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IMPACT OF *FADAMA*-II PROJECT ON INCOME AND INEQUALITY OF RURAL HOUSEHOLDS IN NIGERIA

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ABSTRACT

Past government efforts to reduce rural inequality in Nigeria have not led to appreciable impact due to their supply driven approach. Recently emphasis is now shifting to demand driven approach through Community Driven Development (CDD) projects with focus on bottom-up development. *Fadama*-II one of the CDD projects invested mainly in agricultural projects to increase the income of the users. However, the impact of *Fadama*-II on Income inequality (IE) has not been fully ascertained. Therefore, the impact of *Fadama* II on income inequality of rural households in Nigeria was investigated. The data for this study were obtained from secondary source through a survey conducted in twelve World Bank supported Fadama states by International Food Policy Research Institute in 2006/2007 farming year. Only 1, 738 matched observations from the 3,750 respondents were used in this study. The data were analyzed using, propensity score matching; descriptive statistics double difference estimator, and Gini-coefficient. The result shows that across the three agro ecological zones, annual per capita expenditure increased by 13.8%, 17.1% and 29.1% for HF, MS and DS zones, respectively with Taraba state having the highest change in mean income of 28% while the least is Oyo state (3.2%). *Fadama* II was income inequality (IE) decreasing nationwide (21.2%) with female Fadama Beneficiaries (FB) having the highest reduction of 27.2% compared with male counterparts of 14.1%. The IE reduced by 28.4%, 12.9% and 11.7% in HF, MS and DS. Also across the benefiting states IE reduced with Lagos state having the highest decrease (38.9%) while Adamawa had the least (3.1%). The study recommended that there is need to promote this type of Economic Community Driven Development project in the nation.

Keywords: *Fadama*-II project, income inequality, impact assessment, rural Nigeria.

INTRODUCTION

The problem of income inequality and poverty which are critical limiting factors on the way to development has for a long time been a cause for concern to the Nigerian government. Levels of inequalities have been aggravated in Nigeria as a result of the new causes associated with technology changes, lack of good governance, corruption, weak democratic institutions and past military rule which did not allow free discussion of issues or formulation of truly representative governance organs in the society (Aigbokhan, 1997 and 1999). Some researchers confirmed that income inequality is still on the increase in Nigeria. For instance, Canagarajah *et al.*, (1997) reported increased income inequality over the period spanning 1985 and 1992. This was established by an increase in the Gini coefficient from 0.381 in 1985 to 0.449 in 1992, in 1996/97 Gini index for Nigeria was 0.506, while it was 0.613 in 1998 (World Bank, 2003), but in 2004 household data Gini coefficient reduced to 0.5802 (Oyekale *et al*., 2006). It was also established that Gini index is higher in the rural areas than urban areas. In 1998, Gini index was 0.4799 in rural areas while it was 0.4132 in urban areas. In the same vein, in 2004 the Gini index of rural areas was 0.5808 while in the urban areas it was 0.5278 (Oyekale *et al*., 2006).

However, since efforts of the government to equally redistribute income through taxation policy and the continued efforts through some poverty alleviation programmes did not show any sign of ameliorating the situation. Recently there has been a reorientation of the government's focus towards poverty reduction approaches. In order to reduce income inequality among vulnerable group (poor), Community Driven Development Projects (CDD) that is, bottom to top approach are being adopted in order to grow income of the poor, among which includes *Fadama*-II project. *Fadama*-II project was selected in this study among all other CDD programmes on the basis of its project activities which centered on Fadama User Groups (FUG) having common interest termed economic interest groups (EIG) since collective action can help to overcome many problems faced by poor farmers in production and marketing (Ostrom, 2004). *Fadama*-II was also the largest agricultural projects in the country. In contrary other CDD projects' activities centered on community level and invested mainly in social infrastructure (Federal Project Supporting Unit, 2008).

Fadama-II one of these CDD projects was assessed in this study. Fadama II was a follow-up on the first phase (1992-1998) and was designed to operate for six years (2004-2010). The main objective was to sustainably increase the incomes of the Fadama users through expansion of farm and non-farm activities with high value added output. It covers eighteen States including the Federal Capital Territory (FCT). Out of the 18 participating states, 12 of them were assisted by the World Bank (Adamawa, Bauchi, Gombe, FCT, Imo, Kaduna, Kebbi, Lagos, Niger, Ogun, Oyo and Taraba) with direct beneficiaries of about 2.26 million rural families. A primary aim of *Fadama*-II project was to ensure that other less dominant Fadama Users (Fisher folks, Pastoralists) and even marginal Users (hunters, gatherers) were recognized as Fadama Users and that their

role in maintaining these lands are acknowledged and respected. Moreover, vulnerable sub - groups such as widows, elderly were targeted to ensure that they are beneficiaries of project - funded activities NFDO, 2007.

Some of these studies have assessed the outcomes of the project using only data from participants which prevented them from getting the counterfactual outcomes-the outcomes of the participant if he had not participated in the project. Since impact of the project on the participant is the comparison between the outcomes of the participant if he had participated in the project and if he had not participated in the project. Also a few among these studies used data from both participants and non participants to get the counterfactual outcome using only Double Difference or Propensity Score Matching (Oni *et al*., 2007; Olaniran, 2010). But this study makes use of both Propensity Score Matching and Double Difference (DD) that was employed by Nkoya *et al*., 2007 to address the evaluation problem and used the counterfactual outcome framework to show the impact of the project on the outcome which is defined in the modern policy evaluation literature as the average of the treatment on the treated (ATT). This enables to address problem of selection on observable - PSM and unobservable characteristics-DD. Also counterfactual outcome framework (ATT) helps to further reduced bias estimates. This study further distinguishes itself from other past studies in terms of objectives, since increase in income inequality threatens growth and poverty reduction therefore this study examines contributions of *Fadama*-II project to income inequality. The study is significant in that it helps to know the structure of income inequality in the *Fadama*-II benefiting States. Arising from the foregoing this study assessed the impact of *Fadama*-II on income and income inequality of the rural households in Nigeria.

MATERIALS AND METHODS

Nature of data

The data for this study were obtained from secondary source through a survey conducted in twelve World Bank supported Fadama states by International Food Policy Research Institute in 2006/2007 farming year. The 12 States lie in three major agro ecological zones; the humid forest (Lagos, Ogun and Imo); moist savannah (FCT, Oyo, and Taraba) and dry savannah (Adamawa, Bauchi, Gombe, Kaduna, Kebbi, and Niger) zones. In each of the 12 benefiting states, the project was implemented in 10 selected Local Government Areas (LGAs).

The sample design was multi-stage sampling. This involved stratification of the sampling frame into three strata: (i) *Fadama*-II project participants; (ii) respondents who live in *Fadama*-II project communities but did not participate directly in the project (but who may benefit indirectly); and (iii) respondents who live in communities areas outside the *Fadama*-II local government areas (LGAs) but with socio-economic and biophysical characteristics comparable to the *Fadama* II project communities and in the same state.

In developing the sampling frame for the *Fadama*-II FCA, efforts were made to ensure that all 14 Fadama user groups (FUGs) supported by the project were included in the list. The sampling frame of the household survey also considered the gender of the respondent, ensuring that a quarter of the respondents from each FCA were female. The sampling procedure involved listing the Fadama II LGAs in each state and then randomly picking four *Fadama*-II LGAs. One Fadama community Association (FCA) was randomly selected from each of the 4 LGAs and then 25 households were randomly selected from each FCA, summing up to 3,600 household in all. However, some field teams sampled more than 25 households per FCA, summing up to 3750.

A structured survey instrument (questionnaire) was used for the household survey. This survey consisted of baseline data (2005) which were collected using recall information. Because implementation of the project started only a little over a year (September 2005) before the survey was conducted, respondents were expected to remember the baseline data required for two years prior to the survey (i.e., for the crop years October 2004 to September 2005 and October 2005 to September 2006). The data collected include household composition and size, major assets and major components of household income and expenditure.

Method of analysis

The most accepted method to address evaluation problems is to use an experimental approach to construct an estimate of the counterfactual situation by randomly assigning households to treatment (beneficiary) and control (non-beneficiary) groups. Random assignment assures that both groups are statistically similar (i.e., drawn from the same distribution) in both observable and unobservable characteristics, thus avoiding program placement and self selection biases. Such an approach is not feasible in this study, since program placement and participation decisions were already made prior to design of this study, and are unlikely to have been random. The notion of random assignment also conflicts with the nature of this CDD program, in which communities and households make their own decisions about whether to participate and what activities they will pursue; thus limiting the ability to use this approach even from the outset. One of the most commonly used quasi-experimental methods was used-Propensity Score Matching. The sample collected was matched using Propensity Score Matching (PSM); the aim of PSM is to find the comparison group from a sample of non-participants that is closest to the sample of program participants so as to get the impact of the project on the beneficiaries (Nkoya *et al*., 2007).

These 1738 respondents were used for different analyses in this study. However, since PSM is subject to the problem of "selection on unobservable", that is the beneficiary and control groups may differ in unobservable

characteristics, even though they are matched in terms of observable characteristics. Therefore this study addressed the problem of selection on unobservable by combining PSM with DD estimator. The DD estimator compares changes in outcome measures (i.e., changes from before to after the project) between program participants and non participants. The advantage of this is that it nets out the effect on outcome indicator (Ravallion, 2005).

Explicit exploration of Double Difference Estimator is presented below:

$$\text{Double Difference Estimator} = E\left[(Y_{p_1} - Y_{p_0}) - (Y_{np_1} - Y_{np_0}\right] \quad (1)$$

Where

Y_{p_1} = income of beneficiary after project

Y_{p_0} = income of beneficiary before project

Y_{np_1} = income of non-beneficiary after project

Y_{np_0} = income of non-beneficiary before project

E = expected value.

Estimating the impact

Since the match has been deemed of good quality, this study then used the matched sample to compute the Average Treatment Effect for the treated (impact). It is estimated as follows:

$$E\left(Y^1 - Y^0 / D = 1\right) = E\left(Y^1 / D = 1\right) - E\left(Y^0 / D = 1\right) \quad (2)$$

where, $E\left(Y^1 / D = 1\right)$ is the observed outcome of the treated that is, the expected income earned by project beneficiaries while participating in the project and $E\left(Y^0 / D = 1\right)$ is the counterfactual outcome - the expected income they would have received if they had not participated in the project. The counterfactual outcome here represents outcome of the non beneficiaries since they have similar characteristics with beneficiaries. Standard errors were computed using bootstrapping method suggested by Lechner (2002) to further reduce bias estimate. This method is popularly used to estimate standard errors in case analytical estimates are biased or unavailable.

The three Probit Regression models used are as follows:

a) *Fadama* II beneficiaries (FB) compared with non *Fadama* II beneficiaries within Fadama LGA (NFBW). That is D = 1, represents FB; D = 0 represents NFBW.
b) *Fadama* II beneficiaries (FB) compared to non *Fadama* II beneficiaries outside Fadama LGA (NFBO). That is D = 1, represents FB; D = 0 represents NFBO.
c) *Fadama-II* beneficiaries (FB) compared with all non *Fadama-II* beneficiaries (ANFB). That is D = 1, represents FB; D = 0 represents ANFB

X is the multidimensional vector of pre-treatment characteristics (explanatory variables). These explanatory variables are those which are expected to jointly determine the probability to participate in the project and the outcome. They include: gender (female = 1, male = 0), years of education of respondent (years); household size, age (years), area of rainfed land (hectares), agro ecological zones (cf humid forest); moist savannah and dry savannah, distance to nearest all-weather road before the project (Km), distance to nearest town before the project (Km), value of livestock assets before project (₦) and value of productive assets before the project(₦).

Descriptive statistics

Level of income of *Fadama* II and Non- Fadama II households and their socio economic characteristics were analyzed using descriptive statistics; frequency distribution and percentage. Per capita household consumption expenditure was used as a proxy for per capita household income in this study. This is to overcome the problem of overstated or understated household income.

$$\text{Annual per capita Expenditure} = \frac{\text{Annual expenditure of household (respondent)}}{\text{Household size}}$$

Also since beneficiaries and non beneficiaries have similar observable and unobservable characteristics, the effect of *Fadama* II on income was analysed using ATT described in equation (2).

Measurement of income inequality

Income inequality of *Fadama* II and Non-Fadama II households was achieved by using Gini Coefficient and Double Difference Estimator (DD)

To calculate Gini - coefficient, Morduch and Sicular (2002) noted that where incomes are considered so that $Y_1 \leq Y_2 \leq Y_3 \leq \ldots \leq Y_n$.

The Gini coefficient is given by: $I_{Gini}\left(Y\right) = \sum_{i=1}^{n} a_i\left(Y\right) Y_i$

and $a_i\left(Y\right) = \frac{2}{n^2 \mu}\left(i - \frac{n+1}{2}\right)$

Therefore, $I_{Gini}\left(Y\right) = \frac{2}{n^2 \mu}\sum_{i=1}^{n}\left(i - \frac{n+1}{2}\right) Y_i \quad (3)$

Where

n = number of observations
μ = mean of the distribution
Y_i = income of the ith household $a_i(Y_i)$ is the weight
i = corresponding rank of total income.

The impact of *Fadama* II on income inequality was determined using equation (4) adapted from equation (2) since it is not possible to generate Gini Index for each respondent so as to incorporate it into the counterfactual framework.

$$\text{Impact}(\%) = \frac{(Gini_{p_1} - Gini_{p_0}) - (Gini_{np_1} - Gini_{np_0})}{Gini_{p_0}} * 100\% \quad (4)$$

Where

$Gini_{p_0}$ and $Gini_{p_1}$ Gini coefficient of beneficiaries before and after the project, respectively.

$Gini_{np_0}$ and $Gini_{np_1}$ - Gini coefficient of non-beneficiaries before and after the project, respectively.

Level of income by type of respondents

The values are all in real (deflated to 2003) values. The real value was computed using the consumer price index (CPI) with base year of 2003. The CPI was 158 and 153 for before (2005) and after (2006) the project respectively (Nkoya *et al*., 2007). Per capita consumption expenditure was used as the proxy for household annual income.

Table-1 presents level of income by type of respondents and gender. As shown in the table, the mean income of all the three types of respondents increased after the project implementation with *Fadama* II beneficiaries having the highest percentage change. The percentage change in mean income of *Fadama* II beneficiaries (FB) was 30.9% and 6.2% for all Non Fadama II beneficiaries (ANFB). The percentage change in mean income of Non-Fadama Beneficiaries living within Fadama L/Gs (NFBW) which was 8.3% is higher than that of Non Fadama Beneficiaries living outside *Fadama* L/Gs (NFBO) which is 4.5%. It is evident that income growth rate for all the three types are positive with FB having the highest growth rate (30.9%) followed by NFBW (8%) this could be as a result of spill over effect of the project. This implies that *Fadama* II affects incomes of the beneficiaries and NFBW positively by increasing it after one year of project implementation.

The impact of the project on the income of the beneficiaries due to participation in the project is shown using ATT. The result in the table should not be taken as mean income of the corresponding groups of non-beneficiaries but that of FB due to participation in the project when compared with the corresponding group of non-beneficiaries. The result shows that the average increase of real income of FB due to participation in the project is 27.7% and significant at 5% when compared with ANFB. This is above the goal of 20% increase that *Fadama* II sets to achieve for 50% of beneficiaries after six years of operation. Examining the spillover effect of the project by comparing FB with NFBW and NFBO, the results show 10% significant difference in change of income between FB and NFBW. These results suggest that it is possible that the Fadama II non-beneficiaries could have benefited from spillover of the project. For example, non-beneficiaries used roads, culverts and other public facilities funded by *Fadama* II. Non-beneficiaries could also benefit from services offered by beneficiaries. For example, beneficiaries who acquired milling machines could offer milling services and employment to non-beneficiaries.

Level of income by gender

The mean income of female FB increases more than that of their male counterparts with female FB having percentage change in mean income of 43.2% compared to that of male FB of about 27.6% after one year of project implementation (Table-1). This could be attributed to the fact that most female beneficiaries are engaged in processing activities which brings in returns within a short period while most male beneficiaries are involved in direct production. Similarly, the mean income of female NFBW increases more than that of their male counterparts with female NFBW having 11.6% compared with that of the male NFBW of about 8.7% this result could be due to spillover effect of the project. In contrast, the mean income of male ANFB and male NFBO increased more than that of their female counterparts. When the female beneficiaries and non beneficiaries were compared with one another the result showed that the mean income of FB increased more than that of the ANFB, NFBO and NFBW after one year of project implementation. The impact of the project was not statistically significant on income of female beneficiaries but positive and was more than that of the male when compared with ANFB, NFBW, and NFBO with income changes due to participation by 43.4%, 46% and 49.6%, respectively. This is an indication that *Fadama II* had impact on the Females' incomes.

Level of income by primary activity of respondent

Table-2 reveals the level of income of respondents by primary activity. From the results, changes in mean income varied among all the types of respondent by their primary activities after the project implementation. Respondents that engaged in farm activities had the highest change in mean income with FB having the highest percentage change of 30%. The farm activities consist of crop production, livestock and fishery activities with respondents that engaged in crop production activities having the highest percentage change in their mean income by 52.91%, 21%, 21% and 20% for FB, ANFB, NFBW and NFBO, respectively.

The table also presents the impact of Fadama II on income of the beneficiaries by their primary activities. The impact of the project varied on the income of the beneficiaries by their primary activities when compared to ANFB, NFBW and NFBO. The impact was significantly felt at 1% and 10% with changes in mean incomes of 48%, 51%, 44% and 42%, respectively among respondents that engaged in farm, crop and livestock activities due to participation in the project when compared with ANFB. The impact of the project was also felt at 1%, 5% and 10% with changes in mean income of 33%, 44% and 59% among respondents that engage in farm, crop and livestock activities respectively when compare with NFBW. The difference in the mean income of FB and NFBW was less than that of FB and NFBO this could be as a result of the spillover effect of the project.

Level of income across agro ecological zones

The mean income of Fadama and non Fadama beneficiaries increased across the three agro ecological zones after one year of project implementation (Table-3). The mean income of FB across the three agro ecological zones increased after one year of project implementation with Dry Savannah (DS) having the highest percentage change in mean income of about 38.6% followed by that of Moist Savannah (MS) 30.6% and the least in the Humid Forest (HF) 26%. Also the mean income of NFBW increased with percentage change in mean income 13.3% in the DS followed by that of MS about 8.1%. Comparing Fadama and non Fadama beneficiaries across the three agro ecological zones; the growth rate of FB in the three zones increased more than that of ANFB, NFBO and NFBW. In the same vein due to spillover effect of the project mean income that of the NFBW increased more than that of NFBO after one year of project implementation.

Moreover, Table-3 presents the impact of the project on the beneficiaries due to participation in the project compared with the corresponding groups. Fadama II had a significant impact (at P = 0.01) in DS zone where net participation led to an increase in income by 29.1%, 28.5 % and 46.1% when compared with ANFB NFBW and NFBO, respectively. In the MS zone, the mean income was significant at P = 0.05 due to participation in the project when compared with ANFB and at P = 0.01 when compared with NFBO but was not significant when compared with NFBW. Also in HF zone, income increased by 13.8% and 9.9% and 24.9% when compares with ANFB, NFBW and NFBO but not significant. This is an indication that *Fadama* II had impact across the three agro ecological zones except HF but the income still increased.

Level of income across *Fadama* II benefiting states

The mean income of FB across the twelve benefiting states increased after one year of project implementation with Kebbi state having the highest change in mean income of about 44.6% while the least is Oyo state (14.7%). Although the growth rate of all the states were positive across the three types of respondents but that of FB increased more than ANFB, NFBW and NFBO Also due to spillover effect of the project the mean income of all the states of NFBW increased more than that of NFBO. This implies that *Fadama* II project has improved the income of the beneficiaries even after one year of project implementation (Table-4).

Furthermore, Table-4 presents the impact of Fadama II on the income of the beneficiaries due to participation in the project compared to the corresponding groups. The result of ATT shows that there is significant difference in the mean income of FB in four benefiting states (Adamawa, Gombe, Kebbi and Kaduna) when compared with ANFB. Although the mean incomes were positive in Lagos and Oyo states but not significantly difference. The impact of other states using ATT could not be estimated due to small sample size. This is not an indication that *Fadama* II did not have impact in those states.

Level of income inequality of respondents by type

Income inequality of *Fadama* II Beneficiaries (FB) before the project is 0.5473 and after one year of the project is 0.4547 with decreasing percentage change of 16.92%. While there was an increase of about 4.94% and 14.02% in income inequality of all Non Fadama Beneficiaries and that of Non Fadama Beneficiaries living outside Fadama LGAs (NFBO), respectively (Table-5). Due to spillover effect, there is specifically a decrease of about 4.92% in income inequality of Non Fadama Beneficiaries living within Fadama LGAs. This implies that *Fadama* II project reduces income inequality of the beneficiaries. The table also shows the impact of the project on income inequality. Due to participation in the project income inequality of beneficiaries reduced by 21.2%, 12.5% and 28.4% when compared with ANFB, NFBW and NFBO, respectively however the lower reduction in the income inequality of Beneficiaries when compared with NFBW could be due to spillover effect of the project after on year of project implementation.

Level of income inequality of respondents by gender

Also from Table-5, income inequalities of female and male Fadama Beneficiaries decreased but that of female (25.65%) decreased much more than that of male beneficiaries (8.72%). However, the percentage change in income inequality of all female non Fadama beneficiaries as well as that of non-Fadama Beneficiaries living outside Fadama LGAs was not as high as that of their male counterparts. Also due to spill over effect percentage change in income inequality of female non-Fadama Beneficiaries living within Fadama L/Gs decreased at a higher rate when compared with the male counterparts. Generally, percentage change in income inequality of the female Fadama II beneficiaries decreased at a higher rate followed by that of NFBW while that of NFBO and ANFB increased. The Table also shows the impact of the project on income inequality. Due to participation in the project income inequality of female beneficiaries reduced by 27.23%, 22.03% and 30.84% when compared to ANFB, NFBW and NFBO. While that of the male beneficiaries reduced by 14%, 3.99% and 23.16 when compared to ANFB, NFBW and NFBO. The lower reduction in the income inequality of Beneficiaries when compared to NFBW could be due to spill over effect of the project after on year of project implementation. This implies that *Fadama* II project reduces gender inequality which is one of the goals of the project.

Level of income inequality of respondents by primary activity

Income inequality of FB across their primary activity declined but the decline was higher among the respondents that engaged in farm activities with crop production having the highest percentage change of 25% than those that engage in non farm activities (6%) and the

others (retired schooling and unemployed (13%)) after one year of project implementation (Table-6). This could be as a result of *Fadama* II investment in agricultural infrastructure. On the contrary, income inequality of ANFB incline with the respondents that engage in farm and non farm activities but the increase is higher among respondents that engage in farm activities but the income inequality of respondents that engage in crop production declined. Due to spill over effect income inequality of NFBW declined across the types of primary activities however the decline was higher among respondents that engage in crop production while income inequality incline across the different types of primary activities of NFBO after one year of project implementation.

The result also presents the impact of *Fadama* II on income inequality of respondents. Income inequality of beneficiaries declined across the different types of primary activities and the decline was higher for fishery (25%) activities when compared with ANFB. When compared with NFBW and NFBO income inequality of beneficiary declined across the different type of primary activities except among the NFBW that engage in non farm activities where their income inequality inclined. The decline in income inequality of beneficiaries was higher when compared with NFBO than when compared with NFBW (Table-6). This implies that the distance between the incomes of FB and NFBO was initially higher than that obtained when compared with NFBW.

Level of income inequality of the respondents across agro ecological zones

Table-7 presents level of income inequality of respondents across the three agro ecological zones. It reveals that income inequality of Fadama II beneficiaries across the three zones reduced after one year of the project implementation. This reduction indicates that, on the average, the distance between the incomes of FB have declined by 32.64%, 3.91% and 1.75% across the three agro ecological zones - HF, MS and DS respectively. While income inequality of ANFB at HF decreased that of MS and DS increased after one year of the project implementation. Due to spill-over effect, income inequality of NFBW at HF and DS decreased after one year of project implementation. However, income inequality of NFBW increased at MS but when compared with that of NFBO, the rate was lower than that of NFBO. The Table also shows the impact of the project on income inequality of beneficiaries across the agro ecological zones. The result reveals that income inequality of beneficiaries declined across the three agro ecological zones and the decline was higher for the HF zone.

Level of income inequality of respondents across states

Table-8 presents level of income Inequality of Respondents across the twelve Fadama II Benefiting states. The result reveals that income inequalities of FB fall in all the twelve benefiting states after the project implementation. There is an average decrease of about 7.1% in all the states with Lagos state having the highest percentage change of about 49.4%, followed by FCT (8.3%), Imo (4.9%), Gombe (4.8%), Taraba (4.4%), Kebbi (3.8%), Oyo (3.7%), Ogun (2.8%), Bauchi (2.3%), Niger (2.1), Adamawa (0.5%), and Kaduna having positive percentage change of about 1.7%.

The table also reveals that income inequality of ANFB increased in all the states except in Lagos with a decrease of 18%. Also, the income inequalities of NFBO increased in all the states except Ogun state that reduced by 1.1%. Due to spillover effect, income inequality of NFBW reduced in eight states with Lagos state having the highest percentage change of about 35.1% followed by Bauchi (3.2%), Oyo (3.2%), FCT (2.8%), Niger (2.2%), Kebbi (0.7%), Adamawa (0.6%) and Gombe state having the least percentage of about 0.3%. This implies that Fadama II project has reduced the income inequality target beneficiaries in all the benefiting states. The Table also presents the impact of Fadama II on income inequality of beneficiaries. The result shows that income inequality of FB declined across the twelve benefiting states and across the type of respondent except in Bauchi and Niger states where it inclined when compared to NFBW. Although income inequality reduced when compared to NFBW but the declined was lower than when compared to NFBO. This implies that the distance between incomes of FB and NFBW was not as wide as that of NFBO. This could be due to the spill over effect of *Fadama* II.

Table-1. Level of income by type of respondent and gender.

Type of respondent	Statistics	Before project	After project	% change before and after project	ATT	% Change due to participation
Fadama	Mean	52703.41	68986.42	30.89		
	SD	91730.26	65771.73			
Female	Mean	46547.47	66650.78	43.19		
	SD	127728.3	73880.72			
Male	Mean	54619.22	69713.3	27.64		
	SD	77279.47	63110.77			
ANFB	Mean	52621.52	55895.9	6.22	14585.64**	27.67
	SD	54407.99	66337.75		(6592.39)	
Female	Mean	49813.31	52435.9	5.27	20202.91	43.40
	SD	46645.05	50848.29		(24600.01)	
Male	Mean	53793.31	57338.97	6.59	9836.73	18.01
	SD	57323.18	71796.54		(6167.65)	
NFBW	Mean	52398.45	56730.93	8.27	10952.09*	20.78
	SD	49345.17	50603.61		(6603.81)	
Female	Mean	48756.93	53195.44	11.57	21392.28	45.96
	SD	41942.38	39379.94		(22492.27)	
Male	Mean	53789.7	58463.72	8.69	7555.45	13.83
	SD	51877.7	54227.89		(6032.24)	
NFBO	Mean	52813.58	55173.45	4.47	17047.37**	32.35
	SD	58455.53	77447.61		(7723.58)	
Female	Mean	50624.65	52621.53	3.95	23075.44	49.57
	SD	50049.72	58280.1		(20837.4)	
Male	Mean	53796.58	56318.85	4.69	12761.11	23.36
	SD	61889.22	84688.87		(8503.89)	

*, **, *** are significant levels at 10%, 5% and 1%, respectively.

$$\% \text{ Change due to participation} = \frac{\text{ATT}}{\text{Value of beneficiary before project}} X100$$

Table-2. Level of income of respondents by primary activity.

Primary activity of respondent	Statistics	Before project (N)	After project (N)	% change before and after project	ATT (N)	% Change due to participation
FB						
Fishery	Mean	41745.85	47883.38	14.70		
	SD	53560.01	51416.24			
Livestock	Mean	43924.12	57319.63	30.50		
	SD	41561.64	45197.26			
Crop production	Mean	44100.41	67432.07	52.91		
	SD	70002.29	113761.4			
Non Farm	Mean	44783.52	45673.09	1.99		
	SD	61852.88	58948.09			
Other	Mean	36093.36	42096.73	16.63		
	SD	36046.7	35198.81			
Total Farm	Mean	42260.35	54746.61	29.55		
	SD	54498.48	63344.86			
ANFB	Mean	37695.12	44195.77	17.25	2228.07	5.34
Fishery	SD	39447.23	74065.33			
Livestock	Mean	62749.95	69779.15	11.20	20977.27*	47.76
	SD	69629.33	78448.09			
Crop	Mean	51278.12	61828.32	20.57	22431.98***	50.86
	SD	73656.05	91253.46			
Non Farm	Mean	44539.17	51654.52	15.98	-11852.58	-26.47
	SD	51409.81	63487.97			
Others	Mean	48297.06	51381.65	6.39	5950.19	16.49
	SD	45549.1	46593.65			
Total Farm	Mean	43621.61	50742.06	16.32	13845.45***	32.76
	SD	51872.19	77840.63			
NFBW	Mean	38772.04	47089.22	21.45	3100.81	7.43
Fishery	SD	41505.47	91091.1			
Livestock	Mean	61792.59	69436.86	12.37	25941.44*	59.06
	SD	67446.2	76242.99			
Crop	Mean	45348.23	54772.4	20.78	18354.79*	44.32
	SD	51374.53	54354.86			
Non Farm	Mean	51761.9	61778.2	19.35	-5010.99	-50.49
	SD	36926.56	66876.45			
Others	Mean	54284.59	57951.46	6.76	4651.95	18.06
	SD	48924.63	51553.03			
Total Farm	Mean	42698.74	48011.88	19.42	13994.22**	33.11
	SD	48376.18	54255.67			
NFBO	Mean	36270.66	40368.58	11.30	5269.68**	12.62
Fishery	SD	36580.41	41938.23			
Livestock	Mean	63666.27	70106.77	10.12	17730.45*	40.37
	SD	72131.88	81051.52			
Crop	Mean	57317.83	69014.9	20.41	18354.79*	41.62
	SD	91062.37	117703.6			
Non Farm	Mean	36047.59	39752.36	10.28	-5010.99	-11.189
	SD	63648.57	57443.79			
Other	Mean	41687.44	44129.26	5.86	4651.95	12.89
	SD	40806.78	39496.69			
Total Farm	Mean	42698.74	48011.88	12.44	14097.49***	33.36
	SD	48376.18	54255.67			

*, **, *** are significant levels at 10%, 5% and 1%, respectively.

$$\% \text{ Change due to participation} = \frac{\text{ATT}}{\text{Value of beneficiary before project}} X100$$

Table-3. Level of income across agroecological zones.

Type of respondent	Statistics	Before project	After project	% change before and after project	ATT	% Change due to participation
FB						
HF	Mean	56585.47	71269.56	25.95		
	SD	129109	56683.29			
MS	Mean	50456.9	65892.62	30.59		
	SD	62084.59	71056.49			
DS	Mean	50695.74	70252.96	38.58		
	SD	62597.42	69477.9			
ANFB						
HF	Mean	56994.7	58919.05	3.38	7800.18	13.78
	SD	62022.35	65450.51		(20573.71)	
MS	Mean	48611.69	51703.88	6.36	8602.75**	17.05
	SD	53145.92	60665.84		(4704.44)	
DS	Mean	51359.62	56330.86	8.68	14762.56***	29.12
	SD	45183.43	72153.77		(3655.14)	
NFBW						
HF	Mean	56322.06	58869.8	4.52	5601.76	9.89
	SD	57172.23	53181.47		(23943.79)	
MS	Mean	48505.12	52414.11	8.06	5778.64	11.45
	SD	45694.29	51373.67		(10395.41)	
DS	Mean	51849.84	58731.46	13.27	14450.14***	28.50
	SD	42532.81	46521.69		(1665.08)	
NFBO						
HF	Mean	57553.81	58959.98	2.44	14088.49	24.89
	SD	65897.67	74234.25		(21967.61)	
MS	Mean	48715.31	51001.68	4.69	9384.54***	18.60
	SD	59633.83	68771.49		(2043.15)	
DS	Mean	50967.92	54412.67	6.76	23359.37***	46.08
	SD	47292.34	87467.37		(3785.95)	

*, **, *** are significant levels at 10%, 5% and 1%, respectively.

$$\% \text{ Change due to participation} = \frac{\text{ATT}}{\text{Value of beneficiary before project}} X100$$

Table-4. Level of income across Fadama II benefiting states.

States	Statistics	FB before (N)	After (N)	Income change (%)	ANFB before (N)	After (N)	Income change (%)	% change due to participation	NFBW before (N)	After (N)	Income change (%)	% change due to participation	NFBO before (N)	After (N)	Income change (%)	% change due to participation
Adamawa	Mean	46623.77	63526.53	36.25	43225.34	48381.5	11.93	17.32*	44177.78	49927.82	13.02	19.09***	42408.97	46954.12	10.72	19.55
	SD	67965.77	85943.92		34628.26	42140.11			20578.7	22944.73			43462.74	54487.25		
Bauchi	Mean	49673.78	68286.36	37.47	51112.68	55492.69	8.57		50573.87	57317.54	13.33		51611.08	53804.7	4.25	
	SD	35068.02	41643.78		42453.67	34108.64			33663.81	35974.88			49654.74	32656.04		
FCT	Mean	51337.8	67894.55	32.25	48230	50387.15	4.47		48404.05	56072.54	15.84		47982.11	49885.4	3.97	
	SD	58925.42	58508.55		57961.96	57919.46			50739.44	56816.21			61434.45	60340.84		
Gombe	Mean	51334.6	69399.32	35.19	54615.69	57840.12	5.90	32.27*	54679.04	57904.33	5.90	35.11***	54507.77	57730.73	5.91	16.05
	SD	30452.15	33818.9		55003.56	50977.47			57120.71	59293.11			52257.78	33340.22		
Imo	Mean	61715.57	77165.51	25.03	63011.96	64755.18	2.77		62489.84	64854.49	3.78		63388.27	64683.61	2.04	
	SD	40865.14	43322.71		48468.22	56250.23			54074.93	58490.57			44241.16	54847.29		
Kaduna	Mean	54908.96	71095.76	29.48	53657.97	56895	6.03	21.26**	55668.41	59451.71	6.80		52904.05	55936.23	5.73	12.94
	SD	30621.42	34063.09		37648.03	41228.26			35357.59	33547.28			38990.75	44214.51		
Kebbi	Mean	47835.55	69172.61	44.61	48177.66	55232.53	14.64	56.39***	48487.44	58150.1	19.93	34.44***	47953.33	53119.81	10.77	87.58***
	SD	96077.68	105557.1		45675.57	120172.9			38128.46	45605.56			50770.84	153544.2		
Lagos	Mean	53496.31	66562.19	24.42	52110.76	53063.32	1.83	4.73	52086.99	53504.76	2.72	-26.56	52134.24	52627.27	0.95	28.05
	SD	200198.7	75047.77		78576.31	76752.02			63962.66	43449.12			91146.9	99583.32		
Niger	Mean	52804.08	75396.45	42.79	51340	56811.02	10.66		52804.08	65396.45	23.85		50806.14	53661.97	5.62	
	SD	40571.77	48474.44		41761.26	46296.33			40571.77	48474.44			44936.83	47668.2		
Ogun	Mean	53253.8	69523.16	30.55	52579.5	56916.3	8.25		52144.81	57641.84	10.54		52935.15	54873.21	3.66	
	SD	32178.77	34543.44		51153.86	60269.31			46974.85	60425.39			54873.21	60833.62		
Oyo	Mean	60279.13	69124.96	14.67	58958.89	60047.6	1.85	11.99	58179.25	59549.41	2.36	16.27***	59703.09	60523.15	1.37	14.77
	SD	64972.75	62587.17		65336.15	80266.37			42062.67	41927.67			82159.68	105161.4		
Taraba	Mean	45401.18	64185.4	41.37	44655.04	48433.21	8.46		43589.53	49784.75	14.21		45528.42	47325.4	3.95	
	SD	57034.58	71983.79		49180.62	55563.58			50608.76	66608.64			48383.25	45099.76		

Table-5. Level of income inequality of respondents by type and gender.

Type of respondent	Gini before	Gini after	Percentage change	Impact (%)
FB	0.5473	0.4547	-16.92	
Female	0.6070	0.4513	-25.65	
Male	0.5286	0.4825	-8.72	
ANFB	0.4699	0.4931	4.94	-21.16
Female	0.4431	0.4527	2.17	-27.23
Male	0.4805	0.5087	5.87	-14.06
NFBW	0.4936	0.4693	-4.92	-12.48
Female	0.4391	0.4171	-5.01	-22.03
Male	0.5117	0.4867	-4.89	-3.99
NFBO	0.4485	0.5114	14.02	-28.41
Female	0.4438	0.4753	7.10	-30.84
Male	0.4502	0.5265	16.95	-23.16

Table-6. Level of income inequality of respondents by primary activity.

Primary activity of respondent	Gini before	Gini after	Percentage change	Impact (%)
FB				
Fishery	0.5364	0.4562	-14.95	
Livestock	0.4357	0.3871	-11.15	
Crop production	0.6932	0.5143	-25.81	
Farm	0.5549	0.4755	-14.31	
Non farm	0.5343	0.4999	-6.44	
Other	0.4748	0.4132	-12.97	
ANFB				
Fishery	0.4525	0.5057	11.76	-24.87
Livestock	0.4734	0.4692	-0.89	-10.19
Crop production	0.4944	0.4648	-5.99	-21.54
Farm	0.4753	0.5047	6.19	-19.61
Non farm	0.4895	0.5093	4.04	-10.14
Others	0.4172	0.4078	-2.25	-10.99
NFBW				
Fishery	0.4509	0.4426	-1.84	-13.41
Livestock	0.4722	0.4567	-3.28	-7.60
Crop production	0.5153	0.4296	-16.63	-13.45
Farm	0.4824	0.4614	-4.35	-10.52
Non farm	0.6177	0.5723	-7.35	2.06
Others	0.4209	0.4044	-3.92	-9.50
NFBO				
Fishery	0.4528	0.5453	20.43	-32.20
Livestock	0.4695	0.4779	1.79	-13.08
Crop production	0.4658	0.4893	5.05	-29.20
Farm	0.4682	0.5360	14.48	-26.53
Non farm	0.3727	0.4481	20.23	-20.55
Other	0.3948	0.3981	0.84	-13.67

$$\text{Impact (\%)} = \frac{(Gini_{p_1} - Gini_{p_0}) - (Gini_{np_1} - Gini_{np_0})}{Gini_{p_0}} * 100\%$$

Table-7. Level of income inequality of the respondents across agroecological zones.

Agro ecological zone	Type of respondent	Gini before	Gini After	Percentage change	Impact (%)
Humid Forest	FB	0.5640	0.3799	-32.64	
	ANFB	0.4351	0.4109	-5.56	-28.35
	NFBW	0.4666	0.3952	-15.30	-19.98
	NFBO	0.4069	0.4225	3.83	-35.41
Moist Savannah	FB	0.5141	0.4940	-3.91	
	ANFB	0.5238	0.5698	8.78	-12.86
	NFBW	0.5492	0.5541	0.89	-4.86
	NFBO	0.4948	0.5782	16.86	-20.13
Dry Savannah	FB	0.4410	0.4333	-1.75	
	ANFB	0.4242	0.4679	10.30	-11.66
	NFBW	0.4270	0.4207	-1.48	-0.32
	NFBO	0.4217	0.5040	19.52	-20.41

$$\text{Impact (\%)} = \frac{(Gini_{p_1} - Gini_{p_0}) - (Gini_{np_1} - Gini_{np_0})}{Gini_{p_0}} * 100\%$$

Table-8. Level of income inequality of respondents across state.

State	Type of respondent	Gini before	Gini After	Percentage change	Impact (%)
Adamawa	FB	0.5466	0.5437	-0.53	
	ANFB	0.5064	0.5203	2.74	-3.07
	NFBW	0.5373	0.5350	-0.43	-0.11
	NFBO	0.4496	0.4924	9.52	-8.36
Bauchi	FB	0.3825	0.3738	-2.27	
	ANFB	0.3121	0.3157	1.15	-3.22
	NFBW	0.3352	0.3244	-3.22	0.55
	NFBO	0.3243	0.3351	3.33	-5.10
FCT	FB	0.4897	0.4488	-8.35	
	ANFB	0.5231	0.5258	0.52	-8.90
	NFBW	0.5014	0.4876	-2.75	-5.53
	NFBO	0.5391	0.5474	1.54	-10.05
Gombe	FB	0.3195	0.3041	-4.82	
	ANFB	0.4395	0.4467	1.64	-7.07
	NFBW	0.4653	0.4638	-0.32	-4.35
	NFBO	0.3208	0.3239	0.97	-5.79
Imo	FB	0.3394	0.3228	-4.89	
	ANFB	0.3480	0.3643	4.68	-9.69
	NFBW	0.3434	0.3488	1.57	-6.48
	NFBO	0.3482	0.3741	7.44	-12.52
Kaduna	FB	0.2957	0.3008	1.72	
	ANFB	0.3144	0.3531	12.31	-11.36
	NFBW	0.2958	0.3009	1.72	0
	NFBO	0.3078	0.3470	12.74	-11.52
Kebbi	FB	0.5609	0.5394	-3.83	
	ANFB	0.4142	0.5564	34.33	-29.19
	NFBW	0.4074	0.4042	-0.79	-3.26
	NFBO	0.4151	0.6276	51.19	-41.72

Lagos	FB	0.9263	0.4691	-49.36	
	ANFB	0.5334	0.4369	-18.10	-38.94
	NFBW	0.6077	0.3944	-35.10	-26.33
	NFBO	0.4499	0.4688	4.20	-51.40
Niger	FB	0.4219	0.4132	-2.06	
	ANFB	0.3982	0.4042	1.51	-3.48
	NFBW	0.4321	0.4224	-2.24	0.24
	NFBO	0.4254	0.4291	0.87	-2.94
Ogun	FB	0.2940	0.2859	-2.76	
	ANFB	0.3342	0.3539	1.40	-9.46
	NFBW	0.3342	0.3437	2.84	-5.99
	NFBO	0.3582	0.3543	-1.09	-1.43
Oyo	FB	0.4882	0.4701	-3.71	
	ANFB	0.4730	0.5582	18.01	-21.16
	NFBW	0.3794	0.3672	-3.22	-1.21
	NFBO	0.5289	0.6199	17.21	-22.35
Taraba	FB	0.5178	0.4950	-4.40	
	ANFB	0.4970	0.5218	4.99	-9.19
	NFBW	0.4012	0.4100	2.19	-6.10
	NFBO	0.5986	0.6498	8.55	-14.29

$$\text{Impact (\%)} = \frac{(Gini_{p_1} - Gini_{p_0}) - (Gini_{np_1} - Gini_{np_0})}{Gini_{p_0}} * 100\%$$

CONCLUSIONS AND RECOMMENDATIONS

This study examines the impact of *Fadama* II on income and income inequality on the beneficiaries and non-beneficiaries. Based on the empirical evidence emanating from this study, *Fadama* II contributes significantly to income of the beneficiaries, nationwide, across the three agro ecological zones and in almost all the benefiting states. In the same vein, Fadama II contributes significantly to income of the non-beneficiaries living within the *Fadama* II LGAs areas due to spillover effect. The income of female beneficiaries increased more than that of the male beneficiaries which implies a significant impact of Fadama II on the female beneficiaries.

Moreover, *Fadama* II is income inequality decreasing, that is, income inequality declined in the nation, across the three agro ecological zones and in all the states except in Kaduna state where it inclined. Fadama II also reduced income inequality of female beneficiaries than that of male. This is implies that Fadama II is gender sensitive.

Based on the findings of this study and conclusion drawn, the following are recommended: The mean income of FB increased nation wide, across the three agro ecological zones and across the twelve benefiting states after one year of project implementation. Therefore there is need to promote this type of Economic Community Driven Development project in the nation. Also *Fadama* II is income inequality decreasing and poverty decreasing. Since Fadama II had significant impact on the income, income inequality and poverty of respondents that engaged in farm activities than non-farm activities. Hence there is need to promote enterprises that are agricultural based that is, agricultural activities focusing on livestock activities and crop activities.

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