Majority of both participants (71%) and non-participants (62%) were male and majority of both participants (72%) and non-participants (70) were married. The average household sizes were 7.1 and 6.5 for participants and non-participants respectively. The result revealed that average farm size of both the participants and non-participants were 5.01 and 3.39 hectares respectively. In terms of years spent in school, participants spent an average of 13.78 years while the non- participants only spent 8.51 years in school. This implies that participants were more educated than the non-participants. The result of the respondents farming experience showed both the participants (9.10 years) and the non-participants (10.05 years) in the study area. Average income of participants and that of non-participants of Fadama III were ₦766,200 and ₦665,700 respectively. The result further revealed that 65%, 62% and 89% among the participants of Fadama III program had access to credit, extension visit and were members of other association respectively while only 23%, 11% and 29% of the non-participant had access to credit, extension visit and were members of other association respectively.

TABLE 2: SOCIO-ECONOMIC CHARACTERISTICS OF RESPONDENTS

Variables	Participants (% or mean)	Non-participants (% or mean)
Age (years)	41.55	47.83
Household size (mean)	7.14	6.51
Farm size (ha)	5.01	3.39
Years of education (years)	13.78	8.51
Farming experience (years)	14.66	16.98
Gender		
Female	29	38
Male	71	62
Marital Status		
Single	8	6
Married	72	70
Divorced	10	14
Widowed	10	10
Total annual income (₦)		
Mean(in 000)	766.2	665.7
Access to credit	65	23
Access to extension visit	62	11
Membership of other association	89	29

Source: field survey, 2018

Result of the food security status of the respondents

Table 3 showed the food security status of the respondents. The ⅔ mean per capita food expenditure for all households was ₦3649.84 (food security line). The result showed that 30% of the farming households were food insecure while 70% were food secured. This implied that 70% of the respondents had per capita monthly food expenditure equal to or above the two-third of the mean per capita food expenditure of the entire population while 30% had per capita monthly expenditure below the two-third of the mean per capita food expenditure of the entire population. This studies agreed with Olaolu *et al*. (2013) and Oyebanjo *et al.* (2013) that majority of the farming households are food secured. The mean food security index for the participants of Fadama III was 1.83 while that of non-participants was 1.76. This implied that participants of Fadama III were more food secured.

Furthermore, the incidence of food insecurity among participants of Fadama III project was 0.28 while the non-participants was 0.32. This implied that 28% of the participants of Fadama III had per capita food expenditure below the food security line compared to 32% of the non-participants. This result suggested that participants of Fadama III project were more food secured compared to non-participants. This corroborated Olaolu *et al.* (2013) who found out that beneficiaries of Fadama III project were less poor after the project. The food insecurity gap of the participants of Fadama III project was 0.09 while it was 0.11 for the non-participants. This implied that the total mean expenditure needed to bring the food insecure participants

of Fadama III project at least at the food security line was 9% compared to food insecure non-participants which was 11%. This results suggested that participants of Fadama III were closer to the food security line than non-participants. This study corroborated Olaolu *et al.* (2013). The severity of food insecurity among Fadama III project participants was 0.04 while it was 0.06 for non-participants. This implied that there was about 4% relative food deficiency among the participants of Fadama III project compared to 6% among the non-participants. This result suggested that participants of Fadama III had low food deficiency compared to non-participants.

TABLE 3: HOUSEHOLD FOOD SECURITY STATUS

Food security status	Participants			Non-participants		
Mean food security index	1.83			1.76		
Food insecurity indices	**Incidence**	**Gap**	**Severity**	**Incidence**	**Gap**	**Severity**
Estimates	0.28	0.09	0.04	0.32	0.11	0.06
Standard Error	0.05	0.02	0.01	0.05	0.02	0.02
Percentage %	28	9	4	32	11	6

Source: field survey, 2018; Food security line = ₦3649.84

Result of the effect of participation in Fadama III project on food security status and the severity of food security

Food security status

To determine the effect of participation in Fadama III project on food security status, the double hurdle model was employed.

The first stage used the probit model to determine the effect of participation on food security status of the farming households in the study area. The result of the probit model is given in the Table 4 below.

Results revealed that age of household head, membership of other association and extension visit were statistically non-significant factors influencing food security status. Although age had a positive coefficient but not statistically significant. This implies that age, membership of other association and extension visit did not influence the food security status of the farming households in the study area.

Furthermore, years of farming, non-farm income, participation and household size were statistically significant at 1% and 10% respectively.

Farming experience had a positive coefficient and statistically significant at 10% level of significance. This implied that, with an increase in farming experience, the probability of the household to be food secure increased in the study area. This was in line with Oyebanjo *et al.* (2015) that food security is assured with increase in farming experience.

The coefficient of non-farm income was positive and statistically significant at 1% level of significance which implies that non-farm income had an influence on the food security status of the farmers in the study

area. As the non-farm income of the farmers' increased, the probability of being food secure increased. The result suggested that households which engaged in non-farm activities are endowed with additional income and more likely to be food secure. This finding supported the study conducted by Mitiku and Legesse (2014) that in a situation of crop failure and inadequate sales of livestock and livestock product, income earned from off/non-farm activities are an important means of acquiring food.

The coefficient of participation was positive and statistically significant at 10% level of significance. This implied that as farmers participated more in Fadama III, the probability of being food secure increased. This is so because Fadama III project ensures access to productive resources to boost food security (Osondu *et al.,* 2014).

Household size had a negative coefficient and statistically significant at 1% level of significance. From *a priori*, it is expected that household size will negatively influence food security status. This implies that as the household size increased, the probability of being food secure decreased in the study area. This corroborated Oyebanjo *et al.* (2015), that households with larger size will influence food security negatively.

TABLE 4: EFFECT OF PARTICIPATION IN FADAMA III ON FOOD SECURITY STATUS

Variables	Coefficients	Standard Error	Z	p>|z|
Age of household head	0.0064	0.0088	0.73	0.467
Household size	-0.1754	0.0495	-3.55	0.000***
Farming experience	0.0222	0.0126	1.77	0.076*
Membership of other association	-0.2551	0.2811	-0.91	0.364
Non-farm income	0.0685	0.4190	3.15	0.002***
Participation in Fadama III	0.4854	0.2856	1.70	0.089*
Extension visit	-0.3026	0.2658	-1.14	0.255
Constant	0.6490	0.5388	1.20	0.228
Log likelihood	-101.0742			
Number of observations	200			
LR $chi^2(7)$	42.20			
Prob > chi2	0.0000			
Pseudo R2	0.1727			

Note: ***, ** and * represents 1%, 5% and 10% level of significance respectively

Source: Field survey, 2018.

Severity of food security

The model selected was a truncated regression model because some observations were not included in the model and the dependent variable was per capita food expenditure which is a continuous variable. Per capita food expenditure measured in naira is an alternative measure of food security in a situation where household face the challenge of food accessibility.

Table 5 shows the truncated regression analysis of the severity of food security. The dependent variable was per capita food expenditure and was truncated at a lower

limit of 3649.84 (food security line) and modelled against factors expected to influence the severity of food security. The number of observations included in the model was 140. Results showed that the log likelihood of the fitted model was –1282.89. Wald chi-square statistics was 32.37 and the Pro > Chi^2 was 0.0000 which shows that the parameters are jointly significant at 1%.

The coefficient of age was positive and statistically significant at 5%. This implied that for a unit increase in age, holding other variables constant, the severity of food security increased by a factor of 141.59. This finding supported Oyebanjo *et al.* (2015) that household food security is guaranteed with increase in age.

The coefficient of household size was negative and statistically significant at 1%. This indicated that for a unit increase in household size, the severity of food security decreased by a factor of 2605.3, holding other variables constant. This is possible, because as household size gets larger, the amount spent on food on individual decreases. With larger household size, more mouths will be available to feed. This study corroborated Oyebanjo *et al.* (2015).

The coefficient of farming experience was positive and statistically significant at 1%. This implied that for a unit increase in the number of years spent on farm, holding other variables constant, the severity of food security increased by a factor of 231.75. Most experienced farmers know the cropping practices to employ for optimum yield to ensure household food security. This translates to the fact that limited farming experience may result into low food production and income, hence food security problem. This study supported Oluyole *et al.* (2009) and Oyebanjo *et al.* (2015) that an experienced farmer is likely to have higher productivity and hence able to provide more food for his household members.

The coefficient of participation in Fadama III was positive and statistically significant at 5%. This indicated that for a unit increase in participation in Fadama III, other variables held constant, the severity of food security increased by a factor of 0.037. This means that as a result of participating in Fadama III, the income generated will be used to improve food security. This finding corroborated Ike (2012) who found out that the income level of beneficiaries of Fadama III user groups increased as a result of participation.

The coefficient of access to credit was positive and statistically significant at 1% level of significance. This implied that for a unit increase in credit, other variables being constant, the severity of food security increased by a factor of 6744.8. This results indicated that households with access to credit facilities would be economically empowered to divert incomes to farming activities and access food in adequate quantity and quality (Mitiku and Legese, 2014).

TABLE 5: TRUNCATED REGRESSION ANALYSIS OF EFFECT OF PARTICIPATION IN FADAMA III ON THE SEVERITY OF FOOD SECURITY

Variables	Coefficients	Standard Error	Z	P>|z|
Age of household head	141.5923	68.56937	2.06	0.039**
Household size	-2605.262	530.0119	-4.92	0.000***
Farming experience	231.7535	88.20051	2.63	0.009 ***
Membership of other association	257.2434	2206.451	0.12	0.907
Participation	0.03700	0.0001528	2.16	0.090**
Extension visit	-1382.112	1879.631	-0.74	0.462
Credit	6744.83	2139.817	3.15	0.002***
Constant	6043.82	4185.609	1.44	0.149
/sigma	5101.646	659.169	7.74	0.000
Limit: lower	3649.84			
Upper	+inf			
Log likelihood	-1282.8881			
Number of obs	140			
Wald chi2(7)	32.37			
Prob > chi2	0.0000			

Note: ***, ** and * represents 1%, 5% and 10% level of significance respectively

Source: Field survey, 2018.

CONCLUSION

The food security index showed that the mean food security index of the participants of Fadama III project was 1.83 while for non-participants was 1.76. The incidence of food security among the participants of Fadama III was 0.28, and 0.32 among the non-participants. The food insecurity gap among the participants was 0.09, and 0.11 among non-participants. The severity of food insecurity was 0.04 among participants, and 0.06 among non-participants.

The probit model of the double hurdle model showed that the coefficient of years of farming was positive and statistically significant at 10% level of significance. The coefficient of household size was negative and statistically significant at 1% level of significance. The coefficient of non-farm income was positive and statistically significant at 1% level of significance. The coefficient of participation was positive and statistically significant at 10% level of significance.

The truncated regression model of the double hurdle model showed the coefficient of age was positive and statistically significant at 5% level of significance. A unit increase in age, holding other variables constant, the severity of food security increased by a factor of 141.59. The coefficient of household size was negative and statistically significant at 1%. A unit increase in household size, the severity of food security decreased by a factor of 2605.3, holding other variables constant. The coefficient of farming experience was positive and statistically significant at 1%. A unit increase in the number of years spent on farm, holding other variables constant, the severity of food security increased by a factor of 231.75. The coefficient of participation was positive and

statistically significant at 10%. This indicates that a unit increase in participation in Fadama III, other variables held constant, the severity of food security increased by a factor of 0.037. The coefficient of access to credit was positive and statistically significant at 1% level of significance. A unit increase in credit, other variables being constant, the severity of food security increased by a factor of 6744.8. In conclusion, participation in Fadama III project has a positive and significant influence on food security. Therefore, farmers should be encouraged to participate more in the project in order to improve the level of food security in Nigeria.

REFERENCES

Adepoju, A. O. and Adejare, K. A. (2013). Food insecurity status of rural households during the post-planting season in Nigeria. *Journal of Agriculture and Sustainability*, *4*(1), 16-35.

Arayesh, B. (2011). Identifying the Factors Affecting the Participation of Agricultural Cooperatives' Members. *American Journal of Agricultural and Biological Sciences 6*(4), 560-566.

Babatunde, R. O., Omotosho, O. A. and Sholotan, O. S. (2007). Factors Influencing Food Security Status of Rural Farming Households in North Central Nigeria. *Journal of Agriculture. 2*(3), 351–357.

Bamire, A. S. (2010). Effects of tenure and land use factors on food security among rural households in the dry Savannas of Nigeria." *African Journal of food, Agriculture, Nutrition and Development. 10*(1), 1982-2000.

Benue State Agricultural and Rural Development Authority (BNARDA) (2005). *Implementation Completion Report on National Special Programme for Food Security (NSPFS)*, Benue State, Nigeria. pp 1-23.

Cragg, J. G. (1971). Some statistical models for limited dependent variables with application to the demand for durable goods. *Econometrica: Journal of the Econometric Society*, 829-844.

Danjuma, I. A., Oruonye, E. D., and Ahmed, Y. M. (2016). The Socio-Economic Impact of Fadama III Project in Taraba State: A Case Study of Jalingo Local Government Area. *International Journal of Environmental & Agriculture Research (IJOEAR)*, *2*(2), 35-41.

Daudu, S. (2009). Problems and prospect of folk media usage for agricultural extension service delivery in Benue State, Nigeria. Journal of Human Ecology, 25(1), 19-24.

Etwire, P. M., Dogbe, W., Wiredu, A. N, Martey, E., Etwire, E., Owusu R. K. and Wahaga, E. (2013). Factors Influencing Farmer's Participation in Agricultural Projects: The case of the Agricultural Value Chain Mentorship Project in the Northern Region of Ghana. *Journal of Economics and Sustainable Development*, *4*(10), 36-43.

Food and Agricultural Organization (FAO), International Fund for Agricultural Development (IFAD), and World Food Programme (WFP), (2014). *The state of food insecurity in the world 2014. Strengthening the enabling environment for food security and nutrition*. pp 1-8.

Food and Agriculture Organization of the United Nations, FAO, (2011). The State of Food Insecurity in The World. Rome, Food and Agriculture Organization of the United Nations, http://www.fao.org/elearning/Course/FC/en/pdf/trainerresources/learnernotes0411.pdf accessed on 18/09/2017

Gregory, P., Ingram, J. S. I. and Brklacich, M. (2005). Climate Change and Food Security. *Philosophical Transactions of the Royal Society B-Biological Sciences,* 360(1463), 2139- 2148.

Ike, P. C. (2012). An Analysis of the Impact of Fadama III Project on Poverty Alleviation in Delta State, Nigeria. *Asian Journal of Agricultural Sciences,* 4(2), 158-164.

Imoh, A. N., Isaac, K. J. and Nwanchukwu, E. O. (2009). Comparative analysis of poverty status of community participation in rural development projects of Akwa-Ibom State, Nigeria. *New York Science,* 2, 68-75.

Innih, C. D. and Dimelu, M. U. (2013). Participation and Attitude of Beneficiaries to the Third National Fadama Development Project in Kogi State, Nigeria. *Journal of Agricultural Extension,* 17(2), 1119 – 944.

Jabo, M. S. M., Ismail, M. M., Abdullah, A. M. and 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.

Jrad, S., Nahas, B., & Baghasa, H. (2010). Food security models. *Ministry of Agriculture and Agrarian Reform, National Agricultural Policy Center. Policy Brief*, 33, 32.

Kuwornu, J. K. M., Mensah-Bonsu, A. and Ibrahim, H. (2011). Analysis of Foodstuff Price Volatility in Ghana: Implications for Food Security. *European Journal of Business and Management,* 3(4), 100-118.

Kuwornu, J. K. M., Demi, S. and Amegashie, P. D. K. (2013). Analysis of food security status of farming households in the forest belt of the Central Region of Ghana. *Russian Journal of Agricultural and Socio-Economic Sciences*, 13(1), 26-42

Metu, A. G., Kenechukwu, O. O. and Olisa, D. M. (2016). *Achieving sustainable food security in Nigeria: challenges and way forward*. 3rd International Conference on African Development Issues (CU-ICADI 2016. pp 182-187.

Mitiku, A. and Legesse, W. (2014). The determinants of rural households' vulnerability to food insecurity in Jimma Zone, South Western Ethiopia. *Journal of Biological and Chemical Research*, *31*(1), 62-72.

Muhammad, H. U., Umar, B. F., Abubakar, B. Z. and Abdullahi, A. S (2011). Assessment of Factors Influencing Beneficiary Participation in Fadama II Project in Niger State. *Nigeria Journal of Basic and Applied Science,* 19(2), 248-252.

National Bureau of Statistics, (2012). Nigeria Poverty Assessment report. National Bureau of Statistics. Abuja, pp 18 – 20.

National Bureau of Statistics, (2016). Nigeria Poverty Assessment report. National Bureau of Statistics.

https://www.bbc.com/news/world-africa-17015873. Accessed 18/08/2018.

National Population Commission, (2006). Estimated Population Figures. National Population Commission of Nigeria, Abuja, https://www.jstor.org/stable/25434601 accessed 27/11/2017

Obisesan, A. A., Amos, T. T., & Akinlade, R. J. (2016). *Causal effect of credit and technology adoption on farm output and income: The case of cassava farmers in Southwest Nigeria, 310-2016-5370.*

Olaolu, M. O., Akinnagbe, O. M. and Agber, T. (2013). The Impact of National Fadama Development Project Phase II on poverty and food security among rice farming beneficiaries in Kogi State, Nigeria. *American Journal of Research Communication*, 1, 280 – 295.

Oluyole, K. A., Oni, O. A., Omonona, B. T. and Adenegan, K. O. (2009). Food Security among Cocoa Farming Households of Ondo State, Nigeria. *ARPN Journal of Agriculture and Biological Sciences*, 4, 7-13.

Omoregbee, E. F. and Ighoro, A. (2012). Effect of Agricultural Cooperative Membership on Farmers' Income and Poverty in Delta State, Nigeria. Open Science Repository Agriculture, online (open access), e70081911 accessed on 21/05/2018.

Omotesho, K. F., Ogunlade, I., Lawal, M. A. and Kehinde, F. B. (2016). Determinants of level of participation of farmers in group activities in Kwara State, Nigeria. *Gaziosmanpaşa Üniversitesi Ziraat Fakültesi Dergisi*, 33(3), 21-27.

Oriola, E. O. (2009). A Framework for Food Security and Poverty Reduction in Nigeria. *European Journal of Social Sciences*, 8(1), 132.

Osondu, C. K., Ezeh, C. I., Emerole, C. O. and Anyiro, C. O. (2014). Comparative analysis of technical efficiency of smallholder Fadama II and Fadama III cassava farmers in Imo State. *The Nigeria Journal of Rural Extension and Development*. University of Ibadan, Nigeria. 8(1), 267.

Oyebanjo, O., Ambali, O. I. and Akerele, E. O. (2013). Determinants of food security status and incidence of food insecurity among rural farming households in Ijebu Division of Ogun State, Nigeria. *Journal of Agricultural Science and Environment*, 13, 92-103.

Sanusi, R. A., Badejo, C. A., and Yusuf, B. O. (2006). Measuring Household Food Insecurity in Selected Local Government Areas of Lagos and Ibadan, Nigeria. *Pakistan Journal of Nutrition*, 5, 62-67.

Tiri, G. D., Ojoko, E. A., and Aruwayo, A. (2014). Growth enhancement support scheme (GESS) and the challenges of food security in Nigeria: A review. *ARPN Journal of Agricultural and Biological Science*, 9(7), 226-32.