



Impact of Fadama iii additional financing (AF) on income and food security status of beneficiaries in Sokoto state, Nigeria

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Abstract

The study assess the impact of Fadama III AF's interventions on income and food security status of beneficiaries. A sample of one hundred and sixty five beneficiaries were drawn using a two stage stratified sampling technique. Descriptive statistics, t test and logit regression estimates were use to analyse the data. The sampled respondent were majorly male (93.33%) in their middle age-group with about 62% of them had no western education. Farming was the major occupation (80%) among respondent. Fadama III AF supported farmers with improved seed varieties, fertilizers, agrochemical, water pump, sprayer, tube welle, advisory services and capacity building training. The intervention was found to have increased the output of rice to about 6 tonnes (6202kg) which can be translated to about 98% increase in output when compared with before the intervention. The output difference tends to be highly statistically significant ($p < 0.001$). Invariably, the output translates to increased income by N560, 175.7 and the relative price index for rice stood at 169.05%. The intervention has impacted on the food security status of beneficiaries by sustaining 18.92% of rice value chain farmers to food secured status. It equally raises about 15% of sorghum value chain farmers from severe to moderate food security status. The tomato value chain farmers exhibit about 5% increase in the food secure status. Results of the logit regression estimates revealed that, the intervention attributed changes in income in the value chain crops was an important determinant for enhancing food security.

Keywords: Impact; Fadama III AF; Food Security; Income

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1. Introduction

Nigeria is one of the food deficient countries in sub-Saharan Africa although, it is arguably better, in terms of food production than the others (Davies, 2009). Food insufficiency and importation are prevalent in Nigeria, a country having the the highest food production in SSA (Edokpia and Okafor 2009).

Food production in Nigeria rose from 89.23 million metric tones in 1995 to 110.11 million metric tonnes in 2000. Despite the rise in food production, the country is on the brink of severe food insecurity and could not meet the Millennium Development Goals (MDG's) of eliminating hunger by 2015. The persistence of food security is not as a result of the incapacity of the world as a whole to increase food production. The undernourished and the food insecure persons are in these conditions because they are poor and lack adequate income with which to purchase food or have no access to agricultural resources, education, technology, infrastructure, and credit to produce their own food (Titus and Adetokumbo, 2007). Although food insecurity is closely linked with poverty, traditional income and poverty measures however, do not provide clear information about food security (Bickel et al., 2000; FAO, 2006).

Fadama is a Hausa name for irrigable land usually low-lying plain underlaid by shallow aquifers found along major river systems. Nigerian government in its effort to enhance food security and alleviate poverty launched the program in 1993 in collaboration with World Bank and the Agricultural Development Bank (ADB). The program has been then in phases with some adjustments and modifications made in each phase. Between 1993-1999 Fadama I was executed. Consequently, the World Bank agreed for funding phase II of the project, not only as a follow up of phase I but also to expand it in scope and size (NFDP Appraisal Report, 2003). The design of phase II of the project, therefore, incorporated a community driven development (CDD) approach. Twelve states of the federation benefited from the second phase of the project. Seeing the great benefits derived from the second phase by the users, a third phase (fadama III) was launched and run from July 2008 to December 2013. The project is also anchored on the CDD approach and covers the 19 states that did not benefit from fadama II. Fadama III's main objective is to support the growth of non-oil sectors through the development of productive infrastructure that will enhance agricultural productivity and the diversification of livelihoods. It involves building participating communities' social capital and their capacity to provide rural services to the poor.

The Fadama III AF aims to scale up the impacts and the development effectiveness of Fadama III project by aligning it more closely with the new Agricultural Transformation Agenda which was adopted by the Government of Nigeria in 2011. It supports clusters of farmers in selected states with comparative advantage and high potential to increase production and productivity of cassava, rice, sorghum and horticulture value chains and link them to better organized markets, within the selected states and SPCZs. The Fadama III AF is consistent with the development objective of the parent Project.

Fadama III AF has a narrow geographical focus on clusters of farmers in selected states with comparative advantage and high potential to increase production and productivity of cassava, rice, sorghum and horticulture value chains and link them to better organized markets. Sokoto State is one of the core states under the Fadama III AF with comparative advantage and high potential to increase production and productivity of rice, sorghum and tomatoes value chains. This new strategy seeks to attract private investment

in processing and milling, and other commercial aspects of agriculture around nucleus farms, with associated small-holder linkages such as out-grower schemes and contracting farming arrangements.

Economic development failures account for the persistence of poverty and food insecurity. Compounding the complex situation are factors such as population growth, changing patterns of commodity demand, urban growth and unequal access to employment generated income (Titus and Adetokumbo, 2007). Agricultural interventions to improve household food availability and dietary diversity are considered sustainable solutions to addressing the problems of high household food insecurity. Such programs can also lead to reduced household poverty (Bloem et al., 2001), improve nutritional status of household members (De Pee et al., 2000). Agricultural interventions are most likely to affect nutrition outcomes when they involve diverse and complementary processes and strategies that redirect the focus beyond agriculture for food production and toward broader value chain development. Successful projects are those that invest broadly in improving human capital, sustain and increase the livelihood assets of the poor. One of such agricultural intervention program is the *Fadama* projects. It is against this background the study aimed at assessing the impact of the Fadama III AF's intervention with respect to income and food Security status of the beneficiaries.

2. Methodology

2.1. The study area

The survey was conducted in Sokoto state in the month of march, 2017. Sokoto state lies between latitude 10° 15' - 13° 50' N and longitude 3° 30' - 14° 30' E in the semiarid dry savannah of North Western Nigeria. The topography of the state is predominated by rolling upland plains and fadama lowlands mainly created by the Sokoto-Rima river system; the former occupying much larger than the later. The fadama land although quite small in the area, is one of the most valuable agricultural resources in the state. The soils in the fadama land are texturally finer and nutritionally richer than those of the adjoining plains (Singh and Babaji,1990).

2.2. Sampling procedure and instrument for data collection

The study targeted beneficiaries of Fadama IIIAF across the state, along the 3 value chain crops – Rice, Sorghum and Tomato. A Stratified 2-stage sampling procedure was employed to sample respondent. The state was stratified in to the three existing senatorial districts. From each senatorial districts value chain –crop based groups were purposively selected and samples were allocated proportionately (5%) across value chain crops production clusters. One hundred and sixty five (165) beneficiaries constitute the sample size for the study. A structured questionnaire was used for the households' survey. The questionnaire features questions on household socioeconomics and demographic characteristics, Fadama III AF Supports received, value chain crop output before and after Fadama III AF's interventions and modified food security core module questions related to household food security and food nutrition security situations before and after the intervention.

2.3. Analytical techniques

Descriptive statistics, point estimates and chart were be use to analyze and presents the result of the study. Logit regression was used in determining the influence of the socioeconomic parameters and intervention's differential outcomes (income) across value chain on food security status of the households

2.3.1. Categories of food Security Status

Three categories of food security status were established using a modified food security core modules to describe the food security situation experienced by households: food secure; moderate food insecure; and severe food insecure.

2.3.2. Food Secure

These households had access, at all times throughout the previous year, to enough food for an active, healthy life for all household members.

2.3.3. Food Insecure

At times during the previous year, these households were uncertain of having, or unable to acquire, enough food to meet the needs of all their members because they had insufficient money for food. In these households, adults or children (if present) or both adults and children experienced food insecurity. Depending on the extent of the experience, households were either moderately food insecure or severely food insecure.

Food insecure, moderate - These households had indication of compromise in quality and/or quantity of food consumed.

Food insecure, severe - These households had indication of reduced food intake and disrupted eating patterns.

2.3.4. Nutrition food security status

Food Secured: These are households that had no, or one, indication of difficulty with income-related food access and no compromise in quality (balanced meal) and/or quantity of food consumed.

Food insecure, moderate: These are households that show indications of difficulty with income-related food access, and indication of compromise in quality and/or quantity of food consumed

Food Insecure, Severe: These are households that show serious indications of difficulty with income-related food access, and indication of compromise in quality and/or quantity of food consumed

2.4. Logit regression model

The logit regression model was used to investigate the determinants of food security among beneficiaries in the study area. Logit model is a model used in estimating the probability of events based on dependent dichotomous variables (Gujarati, 1995). This model has found several applications in the literature (Goni,

2006; Amaza et al.,2009; Oluwatayo, 2008). A dichotomous dependent variable assumes only two values (either zero or one). Suppose that food security is represented by 'S_i' where, S is 1 if a household is food secure and 0 otherwise. Respondents' socioeconomic characteristics, value chain crops income difference and farm income difference were regressed against food security status (dependent variable). The logit model in the implicit form to be estimated is given as:

$$S_i = \beta \cdot X_i + U_i \dots \dots \dots 1$$

Where;

S_i = the food security status of ith household (1 food secure, otherwise 0)

• = vector of the parameter estimates

X_i = vector of explanatory variables that range from X₁ to X₈:

X₁ (lnage) = Natural log of Age for the respondents in years

X₂ (sex) = Gender of household head (Male =1, Female = 0)

X₃ (lnhsize)= Natural log for Household Size

X₄ (edu)= Respondent' formal education (some formal education1, otherwise 0)

X₅ (occupation)= Primary Occupation (Farming = 1, Non-Farming = 0)

X₆ (lnincdiff)= Natural log for Farm Income difference (after –before) of Respondent (Naira)

X₇ (lnvcindiff)= Natural log for Value chain crop Income difference (after –before) of Respondent (Naira)

X₈ (vcrice)= value chain crop rice relative to others (rice =1, otherwise 0)

U_i = the error term

3. Results and discussion

3.1. Socioeconomics characteristic of the respondent

Table 1 presents the Socioeconomics distribution of the sample beneficiaries. The result revealed that the majority (93.33%) of the whole respondent across the value chain crops were male while female account only for 14.86% of the respondent in the rice value chain activity. The result further shows about 50 – 75% of the respondent belong to the middle age group of 36 to 55 years with a mean age of about 48 years. The respondents are married with a relatively large family size of about 14 ± 8 persons on the average.

Educational attainment of the respondent revealed the majority (61.82%) had Quranic forms of education where about 22% had some tertiary level education while, 10.30% had some secondary level of education and about 3% had primary and some non-formal forms of education respectively. Occupational distribution revealed farming is the major forms of occupation (80%), followed by trading that accounts for about16% and civil service 4% of the respondents. Millet, Sorghum, rice, cowpea, onion and some other vegetable are the major crops grown among respondent.

The implication of the socioeconomic parameter of the households (such as age, educational level, marital status, household size, farm size, etc) on income and food security impact is that literatures have shown and are believed to have significant influence on household food security (Goni, 2006; Amaza et al., 2009; Oluwatayo, 2008). Support from fadama III AF project is a means of empowerment of participants and is therefore believed that empowerment through agricultural intervention is one of the most sustainable solutions to addressing the problems of high household food insecurity (Bloem et al., 2001, Oluwatayo, 2008; Goni, 2006).

Table 1. Socioeconomic Distribution of the Respondent

Variable	Respondent Type based on Crop Value Chain			
	Rice (n=74)	Sorghum (n=61)	Tomatoes (n=30)	Total (n=165)
Sex				
Male	63 (85.14%)	61 (100%)	30 (100%)	154 (93.33%)
Female	11 (14.86 %)	0 (0.00%)	0(0.00%)	11(6.67%)
Age (years)				
17 - 35	3 (4.05%)	6 (9.84%)	12 (40.00%)	21 (12.73%)
36 - 55	51 (68.92%)	46 (75.41%)	16 (53.33%)	113 (68.48%)
56 - 75	20 (27.03%)	9 (14.75%)	2 (6.67%)	31 (18.79%)
Mean (Std Dev.)	52.81 (11.15)	48 (8.50)	40.03 (11.35)	48.71 (11.23)
Household size				
2 - 5	12 (16.22%)	5 (8.20%)	11(36.67%)	28 (16.67%)
6 - 10	9 (12.16%)	8 (13.11%)	8 (26.67%)	25 (15.15%)
11 - 15	26 (35.14%)	21 (34.43%)	8 (26.67%)	55 (33.33%)
Above 15	27 (36.49 %)	27 (44.26)	3 (10.00%)	57 (34.55%)
Mean (Std Dev.)	14.06 (7.062)	17.59 (9.22)	8.87 (5.48)	14.42 (8.25)
Marital status				
Married	74 (100.00%)	61 (100.00%)	28 (93.33%)	163 (98.79%)
Single	0 (0.00%)	0 (0.00%)	2 (6.67%)	2 (1.21%)
Level of Education				
Non Formal	4 (5.41%)	0 (0.00%)	1 (3.33%)	5 (3.03 %)
Qur'anic	30 (40.54%)	53 (86.89%)	19 (63.33%)	102 (61.82)
Primary education	4 (5.41%)	0 (0.00%)	1 (3.33%)	5 (3.03 %)
Secondary education	9 (12.16%)	4 (6.56%)	4 (13.33%)	17 (10.30%)
Tertiary education	27 (36.49%)	4 (6.56%)	5 (16.67%)	36 (21.82%)
Major occupation				
Farming	45 (60.81%)	61 (100.00%)	26 (86.67%)	132 (80.00%)
Trading	24 (32.43 %)	0 (0.00%)	2 (6.67%)	26 (15.76%)
Civil service	5 (6.76%)	0 (0.00%)	2 (6.67%)	7 (4.24%)
Types of Crop Grown				
Millet	64 (86.49%)	61 (100.00%)	27 (90.00%)	152 (92.12%)
Sorghum	69 (93.24%)	61 (100.00)	27 (90.00%)	157 (95.15%)
Rice	74 (100.00%)	29 (47.54%)	28 (93.33%)	131 (79.39%)
Cowpea	54 (72.97%)	57 (93.44%)	22 (73.33%)	133 (80.61%)
Groundnut	7 (9.46%)	47 (77.05%)	17 (56.67%)	71 (43.03%)
Onion	49 (66.22%)	61 (100.00%)	29 (96.67%)	139 (84.24%)
Garlic	13 (17.57%)	4 (6.56%)	1 (3.33%)	18 (10.91%)
Other vegetables	32 (43.24%)	14 (22.95)	23 (76.67%)	69 (41.82%)

3.2. Fadama III AF intervention to beneficiaries

Fadama III AF supported beneficiaries with input, productive asset as well as enhances their capability in the adoption and utilization through training and advisory services on production and group management. Table 3 presents the kinds of supports by the sample respondents, the results revealed that about 93% of the respondent benefited with improved seed varieties of rice, sorghum and tomato, about 90% and 77% were supported with fertilizers and agrochemical –pesticides while 52% and 27% benefited water pump and sprayer respectively. Only 5% benefited with tube well for irrigation and the entire respondent benefited with advisory services.

Table 2. Input benefitted from Fadama III AF

Support Recieved	Respondent Type based on Crop Value Chain			Total (n=165)
	Rice (n=74)	Sorghum (n=61)	Tomatoes (n=30)	
Improved seed variety	70 (94.59%)	61 (100.00%)	22 (73.33)	153 (92.73%)
Fertilizers	70 (94.59%)	53 (86.89%)	25 (83.33%)	148 (89.70)
Agrochemicals	60 (81.08%)	46 (75.41%)	21(70.00)	127 (76.97%)
Water pump	55 (74.32%)	14 (22.95%)	16 (53.33%)	85 (51.52%)
Sprayer	34 (45.95%)	0 (0.00%)	11 (16.67%)	45 (27.27%)
Tube Well	8 (10.81%)	0 (0.00%)	1 (3.33%)	9 (5.46%)
Advisory services	74 (100.00%)	61 (100.00%)	30 (100.00%)	165 (100.00%)

3.3. Impact of Fadama iii AF intervention on income

3.3.1. Intervention impacts on rice income of beneficiaries

Table 3 presents the point estimates of rice output and income of beneficiaries before and after the intervention. The results revealed that beneficiaries realized about 3 tonnes of rice before the intervention (3084.32kg) the output doubled after the intervention (6202.70kg). This accounts for about 98% increase in output, the test statistics revealed a significant difference in output attributable to Fadama III AF intervention ($p < 0.001$). The result on gross income earned from rice value chain by beneficiaries revealed on average is N252,932 before the intervention and raised to N813,108.1 after the intervention. This accounts for gross income difference of N560,175.7 and the test statistics revealed a significant difference ($p < 0.001$). The relative price index revealed about 169.55% changes in price level before and after the intervention.

Table 3. Point estimates on rice output and income of beneficiaries

Variable	Obs.	Mean	Std Dev.	Min.	Max.
RICE OUTPUT (KG)					
Output Before	74	3084.32	2731.55	375	15000
Output After	74	6202.70	6293.40	750	30000
Output Difference	-	3118.38		-	-
T statistics			3.9103***		
RICE INCOME N					
Income Before	74	252932.4	268349.3	25000	1400000

Income After	74	813108.1	877065.4	90000	400000
Income Difference	-	560175.7			
T statistics			5.2538***		
Price Before	74	5952.70	1362.84	4000	9000
Price After	74	9608.11	948.21	9000	12000
Relative Price index	74	169.55	40.79	100	250

*** Significant at 1%

3.3.2. Intervention impacts on sorghum income of beneficiaries

Table 4 presents the point estimates of sorghum output and income of beneficiaries before and after the intervention. The result revealed beneficiaries had on average output of 4311.48 kg before the intervention and the output roused to 5288.53 kg after the intervention. This accounts for output difference of 977.05 kg, the test statistics reflected that the difference is not statistically significant ($p > 0.01$). However, the income realized by the beneficiaries before the intervention on the average stands at N 224, 098.4 while the income roused by over 300% (N825, 803.3). This reflects an income difference of N601,704.9 and the test statistics denotes a highly significant difference in terms of sorghum income ($p < 0.001$). This could be attributable to increased output as well as high relative price index that roused to an average of 305.71%.

Table 4. Point estimate on sorghum output and income of beneficiaries

Variable	Obs.	Mean	Std Dev.	Min.	Max.
Sorghum output (KG)					
Output Before	61	4311.48	3525.11	1000	14000
Output After	61	5288.53	3687.33	700	16000
Output Difference		977.05			
T statistics		1.4959 ^{ns}			
INCOME N					
Income Before	61	224098.4	180818.8	50000	700000
Income After	61	825803.3	578104.3	119000	272000
Income Difference		601704.9			
T statistics		7.7584***			
Price Before	61	5163.93	533.18	5000	7000
Price After	61	15655.74	946.67	15000	17000
Relative Price index %	61	305.71	30.38	214.29	340

*** Significant at 1% and ns not significant

3.3.3. Intervention impacts on tomato income of beneficiaries

Table 5 presents the point estimates on tomato output and income among tomato value chain beneficiaries before and after the intervention.

Table 5. Point estimate on Tomato output and income of beneficiaries

Variable	Obs.	Mean	Std Dev.	Min.	Max.
Tomato output (Basket)[§]					
Output Before	30	116	112.46	10	500
Output After	30	211.53	185.95	16	900
Output Difference		95.53			
T statistics		2.4079**			

INCOME N					
Income Before	30	135000	144477.4	15000	750000
Income After	30	603683.3	475068.2	48000	1500000
Income Difference		468683.3			
T statistics		5.1698***			
Price Before	30	1260	563.61	300	3000
Price After	30	2950	1069.56	500	6000
Relative Price index %	30	261.06	119.41	100	600

§ Average weight of basket is 32 kg

3.4. Impact of the intervention on beneficiaries' food security status

3.4.1. Food security status of the beneficiaries

Figure1 presents the food security status of the beneficiaries across the value chain before and after the intervention. In the rice value chain, the beneficiaries experience an appreciable shift from food insecure to food secure status before and after the intervention (6.76% versus 18.92%) as well as a decline from moderate to severe food insecurity statuses. In the sorghum value chain none of the beneficiaries was in the food secured status, however there was an increase in percentage of moderate food from 81.97% to 95.08%. Similarly 18.03% was in the severe food insecure status before the intervention and declines to 4.92% after the intervention. The tomato value chain beneficiaries of fadama III AF intervention exhibit about 10% increased in the food security status. By implication it could be deduced the project in just few years of the intervention have enhanced the food security status of beneficiaries.

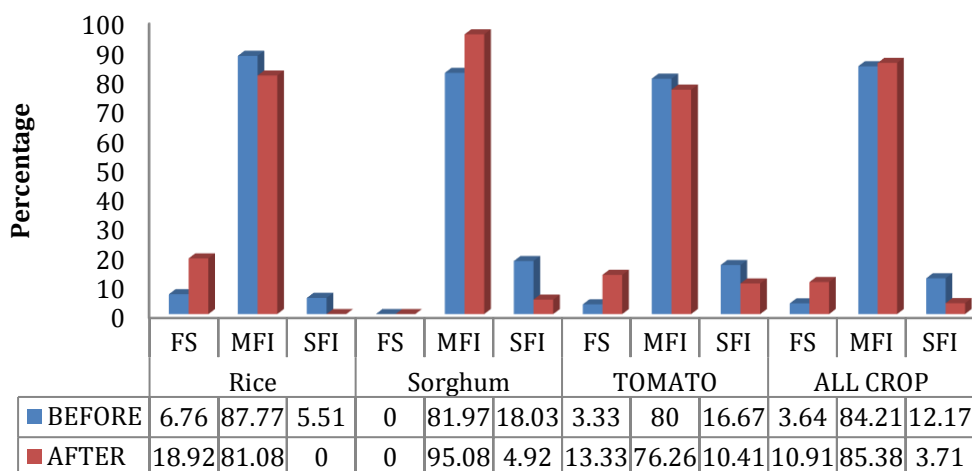


Figure 1. Food Security Status across Value Chain Crops Beneficiaries

Figure 2 presents the nutrition food security status across the value chain beneficiaries. The nutrition food security refers to not only access, affordability and availability of food but rather the quality of food for a balance meal and healthy living. The result revealed 14.86% of beneficiaries in the rice value chain were in the food secured status before the intervention and 16.22% were in the food secured status after the intervention. Similarly there were increases in percentage of those in the moderate food nutrition insecure

status. However, sorghum value chain experience a little in the percentage of food security statuses. Tomato value chain featured increase in the percentages of those in the food secured status while reduction in percentages of moderate food insecure. Generally there was an appreciable change in the food security status between before and after the intervention.

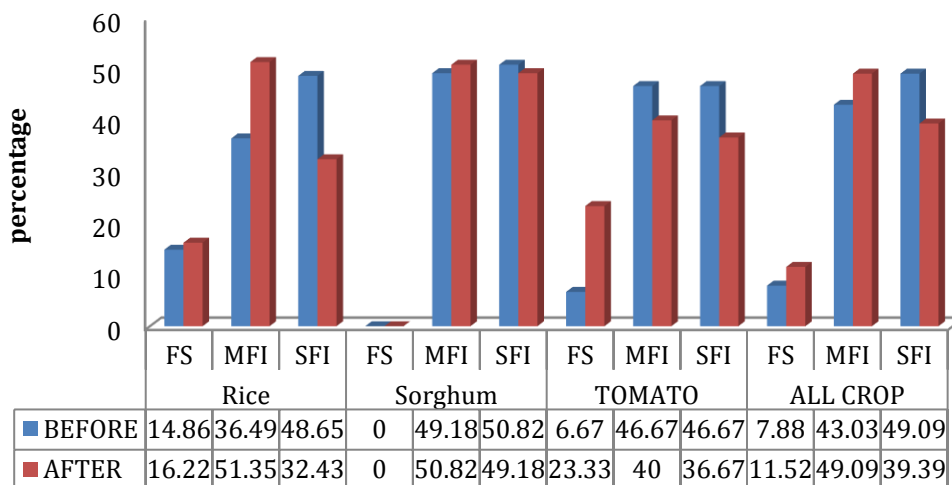


Figure 2. Nutrition Food Security Status across Value Chain Crop Beneficiaries

3.5. Determinant of food security status

Table 6 presents the estimates of logit regression model for the determinant of food security. The result reflects household size decreases the possibility of being food secured by (-0.0564) and the variable is highly significant (p<0.001). While, value chain crops income differences had the possibility of enhancing food security status of the beneficiaries (0.0312 p<0.01).The rice value chain beneficiaries had a relative advantage of having the possibilities of being food secured over other value chain crop beneficiaries. These implied the impact of the intervention on food security and vindicated the place of rice in the life and economy of Nigerians. The result further traces the effect of socioeconomic characteristic and the intervention impact variables on nutrition food security. The coefficient of value chain income difference depicts a positive sign, indicating the possibility of this variable to enhanced food security, though it is not statistically significant.

Table 6. Logit Regression Estimation on the Determinant of Food Security Status

Variable	Coefficient	Std. Error	Z	Marginal Effect
Age	-0.3333	1.3506	-0.25	-0.0154
Sex	0.2974	1.4565	0.20	0.0123
HH Size	-1.2193**	0.4539	-2.69	-0.0564
Education	-0.1627	0.7514	-0.22	-0.0074
Occupation	1.6753	1.1557	1.45	0.0537
FarmIncome difference	0.0304	0.2382	0.13	0.0014
Crop income difference	0.6745**	0.4048	1.67	0.0312
Value Chain Crop rice	1.6892**	0.8226	2.05	0.0312
Constant	-10.0218**	6.0472	-1.66	

Number of observation	163
LR chi2 (8)	19.10
Prob > chi2	0.0143
Pseudo R2	0.2000
Log likelihood	-38.1950

4. Conclusions and policy implications

The intervention was found to have increased the output of rice to about 6 tonnes (6202kg) which can be translated to about 98% increase in output when compared with before the intervention. The output difference tends to be highly statistically significant ($p < 0.001$). Invariably, the output translates to increased income by N560, 175.7 and the relative price index for rice stood at 169.05%. The intervention equally increases the mean output of sorghum from 4511.48 kg to 5288.53 kg, though the output difference tends not to be statistically significant. Yet the incomes from sorghum have increased by N 601, 704.3 on the average, similarly income from tomato increase by N 468, 683.3 on the average.

The intervention has impacted on the food security status of beneficiaries by sustaining 13.51% of rice value chain farmers to food secured status. It equally lifts about 18% of sorghum value chain farmers from severe to moderate food security status. The tomato value chain farmers exhibit about 5% increase in the food secure status. Similarly, on the nutrition food security status the intervention sustains 16.22% of beneficiaries to food secure status and reduces the percentages of severe food insecure to moderate insecure statuses. Results of the logit regression revealed that, the intervention attributed changes in income in the value chain crops was an important determinant for enhancing food security. Rice value chain beneficiaries' stands on a better chance of being food secure over other value chains.

For food supplies to remain stable and secure there must be sustainable growth in household agricultural output. However, to achieve this there is need to invest more on some infrastructural facilities as well as human resources development. There must be considerable improvement in agricultural technologies in order to increase crop yields.

Farming techniques particularly irrigation also contribute to Salinization (the accumulation of salt in soils) which invariably cause stunted growth in plants thereby decreasing harvest and eventually making soil unsuitable. According to Food and Agriculture Organization (FAO) that: "Salinization has degraded an estimated 7-10 percent of the world's 250 million hectare (618 million acres) of irrigated lands." Thus Fadama III AF should equally sustained the increased output through enhancing sustainable farming practices

References

Amaza, P.S., Abdulaye, T., Kwaghe, P. and Tegbaru, A. (2009), "Changes in household food security and poverty status in PROSAB area of southern Borno State, Nigeria", International Institute of Tropical Agriculture (IITA), 40pp.

- Babatunde, R.O., Omotesho, O.A. and Sholotan, O.S. (2007), "Socio-economics characteristics and food security status of farming households in Kwara State, North-Central Nigeria", *Pakistan Journal of Nutrition*, Vol. 6 No. 1, pp. 49-58.
- Bickel, G., Nord, M., Price, C., Hamilton, W. and Cook, J. (2000), "Guide to Measuring Household Food Security, Revised 2000; Measuring Food Security in the United States", United States Department of Agriculture (USDA). Available at: www.ers.usda.gov/briefing/foodsecurity accessed 10 December 2006.
- Bloem, M.W., Moench-Pfanner, R. and Kiess, L. (2001), "Combating micronutrient deficiencies – an important component of poverty reduction", *Biomedical Environmental Science*. Vol 14, pp. 92-97.
- Davies A.E. (2009), "Food security initiatives in Nigeria: Prospects and challenges", *Journal of Sustainable Development in Africa*, Vol 11 No. 1.
- De Pee, S., Bloem, M.W. and Kiess, L. (2000), "Evaluating food-based programmes for their reduction of vitamin A deficiency and its consequences", *Food Nutrition Bulletin*, Vol. 21 pp. 232-238.
- Edopka, D.A. and Okafor, F.C. (2009), "Rural development: A link to food security in Nigeria", *Benin Journal of Social sciences, University of Benin*, Benin City, Nigeria pp. 259-269.
- FAO (2006), "The State of Food Insecurity in the World 2006: Eradicating World Hunger—Taking Stock Ten Years after the World Food Summit", Food and Agriculture Organization, Rome, available at www.fao.org/sof/sofi.
- Goni, M. and Amaza, P.S. (2006), "Determinants of household food security in the Lake Chad area of Borno State of Nigeria", *Journal of Research in Agriculture*, Vol. 3 No. 4, pp. 29-34.
- Gujarati, D.N. (1995), *Basic Econometrics*, Third Edition, McGraw-Hill International Editions, New York and London.
- Nkonya, E. Phillip, D. Mogue, T., Pender, J. and Kato, E. (2009), "Impacts of community-driven development programs on income and asset acquisition in Africa: The case of Nigeria" Contributed Paper prepared for presentation at the International Association of Agricultural Economists Conference, Beijing, China, August 16-22, 2009.
- Singh, B.R. and Babaji, G.A. (1990), "Characterisations of Soils In Dundaye District II. The Fadama Soil of University Farm", *Nigerian Journal of Basic and Applied Sciences*, Vol. 4, pp. 29-39.
- Titus, O.B. and Adetokunbo, A.G. (2007), "An analysis of food security situation among Nigerian urban households: Evidence from Lagos state, Nigeria", *Journal of Central European Agriculture*, Vol. 8 No. 3, pp.397-406.