



## EFFECT OF *FADAMA* IIIAF ON INCOME LEVEL OF RURAL BENEFICIARIES IN NIGER STATE

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### ABSTRACT

The study evaluates the effect of *Fadama* IIIAF on the income level of rural beneficiaries in Niger State, Nigeria. The methodology adopted include Net farm income and propensity score matching using beneficiaries. The finding of the study showed the net farm income (NFI) and return on naira investment the results showed that beneficiaries in the study area have more profit than non-beneficiaries with return to investment of ₦ 15.3 for each ₦ 1 invested. The propensity score matching reviewed that the *Fadama* IIIAF beneficiaries were more rewarded with mean income of ₦ 694,266.7 as against ₦197,733.3 for non-beneficiaries. A test of balancing property was conducted and the results showed that the matching property was satisfied and all the matching shows that productivity was positive and highly significant at 1% for beneficiaries and also shows productivity increased by 6.478 for beneficiaries than non-beneficiaries. The study recommended that given the positive impact of the project on the beneficiaries' similar interventions should be extended to communities that did not benefit from *Fadama* IIIAF project.

**Key words:** Effect, *Fadama* IIIAF, Income, Rural and Farmers.

### INTRODUCTION

Nigeria is blessed with large expanse of land capable of growing all types of tropical and subtropical crops with great potentials and resources coupled with favourable climatic conditions for producing food and other raw materials for industrial use. In the same vein Nigeria is blessed with abundant human and material resources to alleviate food insecurity and other manifestations of poverty that is threatening the peaceful existence of the country.

The United Nation Development Programme (UNDP) in Human Development Index (HDI) ranked Nigeria among the 44 poorest countries of the world and Nigeria is recently placed among the 26 poorest countries with more than 70% estimated to be living below the internationally defined poverty level of one dollar per day (Chirwa, 2005), hence this has been a major and similar problem among the small holder farmers in Niger State.

Agricultural production methods have remained undeveloped despite many years of effort on technology generations and transfer in Nigeria. Rural financial supports are scarce and the rural finance policies implemented previously have impaired rather than assisted (Simonyan and Omolehin, 2012). Despite, in an attempt to alleviate poverty among rural Nigerians and also to increase the standard of living of rural inhabitants as an approach of meeting up with millennium development goals (MDGs) of food sufficiency and poverty eradication.

During the last decade government of the Federal Republic of Nigeria had embarked on several projects with the aim improving the income and productivity of the small holder farmers. However, these projects have neither generated increased income nor improved the living standard of the poor rural farmers in Nigeria.

*Fadama* is a Hausa name for irrigable, low-lying plain underlain by shallow aquifers found along major river systems. The *Fadama* concept is an old tradition in Hausa, where flooded



land is used for growing a variety of crops and small scale irrigation. The National *Fadama* Development Project (NFDP) has been incorporated by the government to address the challenge of poverty in Nigeria. The project was started in 1990 and now is in its third phase. It is 450-million-dollar project is being implemented in 36 states and Nigeria Federal Capital Territory. Phase 1 and 2 helped to raise the incomes of rural farmers by 63 percent. 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. However, *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. The *Fadama* III AF is consistent with the development objective of the parent Project.

Despite previous intervention in agricultural sector more is still required in other to attain a sustainable food production and income generation. The question is: has the recent *Fadama* III AF project succeeded in raising the income of arable crop farmers in Niger State. It is against this background the study aimed at estimate the cost and returns and to analyse the effect of the *Fadama* III AF's on income of arable farmers.

## METHODOLOGY

### The Study Area

The study was conducted in Niger State, located in the Guinea Savanna vegetation zone in the North Central part of Nigeria. The state is geographically located between longitude 3°8'N and latitude 8°10'E of prime meridian (NSGD, 2009). The State shares common boundaries with Kebbi and Zamfara States to the North, Kogi State to the south, Kwara to the south-west, while Kaduna State and Federal Capital Territory (FCT) are on the North east boundary (NSGD), 2009). According to National Population Commission (NPC) (2006), Niger State has population of 3.950,249 million people and using the projected population growth rate of 3.4% per annum, according to United Nation Population Fund (UNPF) (2015), as at 2015, the state has a population of about 5,293,333 million people. The State is characterized by both rainy and dry seasons. Raining season starts from April to October and the dry season from November to March. The annual rainfall is between 1100 and 1600 mm and average monthly temperature ranges from 23 and 37°C, with vegetation characterized by moderately dense woodland shrubs and trees (NSADP, 1994).



### Sampling technique and sample size

There are three agricultural zones in Niger State namely, Zones I, II, and III Niger State Agricultural Development Project [NSADP]. Multi-stage sampling technique involving four stages was used in the sample selection (treatment and Control). In the first stage, purposive sampling technique was used to select one *Fadama* intervention LGA from each of the Agricultural Zone, giving a total of 3 *Fadama* intervention LGA. In the second stage, three *Fadama* Community Associations were randomly selected from each of the selected LGA. In the third stage, five (5) *Fadama* User Groups (treatment) and three Farmers association not benefited from *Fadama* III AF project (control) were randomly selected because of similarity of socio economic characteristics of the farmers. Which gives a total of 15 treatment and 15 control. In the last stage, 8 *Fadama* III AF beneficiaries and 8 non beneficiaries were selected from the 15 selected FUGs and farmers' association, giving a total of 120 beneficiaries and 120 non beneficiaries.

### Method of Data Collection and analysis

Primary data was used for this study. Information on the income level as well as socio-demographic characteristics of respondents before and after *Fadama* IIIAF intervention was elicited through the use of structured questionnaire and interview schedules for those who were not able to read or write which was administered to the respondents by the researcher and assisted by enumerators. The same questionnaire was administered to two groups of respondents that is, treatment and Control.

### Analytical Techniques

#### Net farm income model

Net farm income model was used to evaluate and compare (objective 2) the income of *Fadama* IIIAF project beneficiaries and non-beneficiaries as well as estimate their costs and returns in the study area. The model for the net farm income is as follows:

$$NFI = GFI - TC \quad \dots (1)$$

$$NFI = GFI - (TVC + TFC) \quad \dots (2)$$

$$NFI = GFI - TVC - TFC \quad \dots (3)$$

$$= \sum_{j=1}^x P_j q_j - \sum TVC - \sum TFC \quad \dots (4)$$

Where:

NFI = Net Farm Income,

GFI = Gross Farm Income,

TVC = Total Variable Cost,

TFC = Total Fixed Cost,

$P_j$  = Price of  $j^{th}$  Output sold and

$q_j$  = Quantity of  $j^{th}$  output sold.

$$GM = GFI - TVC \quad \dots (5)$$

Where GM=Gross Margin, GFI=Gross Farm income, TVC=Total Variable Cost

$NFI = GM - TFC$

Where NFI= Net Farm Income, GM= Gross Margin, TFC= Total Fixed Cost

$GR = TFE/GI$

Where GR= Gross Ratio, TFE= Total Farm Expenses, GR= Gross Ratio

$OR = T0C/GI$

OR= Operating Ratio, T0C =Total Operating Cost

$RI = GM/TVC$

RI= Return On Capital Investment, GM=Gross Margin, TVC=Total Variable Cost



### Propensity Score Matching (PSM)

To determine the effect participation in the *Fadama* IIIAF programme on the income of respondents the propensity score matching methods was used.

$$ATT = E(Y_{1/P=1}) - E(Y_{0/P=1}) \quad \dots (6)$$

P= participation in the project (p=1 if participated in the ATA programme and p=0 if did not participate in the programme).

Y<sub>1</sub>= four indicators were used outcome household income, labor, productivity and area of land cultivated of the project beneficiary after participation in the project.

Y<sub>0</sub>= four indicators were used outcome household income, labor, productivity and area of land of the same beneficiary if he/she did not participate in the project.

The propensity score matching (PSM) technique was used to evaluate the impact of ATA programme in the income of rice and sorghum farmers in the study area.

In implementing the PSM, an empirical model has to be specified to drive the propensity score. For the *Fadama* IIIAF programme we will estimate the propensity score for participation in the programme with probit model using the observable variables that are included both determinant Of participation programme and factors that affected the outcome.

The model is specified as

$$y_i = \begin{cases} y_i^* & \text{if } y_i^* > 0 \\ y & \text{if } y_i^* \leq 0 \end{cases} \quad \dots (7)$$

$$y_i^* = \beta_0 + X\beta_1 + \mu_1, \mu / x \approx N(0, \sigma_2) \quad \dots (8)$$

$$y_i^* = \beta_1 X_1 + \beta_2 X_2 + \beta_3 \dots + \beta_{10} X_{10} + \mu \quad \dots (9)$$

Where,

y<sub>i</sub>= dependent variables(Fadama)

β = vector Of unknown coefficients

X<sub>1</sub> =Age (years)

X<sub>2</sub>= Sex

X<sub>3</sub>= Marital status

X<sub>4</sub>=Education (Educational attainment)

X<sub>5</sub>=Experience in farming (years)

X<sub>6</sub>=InvOlvement in farming

X<sub>7</sub>=Farm size (ha)

X<sub>8</sub>=Farm distance (m<sup>3</sup>)

### Costs and returns of arable crop production in the study area

The viability of an enterprise is known by the amount of profit earned per period of time. Profit is the difference between monetary value of goods produced and cost of resources used in their productions. The results of profitability analysis which was used to achieve cost and returns of arable crop is shown in Table 1

Total variable cost is the operating cost of the respondent which are the day to day cost incurred for producing rice and sorghum. The total variable cost incurred by the beneficiaries and non-beneficiaries respondents were ₦20,777.64/ha and ₦ 24,485.78/ha with a gross margin of ₦318,051.63 and ₦8,532.56 respectively. The average of return per naira invested was ₦15.30 for beneficiaries of *Fadama* IIIAF implying that for every one naira invested in sorghum or rice production, there was a profit of ₦15.30 while average rate of return per naira invested was ₦3.48 for non-beneficiaries of *Fadama* IIIAF of rice or sorghum farmers implying that for every one naira invested in rice or sorghum, there is a profit of ₦3.48 thus



indicates that beneficiaries made more profit than non-beneficiaries. This gives a clear indication that *Fadama* IIIAF has positive effect on beneficiaries. The result is in agreement with the findings of Okam *et al.* (2016) whom in their results on comparative analysis of profitability of rice among men and women in Ebonyi State found that rice production by both men and women were profitable with return to investment of ₦1.18 and ₦1.02.

**Table 1: Profitability of *Fadama* IIIAF Rice and Sorghum Production in Niger State, Nigeria**

Cost and Return items	Beneficiaries		Non-beneficiaries		Pooled	
	Cost per (Naira) / Ha	% of cost	Cost per (Naira) / Ha	% of cost	Cost per (Naira) / Ha	% of cost
<b>Variable cost</b>						
Labour cost	8,832.52	34.23	9,910.55	27.76	9,573.71	33.22
Seed cost	1,132.11	4.39	3,596.33	10.07	2,289.87	7.95
Agrochemical Cost	5,016.26	19.44	6,174.31	17.29	5,560.34	19.29
Fertilizer	5,272.36	20.43	3,472.48	9.73	4,426.72	15.36
organic manure	524.39	2.03	1,332.11	3.73	903.88	3.14
<b>Total Variable cost</b>	<b>20,777.64</b>	<b>80.52</b>	<b>24,485.78</b>	<b>68.58</b>	<b>22,754.53</b>	<b>78.96</b>
			<b>24,485.78</b>	<b>68.58</b>		
<b>Fixed Cost</b>						
Farm tools (Depreciation)	4,019.51	15.58	7,079.82	19.83	5,457.33	18.94
Implement maintenance	564.23	2.19	656.88	1.84	607.76	2.11
Total Fixed cost	4,583.74	17.76	<b>7,736.70</b>	<b>21.67</b>	<b>6,065.09</b>	<b>21.05</b>
<b>Total Cost</b>	<b>25,361.38</b>	<b>98.28</b>	<b>32,222.48</b>	<b>90.24</b>	<b>28,819.61</b>	<b>100.00</b>
<b>Returns</b>						
Gross Income	338829.7		109,807.34		231,228.45	
Gross Margin	318,051.63		85,321.56		208,473.92	
Net Farm Income	313,467.88		77,584.86		202,408.84	
Return to investment	15.3		3.48		9.16	
Gross Ratio	0.07		0.29		0.12	
Operating Ratio	0.06		0.22		0.10	

**Source computation 2018**

### **Effect of *Fadama* IIIAF on income of arable crop beneficiaries**

Results of the analysis of the effect of *Fadama* IIIAF on the income, labour, productivity and arable land cultivated for pooled, beneficiaries and non- beneficiaries are presented in Table 2 respectively. The mean incomes of the beneficiaries and non-beneficiaries were ₦694,266.7 and ₦ 197,733.3 the mean difference between the beneficiaries and non-beneficiaries was ₦ 496,533.34 this shows a wide range of difference.

A test of the balancing property was conducted and the results showed that the matching property was satisfied. This implies that the distribution of the conditioning covariates did not differ across the treatment and comparison group in the matched samples. The results of the





balancing property test for the propensity score matching analysis is presented in Table 3. Table 3 shows both matched and unmatched results which indicate the chi-square test after the match which shows that the probability value of all covariates in the probit model are not jointly significant. This confirms that there is no pre-treatment difference between the beneficiaries and non-beneficiaries' households; meaning that the self-selection bias has been removed, satisfying the matching requirement for computing treatment effect. As expected, there was an overall increase in agricultural production due to participation in *Fadama* IIIAF. Table 4 showed that all the matching method indicated a significant impact on income the direction of impact for all the method were positive. Specifically, the estimate of the average treatment effect shows that *Fadama* IIIAF beneficiaries have more annual income of ₦309,000 than the non-beneficiaries. This finding disagree with that of Yunana *et al.* (2013) who reported that, the impact of *Fadama* III project, on farm income in FCT Abuja, Nigeria. It was observed that the project led to a reduction in farm income.

The impact of *Fadama* IIIAF on sorghum and rice in the study area was remarkable (Table 4). The most significant impact of *Fadama* IIIAF on crop productivity was among the beneficiaries. All the matching shows that productivity was positive and highly significant at (0.01%) level. Table 4 shows that the productivity increased by ₦6.478k shows a positive effect on beneficiaries at 0.01 level of significant than the non-beneficiaries. Agbarevo *et al.* (2014) also observed that participation in *Fadama* III project significantly increased crop production among *Fadama* III beneficiaries in Benue state, Nigeria.

**Table 2: Summary statistics on the Effect Of *Fadama* III AF on the income, labor, productivity and area of land cultivated in Niger state, Nigeria**

Variables	Beneficiary			Non-Beneficiary			Difference		
	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum
Income	446000	28000	7000000	694267	48000	7000000	197733	28000	2000000
Age(Years)	36.7583	18	70	39.9167	21	70	33.6	18	50
Sex	0.81667	0	1	0.73333	0	1	0.9	0	1
Marital status	0.58333	0	1	0.98333	0	1	0.98333	0	1
Education	6.15	0	18	4.06667	0	18	8.23333	0	15
Experience in farmi (Years)	15.075	3	5	17.05	7	50	13.1	3	30
Involvement in farming	0.81667	0	1	0.63333	0	1	1	1	1
Farm size(ha)	1.90775	0.5	5	1.99883	0.7	5	1.81667	0.5	5
Farm distance (m)	2.72917	0	20	2.65	1	11	2.80833	0	20
Labour (manday)				69.45	6	700	25.65	4	250
Output harvested (kg)				20.3783	1.14	239.73	4.59533	0.62	34.13

Source: Field Survey (2018)



**Table 3 Balancing property of beneficiaries and non-beneficiaries**

	Coefficient	Unmatched P-value	coefficient	Matched P-value
Age(years)	79.83229	0.99	0.508419	0.08
Sex	191539.7	0.27	6125787	0.49
Marital status	174224.3	0.42	3.583957	0.00
Educational attainment	15251	0.42	0518095	0.26
Experience in farming	-1704.131	0.86	0455363	0.21
Involvement in farming	-903093.7	0.00	0652933	0.75
Farm size(ha)	260368	0.00	0809471	0.74
Farm distance(m <sup>3</sup> )	5746.55	0.08	0.65293	0.26
Chi square	90.30***			
Pseudo R <sup>2</sup>	0.6900			

**Source:** Field Survey (2018)

**Table 4 Estimated Effect of *Fadama III* AF on the income, labor, productivity and area of land cultivated for the beneficiaries and non- beneficiaries (Nearest neighbor matching as the lead method)**

Matching method	Outcome indicator	ATT	t-value
Nearest neighbor matching	Income	3.09000	2.972***
	Area of land cultivated(ha)	-0.680	-0.628
	Labor used(manday)	-74.605	-1.527
	Productivity	6.478	4.906***
Radius matching	Income	3.01000	3.015***
	Area of land cultivated(ha)	-0.985	-1.359
	Labor used (manday)		
	Productivity	6.035	10.452***
Kernel matching	Income	3.03000	4.608***
	Area of land cultivated(ha)	-0.653	-0.870
	Labor used (manday)	-26.412	-0.474
	Productivity	6.376	3.678***
Stratification matching	Income	2.42000	8.949***
	Area of land (ha)	-0.933	-0.894
	Labor used (manday)	-11.083	-0.395
	Productivity	5.546	2.583**

**Source:** Field Survey (2018)

## CONCLUSION AND RECOMMENDATIONS

The Study was carried out to ascertain the effect of *Fadama III*AF intervention on the income of rural beneficiaries in Niger State. In order to ascertain the effect of *Fadama III*AF intervention on farmers comparison was made between beneficiaries and non-beneficiaries. The result on costs and returns revealed that beneficiaries had higher NFI of ₦ 313,467.88 per ha as compared to non-beneficiaries who obtained a lower NFI of ₦ 77,584.86 per ha this account for 75.24 percent difference in NFI. The study also revealed their mean incomes for beneficiaries' ₦ 694,266.7 and for non-beneficiaries' ₦ 197,733.3 the mean difference between them show a wide range difference. The result showed wide gap between the income generation of beneficiaries and non-beneficiaries. This implies that the expenditure by government on the project is justifiable.



Based on the results obtained and the conclusion made the following recommendations are made. There should be adequate awareness of the programme for increase participation by other farmers most especially at the local level. Given the positive impact of the project on the beneficiaries' similar interventions should be extended to communities that did not benefit from *Fadama IIIAF* project.

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