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Impact Assessment of Fadama III Group Participation on Food Security Status of Rural Households in South West, Nigeria

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Abstract

One of the major challenges facing Nigeria is food insecurity which has deprived her citizens of meeting up their daily dietary energy supplies in the time past. Fadama III program was set up and implemented to curb these challenges. However, this study empirically examined the impact of the Fadama III group participation program on food security status of the rural households in South West, Nigeria. A total of 600 respondents were sampled. Primary data were used for the study which was collected through a well-structured and pretested questionnaire. The data collected were analyzed using descriptive statistics, Probit regression, Food security index and double-hurdle model. The result of the descriptive statistics showed that the mean age of the participant and

non-participant was 46±16.25 and 46±16.17 respectively. About 46.1% and 23.6% of the participants of Fadama III program in South West Nigeria were involved in crop production and livestock production respectively. The decision to participate in Fadama III program in South West Nigeria was significantly influenced by gender ($p<0.10$), occupation ($p<0.01$), extension contacts ($p<0.01$) and awareness ($p<0.05$). Based on the food security line created, majority (84.3%) of the participants of Fadama III program were food secure as against 42% of the non-participants that were food secure. The result of the probit regression (first hurdle) showed that gender, farm size, non-farm income, membership in association and income from Fadama III program were significant positive determinants of food security status of participants of Fadama III program while gender and non-farm income were significant positive determinants of food security status of non-participants in South West, Nigeria where household size was a negative significant determinant. The result of truncated regression(second hurdle)also showed that the estimated coefficient of correlation between the selection equation (determinant function) and the outcome equation (per capital expenditure function) of 0.129 for participants of Fadama III program is positive and significant at 1% which implies that participants in Fadama III program have higher capital consumption expenditure than random household sample. Since participation in Fadama III program leads to increased food security status, such community developmental program should be designed in the future in such a way that it will accommodate a large number of potential farmers so as to improve their wellbeing and food security.

Keywords- Food security, Fadama III program, Probit regression, Rural households and South West, Nigeria.

INTRODUCTION

The international community has long been concerned about eradication of hunger and undernourishment especially of vulnerable groups. One of the major challenges facing

developing countries around the world is food insecurity (FAO, IFAD and WFP, 2014). It was reported that, about 805 million (11.3%) global populations were unable to meet their dietary energy supplies from 2012 to 2014 while 791 million people still live in hunger, which means 13.5% of the global population remain underfed (FAO, 2014). According to Food and Agricultural Organization (2011), food security is a situation of physical, social, and economic accessibility of all people at all times to sufficient, safe, and nutritious food that meet their dietary needs and food preference for an active and healthy living.

In sub-Sahara African, countries like Nigeria, meeting the food needs of the ever-increasing population could be a critical challenge (Mundi index, 2012). Therefore, focusing on improving the food production through sustainable agriculture and rural development could be a means of reducing food insecurity (Obisesan *et al*., 2012). In order to achieve sustainable food production, the federal government of Nigeria has implemented various agricultural programs over the years (Metu *et al*., 2016). These programs were designed to transform the agricultural sector which was derailing from its normal contribution to the economy (Oriola, 2009). According to Jibowo (2003), some of the agricultural programs include: National Accelerated Food Production Program (1972-1976), River Basin Development Authority (1975), Operation Feed the Nation (1976-1979), Green Revolution (1980-1984), Agricultural Development Programs (1985) and National Directorate of Employment (1986-1993). However, some of the agricultural programs with elements of participatory approach include the National Special Program for Food Security (2003-date) and the three phases of the National Fadama Development Project, NFDP Phase I (1993-1999), NFDP Phase II (2000-2007), NFDP Phase III (2009-2013).

The National Fadama Development Project (NFDP) was designed to support simple and low cost improved irrigation under the World Bank funding (World Bank, 2001). In order to combat the challenge of food insecurity, the Federal government of Nigeria through the assistance of the World Bank counter-part funding extended the program to Fadama

III (a follow up of Fadama I and II). Hence, Fadama III is targeted towards increasing the food security of the country through raising the income of participating groups known as Fadama Users Groups (FUGs) through Fadama Community Associations (FCAs). This is achieved by directly delivering resources to various interest groups, empowering them through skills and capacity building in order to take collective decision on how to allocate and manage resources effectively for their livelihood activities (Osondu *et al*., 2014).

According to Idrisa *et al*. (2008), food insecurity is a serious challenge among rural households in Nigeria with notable incidence of food insecurity (48.3%) as compared to 26.7% in the urban areas (NBS, 2012). This could be ascribed to the fact that majority are poor and unable to afford safe and nutritious food three times a day due to lack of physical and financial resources (Kuwornu *et al*., 2011). Similarly, it has been reported that food insecurity is on the increase in rural areas of Benue State such that 63.33% are food insecure (Ahungwa *et al*., 2013)

To reverse the food insecurity status of rural farming households in Nigeria, Fadama III program was introduced by the Federal government of Nigeria in 2008. Fadama III provides a platform where farmers can have access to subsidized productive resources in order to ensure food security among rural households. However, to benefit from the program, participation of farmers in various available Fadama III enterprise groups is necessary to ensure their food security (Nwaobiala, 2013). Since farmer's participation at all stages of the program has been demonstrated to be pivotal to its success, it is essential to research the main factors influencing farmers' participation in the program (Aref, 2011).

Although studies (Nwaobiala, 2013; Aref, 2011; Innih and Dimelu, 2013; Omotesho *et al*., 2016) had been conducted on the impact of Fadama programs on rural households in Nigeria. Majority of these studies were mainly on the impact of the program on poverty alleviation in rural Nigeria. None of these studies have examined the impact of Fadama III program on food security status of rural households in South Western, Nigeria which

is one of the core objectives of the program, thus, this created a dearth in knowledge and hence the need to determine the program's impact on food security in South Western, Nigeria. To this effect, this study 1) examined the socio-economic characteristics of the participant and non-participants of Fadama III program; 2) profiled the various enterprises in Fadama III program; 3) identify the factors influencing participation in Fadama III program; 4) determine the food security status of farming households and, 5) analyze the influence of Fadama III on food security of the farming households in the study area.

This study was carried out to provide empirical information on the impact of participation in Fadama III on food security and this will not only help to address the problems of food security but will also serve as a pillar on which other agricultural development programs relevant to food security can be built on.

Methodology

Area of Study

The study was carried out in South-Western region of Nigeria. The South-West region of Nigeria represents a geographical area covering latitude 6^0 North and 4^0 South. The South-Western region of Nigeria comprises of six states including Osun, Ekiti, Oyo, Ondo, Lagos and Ogun State. The region is bounded in the north by Kogi and Kwara States, in the South by Atlantic Ocean, in the west by Republic of Benin and in the East by Edo and Delta State. The South western region of Nigeria can boost of different varieties of arable food crops since the climatic conditions support the production of various food crops including cassava, maize, groundnut etc. A considerable proportion of the beneficiaries of the Fadama III program were available in South Western region of Nigeria, since the region was one of the major targets for the introduction of the program in Nigeria.

Sampling procedures and sample size

The target population were Fadama III beneficiaries and non-beneficiaries. A multistage sampling procedure were employed for the study. The first stage involved the random selection of two States in South West including Ogun and Oyo States. The second stage involved the purposive selection of two (2) agro-ecological zones from each States based on a significant number of rural communities engaged in Fadama program. The third stage involved a random selection of two (2) LGAs each from the agro-ecological zones viz-a viz each States. In the fourth stage, five (5) communities were randomly selected. Finally, 15 farmers were randomly selected from each community. A total of 600 respondents was used for the study. Primary data were collected from both beneficiaries and non-beneficiaries of Fadama III farmers in the study area through interview method using pretested questionnaire on the socioeconomic characteristics such as age, household size, education, farming experience, farm size, extension contact, access to input, membership of cooperative societies and farmer's household monthly expenditure on food.

Fig 1. Map of South West Nigeria

Analytical techniques

The data were analyzed using descriptive statistics, Probit regression, Food security index, Cragg's (double-hurdle) model.

Descriptive statistic

This comprised of mean, frequency distribution and percentages which were used to described the socioeconomic characteristics of the farmers and to determine the food security status of participants and non-participants. T-test was also used to determine the level of significance of the socioeconomic characteristics of both participants and non-participants. It was also used to profiled the various enterprise involved in Fadama III program.

Probit regression analysis

Probit regression analysis was used to determine the factors influencing participation in Fadama III program. According to Adepoju and Adejare (2013), the probit model is used for discrete choice variables in statistical analysis. It is used when the dependent variables are not continuous, but rather dichotomous. In this study, the dependent variable is dichotomous, 1= participant and 0= non-participant households and thus, a binary probit model is explicitly specified as follows:

$$Y= \beta_o+ \beta_1 GEN + \beta_2 AGE + \beta_3 MARSTA + \beta_4 HHSIZ + \beta_5 OCCUP + \beta_6 YREDUCT + \beta_7 MEMASS + \beta_8 FARSZ + \beta_9 FAREXPER + \beta_{10} EXTCONT + \beta_{11} ACCREDT + \beta_{12} AWERNES + \varepsilon_i \ldots\ldots(1)$$

Where,

Y is a binary variable ranging between 0 and 1(0= non-participant and 1=participant)

Xi's are the independent variables

ε_i is the vector of error terms.

β_o = Constant

β_1 -β_{12} = Vector of the explanatory variables

The independent variables are the socioeconomic characteristics of the respondents and are specified as follows:

GEN = Gender of respondent (1=male, 0=otherwise); *AGE*= Age of respondent (years); *MARSTA* = Marital status (1= married, 0= otherwise); *HHSIZ* = Household size (number of persons); *OCCUP* = Occupation (1= farming, 0= otherwise); *YREDUCT* = Years of formal education (years); *MEMASS* = Membership of other association (1=yes, 0=otherwise); *FARSZ* = Farm size (ha); *FAREXPER* = Farming experience (number of years spent in farming); *EXTCONT* = Extension contact (1=yes, 0=otherwise); *ACCREDT* = Access to credit (1=yes, 0= otherwise); *AWERNES* = Awareness of Fadama III program (1=aware, 0=otherwise)

Food security index (household food expenditure approach)

The food security status of the Fadama III participants and non-participants was achieved by determining their households' expenditure on food, from which the per-capita household expenditure was estimated. The food security index was determined by dividing the per-capita food expenditure of the ith household by the two-third mean per capita food expenditure of all households. Estimate from the food security index was used to classify households as food secure or food insecure based on the position they fall. This is expressed as;

$$Zi= \frac{Per\ capita\ food\ expenditure\ of\ the\ ith\ household}{\frac{2}{3} mean\ per\ capita\ food\ expenditure\ of\ all\ households} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

where Zi represents Food Security Index of ith household.

When Zi ≥ 1 (greater than or equal to), ith household is food secure.

When Zi ≤ 1 (less than or equal to), ith household is food insecure.

A household is regarded as food secure when its per-capita monthly food expenditure is above or equal to the two-third mean per capital monthly food expenditure. Conversely, when the per-capita food expenditure of a household falls below the two-third mean per capital monthly food expenditure of all the households sampled, the household is said to be food insecure. However, the amount of expenditure required by different households based on household composition with respect to age and sex was calculated. This was

achieved by dividing the household expenditure by the household size to get the per-capita expenditure.

Following Adepoju and Adejare (2013), using the Foster, Greer and Thorbecke index to measure food security, the study further estimated other indices such as food insecurity gap (FIG), headcount ratio (HCR) and severity of food insecurity among households;

$F\alpha = \frac{1}{n}\sum_{i=1}^{q}\frac{G-R}{G}$ ..... (3)

Where;

$F\alpha$ = Food security index

G= Food security line (2/3 of the mean per capita food expenditure)

R = Per-capita food expenditure in increasing order for all households (~~N~~)

q = number of households below food security line (#)

n = total number of households in the population (#)

α = the aversion parameter which takes values of 0, 1 or 2.

When α = 0, $F\alpha$ is the head count index measuring the incidence of food insecurity, which means the proportion of food insecure people from the total population.

When α = 1, F_1 is the food insecurity gap, measuring the depth of food insecurity. That is, on the average, how far the food insecure households are from the food security line

When α = 2, F_2 is the severity of insecurity among households. This means the depth of food insecurity and inequality among the poor.

Double hurdle model

The double-hurdle model was used to analyzed the food security status and the severity of food security.

First hurdle: Probit Model

The probit model was used to determine the factors influencing food security status of the participants and non-participants of Fadama III program. The dependent variable is the probability of whether a household is food secure or not and the explanatory variables

included socioeconomic, demographic, institutional and participatory variables assumed to influence the food security status. The estimated model is specified explicitly as follows:

$Y_1=\beta_0+\beta_1 AGEHD+\beta_2 GENH+\beta_3 EDUHH+\beta_4 HHSIZ+\beta_5 FARMSIZ+\beta_6 NONFARMINC+\beta_7 FARMINC+\beta_8 FARMEXP+\beta_9 MEMOASS+\beta_{10} ACCREDIT+\beta_{11} ACCEXT+\beta_{12} PARTFADAMA+\beta_{13} INCOMFADAMA+\beta_{14} DECIMAK+\varepsilon_1$ …… (4)

Where;

Y_1= Food security status (1=food secure, 0= otherwise)

AGEH= Age of household head (years); *GENH* = Gender of household head (1=male, 0=female) EDUHH= Education of household head (years); *HHSIZ* = Household size (#); *FARMSIZ* = Farm size (hectares); *NONFARMINC* = Non-farm income (₦); *FARMINC*= Farm income (₦) *FARMEXP* = Farming experience (years); *MEMOASS*= Membership of other association (1= yes, 0= otherwise); *ACCREDT* = Access to credit (1=yes, 0= no); *ACCEXT* = Access to extension services (1=yes, 0= otherwise); *PARTFADAMA* = Participation in Fadama III (1=yes, 0= otherwise); *INCOMFADAMA*= Income from Fadama III (₦); *DECIMAK* = Group decision making (1= yes, 0= no); ε_i = error term.

Second hurdle: Truncated Regression model

The second hurdle was used to determine the impact of Fadama III program on food security (per capita food expenditure) of participants and non-participants of Fadama III program. The dependent variable in this case is a continuous variable which is given by;

$Y_1=\beta_0+\beta_1 AGEHD+\beta_2 GENH+\beta_3 EDUHH+\beta_4 HHSIZ+\beta_5 FARMSIZ+\beta_6 NONFARMINC+\beta_7 FARMINC+\beta_8 FARMEXP+\beta_9 MEMOASS+\beta_{10} ACCREDIT+\beta_{11} ACCEXT+\beta_{12} PARTFADAMA+\beta_{13} INCOMFADAMA+\beta_{14} DECIMAK+\varepsilon_1$……. (5)

Where;

Y_1= Per capita food expenditure (₦)

AGEH= Age of household head (years); *GENH* = Gender of household head (1=male, 0=female) EDUHH= Education of household head (years); *HHSIZ* = Household size (#);

FARMSIZ = Farm size (hectares); *NONFARMINC* = Non-farm income (₦); *FARMINC*= Farm income (₦); *FARMEXP* = Farming experience (years); *MEMOASS*= Membership of other association (1= yes, 0= otherwise); *ACCREDT* = Access to credit (1=yes, 0= no); *ACCEXT* = Access to extension services (1=yes, 0= otherwise); *PARTFADAMA* = Participation in Fadama III (1=yes, 0= otherwise); I*NCOMFADAMA*= Income from Fadama III (₦); *DECIMAK* = Group decision making (1= yes, 0= no); ε_i = error term.

RESULTS AND DISCUSSION

Socio-economic characteristics of the participants and non-participants of Fadama III program in South West Nigeria.

The socioeconomic characteristics of the participants of Fadama III program and non-participants of the program were presented in Table 1. The gender of the participants shows that majority (64.5%) of the participants were male while about 35.5% were female. This shows that men participated more in the Fadama III program than women in South West Nigeria. This might be due to the fact that men generally show more interest in activities that entails community involvement and developmental program than women. This agrees with Moses (2017) on his work on poverty status of Fadama III program participants who established that men were more involved in Fadam III program in Yobe State, Nigeria. Regarding the gender of the non-participants, about 53.4% of the non-participants were male while 46.6% of the non-participants were female which also shows that men were more involved in agricultural activities than women. This might be attributed to the fact than men had more access to agricultural production resources such as land and farm inputs than women in Nigeria. This is also corroborated by Moses (2017). From Table 1, Majority (72.4% and 73%) of the participants and non-participants were in the age range of between 31-50 years. This shows that farmers in South West Nigeria were still young and active and are thus expected to possessed the energy needed to carry out farming activities that will increase their production in the region. The mean age of the participants and non-participants were 46±16.25 and 46±16.17 respectively with

the t-test value (0.098(1.51) indicating that there was no significant difference in the ages of the participants and non-participants of Fadama III program in the region. This result agrees with Iwala (2014) that farmers who participated and those that did not participated but benefited from the infrastructure constructed during the program's implementation were young and agile farmers in Ondo State, Nigeria. The result of the study revealed that majority (86.7% and 87.3%) of the participants and non-participants were married. This might be due to the fact that marriage is a cherish institution in South West Nigeria. This result implies that the use of family labor for farming activities might be possible. This agrees with Folorunsho (2015) who ascertained that majority of the participants and non-participants of Fadama III program in North central Nigeria were married. From Table 1, majority (59%) of the participants had up to secondary education while about 47.6% of the non-participants had up to secondary education in the study area. This shows that the respondents in the region were literate. This might be attributed to the fact that the South Western Nigeria were regarded as the most educated region in Nigeria, hence the implication for the result obtained. This implies that participating in community driven developmental program might not posed a challenge to them due to their level of education they attained. This agrees with Adereti and Fadare (2017) on their work on the role of Fadama III program on improving the socioeconomic status of rural dwellers in Osun state Nigeria that farmers in this region were literate as they can read and write. Majority (73.3% and 81.5%) of the participants and non-participants respectively had been into farming for between 7-18 years. This shows that respondents in the study area had enough experience in farming that can help them participate in the Fadama III program successfully. This agrees with Moses (2017). The mean years of experience in farming for the participants and non-participants were 9.3±6.64 and 9.7±6.91 respectively with the t-value (2.616(0.88)) which indicated that there was no significant difference in the years of farming experience of the participants and non-participants in South West Nigeria. This result contradicts the result of Moses (2017) who

established that non-participants of Fadama III program in Yobe State Nigeria had more years of experience than the participants of the program. The result obtained however agrees with Iwala (2014) and Folorunsho (2015). All (100%) of the participants of the fadama III program were members in one association or the other while 78.5% of the non-participants where members in association. This implies that participants of the program might have had the opportunity to participate in the program due to their involvement in society association. Thus, they might have been aware of the introduction of the program in their communities through the association they belonged. This also implies that they might experience group dynamism and also source for farm inputs through their association. From Table 1, the farm size of the respondents shows that majority (84.7%) of the participants of the fadama III program had a farm size of between 1.1-3.0 ha while majority of the non-participants had a farm size of between 0.1-2.0 ha. The mean farm size of the participants and non-participants were 1.7± 1.1 and 1.3±0.6 with the t-value (0.372**(2.32) which implies that there was a significant difference in the farm size of the participants and non-participants of the Fadama III program. This implies that the participants had more farm sizes than the non-participants of the program in the region although the two categories of respondents were smallholder farmers. These differences observed in farm size might have been impacted by the program as one of the objectives of the program was to increase the yields of the participants through increased farm sizes and introduction of improved technology to the participants of the program in Nigeria. This result is in agreement with Kainga (2013) that farmers in Nigeria are mostly smallholders with average farm size of between 1-2 ha of farm land.

Table 1: Socio- Economic Characteristics of the Respondents

Variables	Participants (n = 293)		Non-participants (n = 307)	
	Frequency	Percentage	Frequency	Percentage
Gender				
Male	189	64.5	164	53.4
Female	104	35.5	143	46.6
Age				
≤ 30	3	1.0	7	2.3
31-40	129	44.0	138	45.0
41-50	83	28.4	86	28.0
51-60	66	22.5	68	22.1
> 60	12	4.1	8	2.6
Mean	46		46	
Std. Dev	16.25		16.17	
t-value	0.098(1.51)			
Marital Status				
Single	12	4.1	16	5.2
Married	254	86.7	268	87.3
Widowed	19	6.5	23	7.5
Divorced	8	2.7	--	--
Education Level				
None	7	2.4	28	9.1
Primary	86	29.4	126	41.0
Secondary	173	59.0	146	47.6
Tertiary	27	9.2	7	2.3
Years of experience in farming				
1-6	12	4.1	33	10.7
7-12	81	27.7	96	31.3
13-18	163	55.6	154	50.2
≥ 19	37	12.6	24	7.8
Mean	9.3		9.7	
Std. Dev.	6.64		6.91	
t-value	2.616(0.88)			
Membership of Association				
Belong	293	100.0	241	78.5
Do not belong	--	--	66	21.5
Farm size (ha)				
0.1-1.0	31	10.6	106	34.5
1.1-2.0	128	43.7	169	55.0
2.1-3.0	120	41.0	29	9.5
≥3.1	14	4.7	3	1.0
Mean	1.7		1.3	
Std. Dev	1.1		0.6	
t-value	0.372**(2.32)			

Profiled of the various enterprises involved by the participants of the Fadama III program in South West, Nigeria

The various enterprises that the participants of the Fadama III program in South West Nigeria were involved in were presented in Table 2. About 46.1% and 23.6% of the participants of Fadama III program in the region were involved in crop production and livestock production respectively. This justified the perception that majority of the farmers in Nigeria were into food crops production. The various crops they cultivated include arable crops such as maize, cassava, groundnut, yam, cocoyam, potatoes etc. The participants that were involved in livestock production reared animals such as goat, broilers, layers etc. About 14.7% of the participants of the Fadama III program were involved in aquaculture which includes the production of fish such as catfish, Tilapia etc. About 10.9% of the participants were agro-processors in the region. This shows that the Fadama III program captured the agricultural value chain in Nigeria as agro-processors were also allowed to participates in the program. This will ensure a reduced post- harvest loss in the region and might also contributed to increased income and food security in the region. Little proportion of the participants of the Fadama III program in south West Nigeria were involved in agroforestry. This might be unconnected with the fact that agroforestry does not bring immediate return to the farmers, hence reason why majority were not involved in agroforestry production in the region. This result is corroborated by Effiong and Asikong (2013) who ascertained that participants of Fadama III program in Cross River State, Nigeria were mostly arable crops and livestock farmers.

Table 2: Distribution of respondents by various enterprises in Fadama III program involved by the participants

Enterprise	Frequency	Percentage (%)
Crops	135	46.1
Aquaculture	43	14.7
Agro processing	32	10.9
Livestock	69	23.6
Agroforestry	14	4.7
Total	293	100.0

Determinants of participation in Fadama III program in South West, Nigeria

The determinants of the participation in Fadama III program were examined using Probit regression. The result of the probit model used in examining the factors that influenced the decision to participate in Fadama III program were obtained using maximum likelihood estimation technique and were presented in Table 3. The likelihood estimates of the probit regression indicated that the Chi-square statistics of 73.64683 was highly significant ($p< 0.000$) which suggested that the model has a strong explanatory power. This conform with Sanusi (2019). The decision to participate in Fadama III program was significantly influenced by factors including gender, occupation, extension contacts and awareness.

Gender was positive and significant at ($p<0.10$). This implies that gender influenced the decision to participate in a community driven program like Fadama III program. Thus, men are more likely to participate in Fadama III program than women because they are always involved in developmental project within the community. Gender will increase the chances of men participating in Fadama III program by 31.1% in South West Nigeria. This agree with Cornelius *et al*. (2015). Occupation was positive and significant at 1% level of probability. This indicates that people who were farmers in the community before the introduction and implementation of Fadama III program had higher chances to participate in the program than those that just want to start farming activities due to the

program's implementation. This might be unconnected with the fact that the Fadama III program was targeted towards existing farmers and not new entrant farmers. Thus, occupation will increase the participation of farmers in Fadam III program by 87.9% in the region. Extension contacts was positive and significant at 1%. This shows that farmers who had contacts with extension agents in the time past has the likelihood of participating in Fadama III program in the region. This might be due to the fact that they had first-hand information about the introduction of the program even before the program starts. They might have prepared well and immediately keyed into the program during the program's implementation in their communities. Thus, extension contact will increase the likelihood of participating in Fadama III program by 93.1% in the region. This agrees with Cornelius *et al*. (2015). Awareness was positive and significant at 5% probability level. This implies that farmers that were aware of the introduction of the Fadama III program before it starts had the likelihood of participating in the program. Thus, awareness increases the likelihood of participating in Fadam III program in South West Nigeria by 122%. This might due to the fact that majority of the participants were membership in association, thus, they have access to quality information through their association. This information might have help them in participating in Fadama III program.

Table 3: Factors influencing participation in Fadama III programme

Variables	Coefficient	Std. Error	T-value
Constant	-111.880	74.242	-1.51
Gender	0.311*	0 .166	1.87
Age	0.044	0.054	0.82
Marital Status	-9.385	6.296	-1.49
Household size	0.872	1.480	0.59
Occupation	0.879***	0.138	6.37
Years of Education	-2.126	5.853	-0.36
Membership in association	0.425	0.190	2.23
Farm Size	4.286	4.281	1.11
Farm Experience	1.220	1.566	0.16
Extension contacts	0.931***	0.322	2.89
Access to credit	0.197	0.139	1.4
Awareness	1.220**	0.566	2.16
LR $chi^2(14)$	47.853		
Prob > chi^2	0.000		
loglikelihood	-73.64683		

*****, **, * significant at 1%, 5% and 10% respectively**

Food Security Status of the participants and non-participants of Fadama III program

The food security status of the participants and non-participants of Fadama III program in South West Nigeria was presented in Table 4. The food security line defined as two thirds of mean per capital food expenditure of the participants and non-participants of Fadama III program stood at ₦12,912.36 and ₦11,362.18 respectively. Any household's per capita expenditure below the amount in the food security line was described as being food insecure, while those households who's per capital expenditure above or equaled amount in the food security line is described as food secure. Therefore, with the food security line of ₦12,912.36 and ₦11,362.18 for the participants and non-participants respectively, majority (84.3%) of the participants of Fadama III program were food secure as against 42% of the non-participants that were food secure. About 15.7% of the participants of the Fadama III program were food insecure while larger percentage (58%) of the non-participants were food insecure. This result implies that participants of the Fadama III program were more food secure than the non-participants in South West Nigeria. The incidence of food insecurity of the participants and non-participants of

Fadama III program were 0.157 and 0.580 respectively as presented in Table 5. The results implied that the proportion of rural households whose per capita food expenditure fell below food security line among the participants were 15.7% and it was 58% among the non-participants of the Fadama III program in South West Nigeria. The food insecurity gap index (food insecurity depth) which is the distance of the per capital food expenditure of food insecure households from food security line for the participants and non-participants of the Fadama III program were 3.2% and 8.4% respectively. This implies that the food insecure households among the participants and non-participants would need to mobilize additional 3.2% and 8.4% of their food insecurity lines to completely move out of food insecure status respectively in the region. In addition, the squared food insecurity gap index (severity) for the participants and non-participants of the Fadama III program in the region had a value of 0.014 and 0.051 respectively. This implies that the severity of food insecurity was 1.4 and 5.1 for both the participants and non-participants respectively. The results further proof the big role of Fadama III program in contributing to food insecurity reduction in South West, Nigeria. The results of analysis of food insecurity status (incidence, depth and severity) by participating status shown in Table 5 was an indication that the incidence of food insecurity, depth and severity were lower among the participants of Fadama III program than non-participants. However, this shows that the participation in Fadama III program is yet to completely lifted the participants out of food insecurity status but it had narrowed the resource gap for participants of Fadama III program. Thus, Fadama III program had the potential to gradually improve their consumption to the level required to escaped from food insecurity status among the respondents in South West, Nigeria.

Table 4: Distribution of the participants and non-participants by food security status

Categories	Food secure		Food Insecure		Total
	Frequency	Percentage	Frequency	Percentage	
Participants	247	84.3	46	15.7	293(100.0)
Non-participants	129	42.0	178	58.0	307 (100.0)

Table 5: Food Insecurity indices for the participants and non-participants

Categories	Food Insecurity Indices		
	Incidence (F_0)	Depth(F_1)	Severity (F_2)
Participants	0.157	0.032	0.014
Non-participants	0.580	0.084	0.051

Determinants of Rural Household Food Security Status of Participants and Non-participants of Fadama III Program in South West Nigeria

Table 6 presents the Probit regression results of the determinants of rural household food security status of the participants and non-participants of Fadama III program in South West, Nigeria. The Chi-square value of -62.47293 and -46.57301 for the participants and non-participants which was both significant at 1% is an indication that the model is well fitted. The result shows that gender, farm size, non-farm income, membership in association and income from Fadama III program were significant positive determinants of food security status of participants of Fadama III program while gender and non-farm income were significant positive determinants of food security status of non-participants in South West, Nigeria where Household size was a negative significant determinant.

Gender of the participants and non-participants were positive and significant at 10% and 5% respectively. This implies that households headed by males have a higher probability of being food secure by 0.072 and 0.074 for the participants and non-participants respectively. This could be attributed to the fact that male headed households usually try as much as possible to encourage themselves and other members of the households to put in extra work will might increase the household income and subsequently ensure they are food secure.

With respect to household size, the negative relationship with food security of the non-participants of Fadama III program indicates that the probability of household food security decreases with increases household size. Thus, household size decreases food security status of the non-participants by -2.705. This might be due to the fact that as household size increases in number, there will be more mouth to feed, hence lead to food insecurity within the households. This finding is in line with Adepoju and Adejare (2013). Farm size was positive and significant at 5% probability level for the participants of

Fadama III program. This implies that as farm size increases it subsequently led to the participants of the Fadama III program being food secure in South West Nigeria. This might have been impacted by the Fadama III program implementation on the participants in the region. With regards to non-farm income, the positive relationship with household food security status for both the participants and non-participants of Fadama III program indicates that the probability of household food security status increases with non-farm income. Specifically, non-farm income increased the probability of being food secure by 2.47E-06 and 3.65E-06 for the participants and non-participants of Fadama III program. This implies that having additional source of income apart from farming activities might ensure food security among the participants and non-participants of the Fadama III program in South West, Nigeria.

Membership in association of the participants of Fadama III program was positive and significant at 10% probability level. The positive relationship indicates that membership in association by the participants increases the probability of the household being food secure by 1.585. This could be attributed to the fact that farmers who were members of association had a higher tendency to obtain quality information and farm inputs which might increase their production level and subsequently led to them being food secure in the region. This is in line with Oni *et al.,* (2011) Income from Fadam III program had a positive relationship with food security status of the participants of Fadama III program in South West Nigeria. Thus, income from Fadama III program increases the probability of the household food security by 2.833. This could be attributed to the fact that participants of Fadama III program experienced an increase in income from their farming activities through an expended farm size impacted by the implementation of the program in their region. This subsequently led them to being food secured in the region. This study is in line with Moses (2017).

Table 6: Determinants of rural household food security status of participants and non-participants of Fadama III program

Variables	Participants		Non-participants	
	Coefficients	Std. Err.	Coefficients	Std Err.
Age	0.016	0.024	-0.043	0.039
	(0.66)		(-1.1)	
Gender	0.072*	0.040	0.074**	0.038
	(1.78)		(1.97)	
Years of education	0.050	0.051	0.092	0.084
	(0.98)		(1.09)	
Household size	1.177	0.762	-2.705**	1.258
	(1.54)		(-2.15)	
Farm size	2.259**	0.943	0.703	0.689
	(2.4)		(1.02)	
Non-farm income	2.47E-06*	1.40E-06	3.65E-06*	1.92E-06
	(1.77)		(1.9)	
Farm income	0.001	0.037	0.130	0.150
	(0.03)		(1.56)	
Farming Experience	0.678	0.727	-0.295	0.717
	(0.93)		(-0.41)	
Membership in Ass.	1.585*	0.918	-0.715	0.943
	(1.73)		(-0.76)	
Access to credit	0.063	0.046	0.066	0.098
	(1.37)		(0.68)	
Access to extension	1.080	0.748	1.744	1.704
	(1.44)		(1.14)	
Participation in Fadama III	0.323	0.558	-0.273	0.931
	(0.58)		(-0.29)	
Income from Fadama III	2.833***	0.945	-5.780	5.754
	(3.00)		(-1.1)	
Group decision making	0.151	0.451	-0.333	0.418
	(0.34)		(-0.8)	
Constant	-6.601***	2.456	-9.796**	4.365
	(-2.69)		(-2.24)	
	Number of observations = 293		Number of observations =307	
	Prob > chi2 = 0.0000		Prob > chi2 = 0.0001	
	Log likelihood = -62.47293		Log likelihood = -46.57301	

Figures in parentheses are t-values; ***= significant at 1%, **= significant at 5%, *= significant at 10%.

Impact of Fadama III program on per capital food expenditure (food security) in South West, Nigeria

Presented in Table 7 is the estimates of the truncated regression model which revaled the relationship between the households' socioeconomic variables, Fadama III program variables and per capital food expenditure (food security) for the participants and non-participants of fadama III program in South West Nigeria. The result shows that household size, farm size, access to credit, access to extension services and income from Fadama III program increases per capita food expenditure among participants of Fadama III program in South West Nigeria. Household size, farm size and access to credit was positive and statistically significant at 1% probability level while access to extension services and income from Fadama III program was positive and significant at 10% and 5% respectively.

With regards to non-participants, the result showed that access to credit was positive and significant at 5%. This means that access to credit increased household per capita food expenditure (food security) for the non-participants. However, the result implies that the impact of socio-economic and Fadama III program variables on per capita food expenditure (food security) differs across the participating and non-participating households.

The result of the truncated regression model also showed that the estimated coefficient of correlation between the selection equation (determinant function) and the outcome equation (per capital expenditure function) of 0.129 for participants of Fadama III program is positive and significant at 1% which implies that participants in Fadama III program have higher capita consumption expenditure than random household sample. The corresponding correlation between the selection equation and outcome equation of -0.233 for the non-participants was negative and significant at 5%. The result suggests that household who are not participants have less consumption expenditure than the participating household in South West Nigeria. This implies that household's

participation in Fadama III program increased food security measured in terms of increased per capita food expenditure.

Table 7: Impact of Fadama III program on food security Status of participants and non-participants

Variables	Participants		Non-participants	
	Coefficients	Std. Err.	Coefficients	Std Err.
Age	0.0003	0.003	-0. 053	0. 022
	(0.1)		(-2.34)	
Gender	-0.010	0.006	0. 010	0. 014
	(-1.45)		(0.73)	
Years of education	0.003	0.006	0. 032	0.032
	(0.51)		(1.49)	
Household size	0.297***	0.079	0.206	0. 032
	(3.75)		(0.99)	
Farm size	0.217***	0.081	-0.005	0.008
	(2.68)		(-0.65)	
Non-farm income	-0.050	0.120	0.580	0.361
	(-0.42)		(1.61)	
Farm income	-1.70E-07	2.55E-07	-1.46E-07	1.60E-07
	(-0.67)		(-0.91)	
Farming experience	0.009	0.005	0.119	0.089
	(1.65)		(1.34)	
Association membership	-0.051	0.158	0.303	0.411
	(-0.32)		(1.17)	
Access to credit	0.333***	0.112	-0.756**	0.367
	(2.96)		(-2.06)	
Access to extension service	0.023*	0.012	0.050	0.053
	(1.87)		(0.94)	
Participation in Fadama III	0.209	0.156	1.280	0.634
	(1.34)		(2.02)	
Income from Fadama III	0.203**	0.096	0.061	0.450
	(2.11)		(0.14)	
Group Decision making	0.438	0.338	-0.995	0.716
	(1.29)		(-1.39)	
Constant	1.893***	0.715	0.467	1.451
	(2.65)		(0.32)	
Sigma	0.129***	0.020	-0.233**	0.151
	(6.21)		(2.51)	

Figures in parentheses are t-values; ***= significant at 1%, **= significant at 5%, *= significant at 10%.

Conclusions

The study examined the impact of Fadama III group participation on food security status of the rural households in South West, Nigeria. Majority of the participants of the Fadama III program in the region were into crop and livestock production. The result of the study showed that based on the food security line created, majority of the participants were above the food security line and are thus food secure. This showed that the Fadama III program had impacted the food security status of the beneficiaries of the program in South West, Nigeria. The decision to participate in Fadama III program in South West Nigeria was significantly influenced by factors including gender, occupation, extension contacts and awareness. The result of the probit regression (first hurdle) showed that gender, farm size, non-farm income, membership in association and income from Fadama III program were significant positive determinants of food security status of participants of Fadama III program while gender and non-farm income were significant positive determinants of food security status of non-participants in South West, Nigeria where household size was a negative significant determinant. The result of truncated regression model (second hurdle) also showed that the estimated coefficient of correlation between the selection equation (determinant function) and the outcome equation (per capital expenditure function) implies that participants in Fadama III program have higher capita consumption expenditure than random household sample.

Policy Recommendations

In order to increase the participation of households in community development program in the future which will impact their food security and poverty status in South West, Nigeria, Government, Stakeholders and agencies need to put in place and implement a number of policies which include:

i. There should be an increase in the level of awareness of future community driven impact program. This is important because many of the farmers does not have information about the introduction and implementation of the program in the region

which resulted in low participation in the Fadama III program in the study area. If the level of awareness is increased, it will increase the level of participation in the program in the future.

ii. Since participation leads to increased food security status, such community developmental program should be designed in the future in such a way that it will accommodate a large number of potential farmers so as to improve their wellbeing and food security.

iii. Members of the community should be encouraged to join association so that they can access quality information about similar future program. This will enable them to prepare well even before the implementation of the program.

iv. Women farmers should be mobilized in the future to actively participate in community development program so that they can greatly benefit from such program which will improve their wellbeing and food security of their household.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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REFERENCES

[1] 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.

[2] Adereti, F. O. and Fadare, I. A. (2017). Role of Fadama III Project in Improving the Socio-Economic Status of Rural Dwellers in Osun State, Nigeria. International Journal of Agriculture, Forestry and Plantation.5: 66-71.

[3] Ahungwa, G. T., Umeh, J. C. and Muktar, B. G. (2013). Empirical Analysis of Food Security Status of Farming Households in Benue State, Nigeria. Journal of Agriculture and Veterinary Science (IOSR-JAVS), 6 (57-62), 2319-2380.

[4] Aref, F. (2011). Farmers' participation in agricultural development: The case of Fars province, Iran. Indian Journal of Science and Technology, 4 (2): 155-158.

[5] Cornelius, M. E, Kabir, U and Ojeleye, O. A. (2015). Impact of Fadama III Project on the Food Security Status of Beneficiary and Non-Beneficiary Farmers in Kabba/Bunu LGA, Kogi. Journal of Biology, Agriculture and Healthcare, 5 (24): 22-28.

[6] Effiong And Asikong (2013). Mid-Term Assessment of the Activities of Fadama III Development Project in Cross River State. Global Journal of Agricultural Sciences, 12: 31-35.

[7] FAO (2011). The State of Food Insecurity in The World. Rome, Food and Agriculture Organization of the United Nations.

[8] Food and Agricultural Organization, International Fund for Agricultural Development, and World Food Programme, (2014). The state of food insecurity in the world 2014: strengthening the enabling environment for food security and nutrition. FAO, Rome.

[9] Folorunsho, S. T. (2015). Impact of Fadama III on Productivity, Food Security and Poverty Status of Tuber Farmers in Central States of Nigeria. Unpublished P.hD Thesis, Depatment of Agricultural Economics Ahmadu Bello University, Zaria, Kaduna State, Nigeria.

[10] Idrisa, Y. L., Gwary, M. M. and Shehu, H. (2008). Analysis of food security status among farming households In Jere Local Government of Borno State, Nigeria. J Trop Agric Food Environ Ext, 7 (3), 199-205.

[11] 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.

[12] Iwala, O. A. (2014). Economic Impact, Viability and Sustainability of Fadama III Small-Scale Community-Owned Infrastructure in Ondo State, Nigeria. American Journal of Research Communication, 2(5): 60-70.

[13] Jibowo, A. A. (2003). History of Agricultural Extension in Nigeria, In: Adedoyin, S. F. (eds). Agricultural Extension Society of Nigeria: Agricultural and Rural Management Training Institute. Ilorin, Nigeria, 1-12.

[14] Kainga PE (2013). Budgetary Analysis of Banana (Musa sapientum L.) and Plantain (Musa paradisiaca L.) Production. J. of Agric. and Crop Res., 1(4): 55-60.

[15] 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.

[16] Metu, A. G., Kenechukwu O. O., and Olisa D. M. (2016). Achieving sustainable food security in Nigeria: challenges and way forward. 182-187.

[17] Moses, J. D. (2017). The impact of Fadama III on the poverty status of food crop farmers in Yobe State, Nigeria. Sky Journal of Agricultural Research. 6(4): 78-84.

[18] Mundi Index, (2012). Country facts and Figures. Accessed on 15/01/2013 from http://www.indexmundi.com/facts/indicators/nigeria

[19] Nwaobiala, C. U. (2013). Appraisal of Farmers' Participation in IFAD/FGN/NDDC/Community Based Natural Resource Management Programme in Abia and Cross River States Nigeria. A Ph. D Thesis Department of Agricultural Economics and Extension Abia State University Uturu.

[20] Obisesan, A. A., Omonona, B. T., Yusuf, S. A. and Oni, O. A. (2012). Technology Adoption and poverty alleviation among Cassava-based Farming Households in Southwest, Nigeria: case of RTEP Production technology. World Rural Observations.

[21] 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.

[22] Oni, O.A., Salman, K.K. and B.O. Idowu (2011): Social Capital Dimensions and Food Security among Farming Households in Ogun State, Nigeria. Journal of American Science 7(8): 776-783.

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

[24] 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), 26-37.

[25] Sanusi, W. A. (2019). Assessment of Food Security Status of Fadama III Project Beneficiaries in Saki Agricultural Zone of Oyo State, Nigeria. International Journal of Agriculture, Environment and Bioresearch. 4(3):172-182.

[26] World Bank, (2001). Poverty Manual, (Chapter 1: The Concept of Poverty and Well-Being). Washington DC, USA.