An Evaluation of the Poverty Status and Profit Efficiency of Rice Farmers: Empirical Evidence from Fadama III Additional Financing in Benue State, Nigeria

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Abstract

Reducing poverty through development programs is a major strategy employed by the Federal Government of Nigeria. To appraise the development project, this research's main objective was to evaluate the impact of Fadama III "irrigable land"Additional Financing (AF) on poverty status and profit efficiency among rice farming households in Benue State, Nigeria. Data were collected from a total sample of 625 respondents, including 358 participants in Fadama III AF and 267 non-participants. Descriptive statistics, the translog stochastic frontier profit function, and the Foster-Greer-Thorbecke poverty index were used to achieve the specific objectives of the study. The findings revealed that the incidence of poverty among the sampled rice farming households was high. A high proportion, 60% and 54%, were poor for participating and non-participating households, respectively. Similarly, participation in Fadama III AF significantly reduced consumption-based moderate and severe poverty by 32% and 44% among the participating rice farming households, respectively. Participation in Fadama III AF significantly reduced moderate and severe poverty by 38% and 35%, respectively. Furthermore, participants in Fadama III Additional financing (AF) were profit efficient, while their counterparts were profit inefficient, experiencing a profit shortfall of 15%. This inefficiency was partly due to non-optimal input prices for seeds, labor, and land, as well as the misuse of factors such as land. The study concluded that since Fadama III had positive and impactful outcomes on the poverty status of the participants, the government should sustain the progress achieved in the intervention through the injection of additional funding and scaling up inclusive participation of more women in the program.

Keywords: Efficiency, Financing, Poverty index, Profit function, Rice, Nigeria

Research article
Received Date: 5 January 2025
Accepted Date: 16 June 2025

INTRODUCTION

Hunger and poverty are related. Food insecurity is mostly a result of poverty (Debebe and Zekarias, 2020). In the first half of 2022, the agricultural sector contributed 23 percent of the nation's Gross Domestic Product (GDP), but the majority of people continue to lack access to enough food, and poverty rates remain high (Federal Ministry of Agriculture and Rural Development (FMARD), 2022; Okpala et al., 2023). An estimated 32.1 million people in Nigeria are currently in a stressed, crisis, or emergency food-insecure situation (Aduloju et al., 2022). This is reflected by Nigeria's high Global Hunger Index (GHI), low Food Consumption Score (FCS), and high-calorie deficiency (Global Hunger Index, 2019).

In Benue State in 2022, the Multidimensional Poverty Index (MPI) was 0.25. Of the 4.71 million inhabitants, 75% are multidimensionally poor, meaning they lack resources such as cooking fuel, suffer from food insecurity, and lack adequate housing (National Bureau of Statistics [NBS], 2022). However, the Nigerian government is not backing down on its efforts to reduce poverty, raise the income of the rural population, and reduce food insecurity among its ever-growing population by implementing various national programs and policies aimed at increasing agricultural production. The National Fadama Development Programme is one of the recent interventions aimed at increasing farmers' productivity, income, and livelihood. The National Fadama Development Project (NFDP) is a national rural and agricultural development project with broad activities that include off-wet season farming, post-harvest processing, and value chain conducts. This is conceived in order to meet the teeming demand of growing population of Nigerians as well as to support judicious used of endowed human and material resources in the country so that farmers can grow crops on consistent schedule and create more reliable food supply (Kuza et al., 2018).

Rice, like most agricultural crops in Nigeria, is grown on smallholding farms by smallholder farmers who rely heavily on agriculture for their livelihoods and live below the official poverty line of US$2.15 a day. Nigeria is an interesting case study, as about 83 million people were already living below the national poverty line (World Bank 2020). According to current World Bank predictions, Nigeria is expected to be one of the three nations with the largest increase in the number of poor people. Interventions aimed at combating poverty have mainly focused on the rural and agricultural populace. The strategies of these interventions primarily focus on providing inputs to increase agricultural production. However, agricultural production continues to be plagued by inefficiency (Onuche et al., 2015). Although it is anticipated that government initiatives will inevitably boost rice yields, this does not always imply more effective results in terms of efficiency. Efficiency is attained when resources are allocated in a way that results in the greatest quantity of output and revenue. The Fadama program, funded by the World Bank, the federal government, and state governments, aims to improve low-income farmers' conditions and Nigerians' access to food through increased production.

The Fadama development program has been studied extensively in the past and recently. However, this particular study provides information on how the program reduced moderate and severe poverty. Building upon these studies may be necessary due to frequent changes in economic fundamentals and indices. For instance, Kwon-Ndung et al. (2018) stated that there was evidence of a positive, heterogeneous, and significant impact of Fadama III on poverty alleviation, as household income among both the asset-poor and non-poor in Benue State was significantly raised. Although the study by Kwon-Ndung et al., (2018) was particularly helpful in understanding the poverty level of the beneficiaries. However, such findings do not necessarily demonstrate that the project has had a poverty-alleviating effect on them. This is based on the fact that an increase in income among asset-poor individuals or simply among the poor may not be sufficient to lift them out of poverty. In other words, there is still a need to determine whether the average income increase among the asset-poor or poor beneficiaries of Fadama III AF is significantly greater than the minimum income required for an individual to be considered non-poor. Similarly, very few studies have investigated the efficiency level of participants in Fadama projects. Therefore, this research study focuses on evaluating the profit efficiency and poverty status of rice farmers participating in Fadama III Additional Financing in Benue State, Nigeria. The specific objectives of the study are as follows:

i. Examine the profit efficiency of the rice farmers in Fadama III additional financing in the study area.
ii. Determine the impact of Fadama III additional financing on the poverty status of rice farmers in the study area.

METHODOLOGY

This study was conducted in Benue State, North Central Nigeria. The State is located between longitudes 7º47′E and 10ºE and latitudes 6º25′N and 8º8′N, sharing boundaries with five other states: Nasarawa State to the north, Taraba State to the east, Cross River State to the south, Enugu State to the southwest, and Kogi State to the west (Aminu & Nyor, 2021). The National Population Commission (2022) estimated Benue State's Population at 6141,300 people in 2022. The state experiences a rainy season from April to October, with annual rainfall ranging from 100 to 200 mm, and a dry season from late October to March. The temperature remains consistently high throughout the year, ranging from 23°C to 32°C. Arable land is estimated at 3.8 million hectares. Yamane's (1967) formula was used to determine the sample size for the participants and non-participants population.

$$n = \frac{N}{1+N(e^2)} \quad (1)$$

Where n is the sample size, N is the population size, 1 is a constant and e is the level of significance (confidence interval of 95%). Since there are 3406 participants' rice farmers, then the sample was

$$n = \frac{3406}{1+3406\ (0.05^2)} = 357.96\ n\sim\ 358$$

Multi-stage sampling technique was used in this study. The first stage involved the purposive selection of the 13 participating Local Government Areas (LGAs) of Fadama III AF in the state that received inputs for one year. In the second stage, purposive sampling was used to select farmers in the local government area who were rice farmers, as the Fadama III AF program targeted rice farmers in these areas (non-participants). In the third stage, rice farmers who had participated in the Fadama III AF program and the non-participants were selected through systematic random sampling. Since there was a list of rice farmers, this approach was preferred. The list of farmers (sampling frame) was accessed from the Benue State Agricultural and Development Authority (BNARDA), which comprised 3,406 rice farmers, from whom 358 participants were selected for the study. Another sampling frame consisted of lists of 900 rice farmers, from which 278 non-participants were also selected in the communities where the program was not conducted.

The first farmer was chosen at random, while subsequent farmers were chosen based on the adoption of the formula by Abdul-Rahman and Abdulai (2018).

$$K = \frac{N}{n} \quad (2)$$

Where k is the sampling interval, n is the sample size and N is the population size. An element was chosen from the list at random and every k^{th} element in the sampling frame selected. Table 1 summarizes the sampling procedure.

Table 1. Sampling Procedure

LGAs	Sample Frame		Sample Size		
	Participants	**Non-participants**	**Participants**	**Non-participants**	**Proportion**
Buruku	300	80	32	25	0.088
Gboko	565	150	59	46	0.165
Guma	550	80	58	25	0.161
Gwer- East	403	70	42	22	0.118
Gwer- West	110	50	12	15	0.032
Katsina-Ala	290	120	31	37	0.085
Kwande	230	55	24	6	0.067
Logo	150	100	16	17	0.044
Obi	155	60	16	31	0.045
Ogbadigbo	50	15	5	5	0.015
Oju	125	40	13	12	0.036
Otukpo	250	50	26	15	0.073
Ushongo	228	30	24	9	0.067
Total	**3406**	**900**	**358**	**267**	**1**

Source: Benue State Fadama III AF ICR, 2019, BNARDA, 2019

Data was gathered from cross-sectional primary sources. The researcher administered a well-structured questionnaire to the sampled farmers between November 2021 and February 2022, with the assistance of qualified enumerators. The data collection followed a reconnaissance survey in September 2021. Data on participants' and non-participants' socioeconomic, demographic, income, and spending patterns were collected, as well as information on the inputs and outputs used in rice production, the associated costs of those expenditures, and the sales of that output using recall information. This study does not measure the impact of Fadama III AF over time but rather at the time the study was conducted.

Model Specification

To accomplish objective one, which required determining the maximum profit from rice production given the inputs utilized, the output gained, and their corresponding market values, Rahman (2004) stochastic frontier translog profit function was employed. The models was estimated as follows

$$\ln\boldsymbol{\pi} = \boldsymbol{\alpha_0} + \sum_{i=1}^{4} \boldsymbol{a_i}\, \boldsymbol{lnP_i'} + \frac{\mathbf{1}}{\mathbf{2}} \sum_{i=j}^{4} \sum_{j=1}^{4} \boldsymbol{\tau_{ij}} \boldsymbol{lnP_i'}\, \boldsymbol{lnP_j'} + \sum_{i=1}^{4} \sum_{k=1}^{2} \boldsymbol{\emptyset_{ik}}\, \boldsymbol{lnP_i'} \boldsymbol{lnZ_k} + \sum_{i=1}^{2} \boldsymbol{\beta_k}\, \boldsymbol{lnZ_k} + \frac{\mathbf{1}}{\mathbf{2}} \sum_{k=1}^{2} \sum_{l=1}^{2} \boldsymbol{\varphi_{kl}}\, \boldsymbol{lnz_k ln\, z_l} + \boldsymbol{\varphi D_1} + \boldsymbol{v_i} + \boldsymbol{u_i} \quad (3)$$

Where
$\tilde{\pi}_i$ =Normalized profit of rice harvested (₦)
$\tilde{l}_n$ =Natural log
$p_i(p_j)$ =Profit of rice harvested (₦)
p_{1i} =Normalized price of seed (₦/kg)
p_{2i} = Normalized price of fertilizer (₦/kg)
p_{3i} = Normalized price of labour (₦/man-day)
p_{4i} = Normalized price of agrochemical use (₦/L)
z_{1i} =Farm size (₦/ha)
z_{2i} =Farm capital (sum of total cost of hoes, sprayers, sickle and other farm implements ₦)
D_i = Participation in Fadama III AF (Yes=1; No=0)
v_i = two sided random error
u_i = one-sided half-normal error
$\alpha_0, a_{i,}\tau_{ij}, \emptyset_{ik}, \beta_k, \varphi_{kl}\delta_0and\omega_i$are the parameters of the model.
Where

$$u = \delta_0 \sum_{d=1}^{12} \delta_d w_d + \omega \quad (4)$$

w_d = Variable explaining the inefficiency effects
w_1 =Sex of the farmer (Male =1; Female = 0)
w_{2i} = Age of the farmer (Years)
w_{3i} = Education level of the farmer (Primary education = 1; Otherwise = 0)
w_{4i} = Education level of the farmer (Secondary education = 1; Otherwise = 0)
w_{5i} = Education level of the farmer (Tertiary education = 1; Otherwise = 0)
w_{6i} = Experience in rice farming (Years)
w_{7i} = Household size (Number)
w_{8i} =Cooperative membership (Years)
w_{9i} = Contact with extension agents (Yes =1; No = 0)
w_{110i} = Log of total income excluding income from rice farming (₦)
w_{11i} = Loan from cooperatives (Yes =1; Otherwise = 0)
w_{12i} = Loan from friends and family (Yes =1; Otherwise = 0)
D_i = Participation in Fadama III AF (Yes=1; No=0)
The Foster Greer and Thorbecke poverty Index was used to achieve objective ii of the study. The study adopted both income and expenditure as poverty indicators as stated by World Bank (2005). In order to achieve that, two measures of welfare were first considered namely households' annual total income and consumption expenditures. Let I_i and C_{1i} be the annual totals of income and spending on consumption, respectively. The model is stated thus;

$$y_{1i} = \begin{cases} Non-poor \;\; if \;\; PCI_i \geq \left[\left(\frac{2}{3}\right)\left(\frac{1}{N}\sum_{i=1}^{N} PCI_i\right)\right] \\ Moderately\ poor \;\; if \;\; PCI_i > \left[\left(\frac{1}{3}\right)\left(\frac{1}{N}\sum_{i=1}^{N} PCI_i\right)\right] \quad \& \quad PCI_i < \left[\left(\frac{2}{3}\right)\left(\frac{1}{N}\sum_{i=1}^{N} PCI_i\right)\right] \\ Severely\ poor \;\; if \;\; PCI_i < \left[\left(\frac{1}{3}\right)\left(\frac{1}{N}\sum_{i=1}^{N} PCI_i\right)\right] \end{cases} \quad (5)$$

$\text{PCI}_i = (I_i/N)/365 =$ Per capita daily income (₦/Person/Day); $\text{PCE}_i = (E_i/N)/365 =$ Per capita daily consumption expenditures (₦/Person/Day); $N =$ Sample size. Note that for the purpose of analysis, y_{1i} and y_{2i} were recoded as $y_{1i} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ and $y_{2i} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$, respectively.

RESULTS and DISCUSSION

Profit efficiency of the participants and non-participants rice farming households in Fadama III AF

The result in Table 2 presents the maximum likelihood estimates of the translog stochastic frontier profit function. The model was statistically significant at 1% level of probability (Wald Chi2(28) =1,189.38; p<0.01), meaning that all the independent variables jointly influenced the dependent variable (profit). Lambda estimate was positive and significant, which implies that there was profit inefficiency in rice farming. In order words, rice farmers can still improve their profit level with the resources available and their current market prices. This agrees with Adamu and Bakari (2015) who found evidence of profit inefficiency among small scale rice farmers in Taraba State, Nigeria. The price of seed had a positive and significant effect on profit, which means that increase in the price of seed will increase rice profit. The finding is contrary to the a priori expectation (Wijetunga, 2016; Okoruwa et al., 2009). However, in line with Musaka (2017), farmers hold the opinion that the more expensive the seed, the better it is for production. Dang (2017) claims that this positive relationship between the price of seed and profit can be explained by the fact that farmers spend more on improved seeds and generate more profit than their competitors. This demonstrates that it was sensible to raise the price and quality in order to increase profit because the marginal value productivity of better seed was more than its price. This could well be true in this study given that the majority of the farmers reported using high quality seeds such as Faro 44 and Faro 52. There was evidence of a positive and significant interaction effect on profit between the price of seed and the price of fertilizer, thereby signifying that rice farmers spending more on fertilizer and seed were particularly better off in terms of profit realized than their counterparts. This finding further suggests that increase farmers' profit with improved fertilizer management practices improved yield (Oyinbo et al., 2021).

The cost of labour had a positive and significant effect on profit. Although contrary to the a priori expectation but similar results were found by Dang (2017) in Vietnam and Ogundari (2006) in Oyo State, Nigeria. This may be due to the fact that rice production is labour intensive considering that most farm operations were carried out manually which resulted to an increase in the cost of labour. The services of hired labourers are frequently used by the farmers especially in planting and nursing activities. The same finding was found by Ogundari (2006), Adeleke et al. (2008) in Atiba, Oyo State, and Wadud (2011). Similarly, land and farm capital are significant and an increase in a unit will lead to an increase in the profit of rice for the farmer.

Table 2. Maximum likelihood estimates of the translog stochastic frontier profit function for rice production

Variables	Parameters	Coef.	Std. Err.	*t*-value
Constant	$p0$	-4.428	5.754	1.327
Cost of Seed	$p1$	5.811***	2.833	8.643
Cost of Fertilizer	$p2$	10.796***	3.406	14.202
Cost of Labour	$p3$	3.183***	3.435	6.617
Cost of Agrochemical	$p4$	-4.483	3.152	-1.331
Land	$z1$	1.438***	3.676	5.114
Farm capital	$z2$	0.460*	1.258	1.719
Squared terms				
½ln price of seed x In price of seed	β_{11}	-1.363	0.305	-1.059
½ln price of fert x In price of fert	β_{22}	0.203	1.075	1.278
½ln price of lab x In price of lab	β_{33}	2.862***	1.364	4.226
½ln price of agro x In price of agro-chemical	β_{44}	-2.769*	0.922	-1.847
½ln price of land x In price of land	α_{11}	-0.126	0.333	0.207
½ln price of farm capital x In price of farm capital	α_{22}	0.104	0.171	0.275
Interaction among inputs				
½ ln price of seed x ln price of fertilizer	β_{12}	1.028*	0.609	1.636
½ ln price of seed x ln price of labour	β_{13}	-1.204	0.508	-0.696
½ ln price of seed x ln price of agro	β_{14}	-0.347	0.414	0.067
½ ln price of fert x ln price of labour	β_{23}	-0.346	0.838	0.493
½ ln price of seed x ln price of agrochem	β_{24}	3.540***	0.868	4.408
ln price of labour x ln price of agroc	β_{34}	-1.807	0.984	-0.823
ln price of land x ln price of farmcap	α_{12}	-0.210	0.499	0.290
½ ln price of seed x ln price of land	β_{1z1}	0.055	0.178	0.233
½ ln price of seed x ln price of farmcap	β_{1z2}	-0.545	0.370	-0.174
½ ln price of fert x ln price of land	β_{2z1}	-1.152	0.495	-0.657
½ ln price of fert x ln price of farmcapital	β_{2z2}	-0.127	0.395	0.267
½ ln price of labour x ln price of farmcapital	β_{3z1}	1.039	0.396	1.436
½ ln price of labour x ln price of farmcap	β_{3z2}	-0.391	0.455	0.063
½ ln price of agro x ln price of land	β_{4z1}	0.156	0.343	0.499
½ ln price of agro x ln price of farmcap	β_{4z2}	-0.513	0.423	-0.090
Diagnostic statistics				
D	Φ	-0.156	0.051	-0.106
Sigma_u	σ_u	0.089***	0.029	3.012
Sigma_v	σ_v	0.463***	0.013	35.260
Lambda	Λ	0.191***	0.032	6.048
LLF		-416.91		
Wald chi2(28)		1,189.38***		
p>chi2		<0.001		
Observations		625		

Source: Field Compilation (2022)
LLF=Log-likelihood Function; ***<0.01, **<0.05 and *<0.1

Impact of Fadama III AF on the poverty status rice farming households

The ML estimates of the ESR model of the consumption- and income-based poverty status are given in Table 3 and Table 4. Both models were statistically significant at 1% level of probability ($Wald_1$ = 234, p<0.01; $Wald_2$ = 266, p<0.01), which means that the independent variables influenced the dependent variables. The LR tests of independence between the selection and outcome equations were statistically significant, which means that the hypothesis to no selectivity bias was rejected. In other words, there was correlation between the selection equation and the outcome equations in the consumption and income-based ESR model of poverty.

According to the ESR model of the consumption- and income-based poverty status, participation in Fadama III AF was determined by marital status, household size, land size, rice earnings, earnings from other livelihood activities, values of total assets owned, cooperative membership and number of years of cooperative membership. All these factors had a linear relation with the decision to participate in Fadama III AF except for the value of total assets owned.

Additionally, while the probability to participate in Fadama III AF increased with household size, earnings from other livelihood activities, cooperative membership and number of years of cooperative membership; it decreased with land size, rice earnings and being a widower/widow. The determinants of the consumption- and income-based poverty status among the participating and non-participating households were quite similar except for slight differences in terms of the magnitude of the influence of the independent variables perhaps suggesting the presence of some level of heterogeneity in the sample. Also, it can be seen that while education did not have any influence on poverty status among participating households, non-participating households headed by people having tertiary education were less likely to become non-poor than their counterparts. Although education is critical for growth in every sector of an economy as being an added advantage, its contribution alone without other significant efforts in terms of establishment of physical and institutional capital could lessen its poverty alleviation effect.

Table 3. FIML estimates of the switching regression model for the consumption expenditures-based poverty status of participants and nonparticipants

	Participation (D = 1/0)			Poverty status for D = 1			Poverty status for D = 0		
Variables	**Coef.**	**SE**	***t*-value**	**Coef.**	**SE**	***t*-value**	**Coef.**	**SE**	***t*-value**
Constant	-5.122**	2.054	-2.490	-0.553	0.368	-1.500	-0.303	0.373	-0.810
Sex	0.145	0.141	1.030	-0.005	0.020	-0.240	0.019	0.028	0.670
Age	-0.004	0.049	-0.070	-0.010	0.007	-1.550	-0.039***	0.011	-3.410
Squared age of rice farmer	0.0001	0.001	0.200	0.0002***	0.0001	2.890	0.0003**	0.0001	2.900
Primary Education	0.082	0.256	0.320	-0.008	0.038	-0.220	0.094	0.058	1.620
Secondary Education	-0.131	0.227	-0.570	-0.039	0.030	-1.290	-0.057	0.050	-1.130
Tertiary Education	-0.089	0.221	-0.400	-0.008	0.032	-0.250	-0.079*	0.047	-1.680
Marital status (Divorced, 0)	0.142	0.398	0.360	-0.072	0.060	-1.210	0.043	0.081	0.530
Marital status (single)	-0.177	0.255	-0.690	0.127***	0.043	2.980	-0.101*	0.059	-1.720
Mstatus widower	-0.432*	0.229	-1.880	-0.085**	0.038	-2.250	-0.046	0.047	-0.980
Household size	0.140***	0.036	3.880	0.002	0.004	0.510	0.009	0.009	1.030
Main occupation	-0.203	0.166	-1.220	0.109***	0.024	4.550	0.101***	0.034	3.020
Farm size	-0.759***	0.104	-7.330	-0.042**	0.019	-2.160	-0.090***	0.025	-3.660
Total income excluding rice income	-0.156*	0.132	-1.190	0.045*	0.023	1.970	0.025	0.025	1.000
Log of rice income	0.308***	0.079	3.880	-0.030**	0.012	-2.500	0.048***	0.019	2.580
Non-farm asset owned	2 E-05***	2.8E-06	5.150	7 E-06***	4 E-07	19.710	8 E-06***	8 E-07	10.570
Square of non-farm asst owned	-2 E-11***	3.9E-12	-4.600	-8 E-12***	5 E-13	-15.840	-10 E-12***	1 E-12	-9.290
Farm asset owned	1.890***	0.155	12.210						
Square of farm asset owned	0.185***	0.048	3.870						
Sigma 1	0.167***	0.006	26.701						
Sigma 2	0.215***	0.010	21.871						
Rho 1	-0.057	0.137	-0.415						
Rho 2	0.267*	0.137	1.947						
LR Chi2 test of indep.	3.6*								
LLF	-77.19								
Observations	625								
Wald1 chi2	234***								
Prob > chi2	<0.001								

Source: Field Compilation (2022)

***<0.01, **<0.05 and *<0.1; LR=Likelihood Ratio; LLF = Log-likelihood Function; D =1 = Participants; D = 0 = Nonparticipants.

Table 4. FIML estimates of the switching regression model for the income-based poverty status of participants and nonparticipants

	Participation (D = 1/0)			Poverty status for D = 1			Poverty status for D = 0		
Variables	**Coef.**	**SE**	***t*-value**	**Coef.**	**SE**	***t*-value**	**Coef.**	**SE**	***t*-value**
Constant	-5.570***	2.002	-2.780	-3.590	0.458	-7.840	-1.641***	0.404	-4.060
Sex	0.131	0.140	0.930	-0.015	0.025	-0.600	-0.007	0.031	-0.220
Age	0.012	0.049	0.240	-0.008	0.008	-0.990	-0.051***	0.012	-4.180
Squared age of rice farmer	-0.0001	0.001	-0.170	0.0002*	0.0001	1.820	0.001***	0.0001	3.900
Primary Education	0.116	0.256	0.450	0.006	0.047	0.130	-0.081	0.063	-1.280
Secondary Education	-0.107	0.226	-0.470	0.010	0.038	0.260	-0.174***	0.054	-3.200
Tertiary Education	-0.053	0.221	-0.240	0.011	0.040	0.270	-0.110**	0.051	-2.150
Marital status (Divorced, 0)	0.086	0.396	0.220	-0.171**	0.075	-2.290	0.150*	0.088	1.700
Marital status (single)	-0.189	0.254	-0.740	0.108**	0.053	2.020	0.019	0.064	0.300
Mstatus widower	-0.424*	0.229	-1.850	-0.066	0.047	-1.400	0.018	0.051	0.350
Household size	0.129***	0.036	3.600	-0.029***	0.005	-5.580	-0.026***	0.010	-2.630
Main occupation	-0.237	0.165	-1.430	0.080***	0.030	2.640	-0.013	0.036	-0.360
Farm size	-0.743***	0.103	-7.220	0.048**	0.024	1.990	0.065**	0.027	2.430
Total income excluding rice income	-0.150	0.128	-1.180	0.213***	0.028	7.530	0.089***	0.027	3.270
Log of rice income	0.312***	0.077	4.060	0.061***	0.015	4.000	0.147***	0.020	7.390
Non-farm asset owned	1 E-05***	3 E-06	4.820	5 E-06***	4 E-07	11.030	3 E-06***	8 E-07	3.870
Square of non-farm asst owned	-2 E-11***	4 E-12	-4.330	-5 E-12***	6 E-13	-9.050	-3 E-12***	1 E-12	-2.670
Farm asset owned	1.923***	0.155	12.420						
Square of farm asset owned	0.207***	0.045	4.570						
Sigma 1	0.211***	0.008	25.578						
Sigma 2	0.232****	0.010	22.609						
Rho 1	-0.278**	0.127	-2.192						
Rho 2	0.169	0.136	1.238						
LR Chi2 test of indep.									
LLF	-179.06								
Obs	625								
Wald2 chi2	266***								
Prob > chi2	<0.001								

Source: Field Compilation (2022)
***<0.01, **<0.05 and *<0.1; SE=Standard Error.

CONCLUSION

The research was based on an evaluation of the poverty status and profit efficiency of rice Farmers in Fadama III additional financing in Benue State, Nigeria. The Fadama III additional financing program has a considerable impact on the profit efficiency and poverty status of the rice farmers. Although the magnitude of the estimated effects differs depending on whether poverty is based on consumption or income. In terms of consumption poverty, the impact on moderate and severe poverty was minimal, but more on moderate poverty for income-based poverty.

The study concluded that Fadama III additional financing decreases the incidence of poverty and enhanced the profit efficiency of the participants. We recommend that the project should be sustained and improved upon. This can be done with additional funding of the programme and the elimination of gender bias through the inclusion of more women in the initiative.

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