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IMPACTS OF COMMUNITY-DRIVEN DEVELOPMENT PROGRAMS ON INCOME AND ASSET ACQUISITION IN AFRICA: THE CASE OF NIGERIA

Ephraim Nkonya,[1] Dayo Phillip,[2] Tewodaj Mogues,[1] John Pender,[1] and Edward Kato[1]

[1] International Food Policy Research Institute, 2033 K St., N.W. Washington, DC 20006

[2] University of Agricultural Abeokuta, Abeokuta, Ogun, Nigeria

Corresponding author: Ephraim Nkonya. Email: e.nkonya@cgiar.org,

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Abstract

This study evaluates the impacts of a community-driven development (CDD) project on household income and acquisition of productive assets in Nigeria. Using panel data and difference-in-differences and propensity score matching approaches, the study finds that the project succeeded in targeting the poor and women farmers in its productive asset acquisition component. Participation in the project also increased the income of beneficiaries by about 60%, which is well above the targeted increase of only 20% in the 6-year period of the project. However, sustainability of this dramatic achievement is uncertain since the project did not involve rural credit services. The large cash transfer through its productive asset acquisition component is also unsustainable.

Keywords: Nigeria, Africa, community-driven development, impact evaluation, poverty, targeting, income, assets

JEL: H43, H42, Q13, Q15

1. Introduction

The community-driven development (CDD) approach has become a key strategy used by both government and development assistance programs (Gillespie, 2004; Mansuri and Rao, 2004; Platteau, 2004). The popularity of the CDD approach has been propelled by its potential to develop projects and programs that are sustainable and responsive to local priorities, empower local communities to manage and govern their own development programs, and more effectively target poor and vulnerable groups (Gillespie, 2004). Empirical evidence of the effectiveness of CDD in achieving these objectives is mixed (Mansuri and Rao, 2004). Khwaja (2001) observed that projects managed by communities were more sustainable than those managed by local governments because of better maintenance of the assets and infrastructure created by the

project. However, and Mosse (1997) found that CDD projects that lacked continuous external institutional, financial, and technical support were not sustainable. In heterogeneous communities with high social inequality, the performance of CDD projects in targeting the poor has been worse than that of externally managed programs (Conning and Kevane, 2002). However, they also revealed that in egalitarian communities with open and transparent systems of decision making, targeting was better with CDD than with development approaches using external project management.

This study assesses the impact of a CDD project called Fadama II, which aims to reduce poverty by supporting communities to acquire infrastructure and productive assets, providing demand-driven advisory services, increasing the capacity of communities to manage economic activities, and reducing conflicts among resource users. We evaluate the impact of the project on income poverty and productive assets, and also examine whether the project succeeded in targeting the poor and the vulnerable through its poverty reduction efforts and productive asset acquisitions. Nigeria serves as a good case study country given its high incidence of poverty (55%) and since it has the largest population in sub-Saharan Africa – a region with the highest incidence of poverty (World Bank, 2007; Ojowu, et al., 2007).

2. Methodological Framework

This study was conducted in all 12 states benefiting from the project. Placement of Fadama II projects was not random. Purposive project placement is common with many government-funded programs in developing countries (Duflo et al., 2006). This introduces a selection bias in evaluation, which is addressed by combining average effect of the treatment on the treated (ATT) and propensity score matching (PSM) approach used in this study (described below).

We used a household survey to analyze the impact of the Fadama II project on beneficiaries and the spillover of benefits to nonparticipants living in Fadama II communities. To capture the spillover of impact to project nonbeneficiaries, we divided the sampling frame into three strata: (1) direct project participants, (2) respondents living in Fadama II communities but not directly participating in the project (although they might benefit indirectly), and (3) respondents living in communities in *fadama*[1] resource areas outside the Fadama II local government areas (LGAs) but with socioeconomic and biophysical characteristics comparable to the Fadama II communities and in the same state.

This stratification was designed to allow for estimation of the direct and indirect effects of Fadama II. By comparing project outcomes for direct beneficiaries with outcomes for similar nonparticipating households in the same communities, we obtained an estimate of the direct impacts of Fadama II participation. Because nonparticipating households in the Fadama II communities may have benefited from spillover effects, this comparison does not provide an estimate of the full impact of the project. Comparing Fadama II beneficiaries to similar households in similar communities not included in the project provides a better estimate of the total impact of the project on beneficiaries (assuming that spillovers are not affecting households in the communities outside the project).

A total of 3,750 households were randomly selected from the 12 states. The number of households sampled in each of the three categories were: 1,281 Fadama II beneficiaries, 1281 nonbeneficiaries within Fadama II LGA, and 1,229 nonbeneficiaries outside Fadama II LGAs. The ATT analysis requires baseline data of good quality. However, the baseline survey conducted by the project in 2005 did not cover the control group. Hence, we collected baseline data using recall information. Project implementation started in September 2005, only slightly

[1] *Fadama* is a Hausa word for low-lying flood plains, usually with easily accessible shallow groundwater.

more than a year before the survey was conducted. Therefore, we expected respondents to remember the baseline data for the crop years October 2004 to September 2005 and October 2005 to September 2006 .

Data analysis: We use ATT to assess the impact of the project:

$$ATT = E(\frac{Y_1}{p} = 1) - E(\frac{Y_0}{p} = 1) \quad (1)$$

where p = participation in the project (p = 1 if participated in the project, and p = 0 if did not participate in the project); Y_1 = outcome (household income, in this example) of the project beneficiary after participation in project; Y_0 = outcome of the same beneficiary if he or she had not participated in the project.

Adding and subtracting $E(\frac{Y_0}{p} = 0)$ on the right side of equation (1), we get

$$ATT = [E(\frac{Y_1}{p} = 1) - (E(\frac{Y_0}{p} = 0)] - [E(\frac{Y_0}{p} = 1) - (E(\frac{Y_0}{p} = 0)] \quad (2)$$

The first expression (within the first set of square brackets) is observable but the second expression is unobservable because $E(\frac{Y_0}{p} = 1)$ is unobservable and thus represents the bias resulting from project placement or targeting bias and self-selection bias. One approach for addressing bias is using a control group with comparable characteristics that affect the participation in Fadama II and the outcomes under consideration. We use PSM to match project beneficiaries and nonbeneficiaries. The difference in outcomes between the two matched groups can be interpreted as the impact of the project on the beneficiaries (Smith and Todd, 2001). We used this method to estimate the ATT for impacts of the Fadama II project on household productive assets and incomes. In our study, 1,728 of 3,758 observations matched. Therefore, we used only the matched observations to analyze the impact of Fadama II. The bias resulting from comparing noncomparable observations in some cases may be much larger than the bias

resulting from selection on unobservables (Heckman, Ichimura, Smith, and Todd, 1998). In this study, we address the problem of selection on unobservables by combining PSM with ATT estimator (Duflo, et al., 2006).

Combining PSM with ATT estimator controls for differences in pre-project observable characteristics can be established. A bias could still result from the heterogeneous or time-variant impacts of the unobservable differences between participants and nonparticipants. Such shortcomings are unfortunately inherent in all nonexperimental methods of impact assessment (Duflo et al., 2006). Although no solution to these potential problems is perfect, we believe the method we have used addresses these issues as well as possible in this case.

Several methods are possible for selecting matching observations. We used the kernel matching method (using the normal density kernel), which uses a weighted average of "neighbors" (within a given range in terms of the propensity score) of a particular observation to compute matching observations. Unlike the nearest-neighbor method, using a weighted average improves the efficiency of the estimator (Smith and Todd, 2001).

Further testing of the comparability of the selected groups was done using a "balancing test" (Dehejia and Wahba, 2002), which tests for statistically significant differences in the means of the explanatory variables used in the probit models between the matched groups of Fadama II participants and nonparticipants. In all cases, that test showed statistically insignificant differences in observable characteristics between the matched groups (but not between the unmatched samples), supporting the contention that PSM ensures the comparability of the comparison groups (at least in terms of observable characteristics).

We used bootstrapping to compute the standard errors of the estimated ATT, generating robust standard errors because the matching procedure matched control households to treatment

households "with replacement" (see Abadie and Imbens, 2002, on the use of bootstrapping for inference in matching estimators).

3. Empirical Results

Impact of Fadama II on asset acquisition: Because Fadama II supported productive asset acquisition by Fadama II beneficiary groups [Fadama User Groups (FUGs)] rather than assets owned by individual beneficiary households, we divided the productive assets into those owned by individual farmers and those owned jointly by economic interest groups.

Fadama II project had a large and statistically significant impact on the value of productive assets owned by groups and individuals benefiting from the project compared with nonbeneficiaries (Table 1). In all comparisons reported in Table 1, Fadama II beneficiaries saw the value of group-owned productive assets increase significantly across all, asset terciles, and genders. The poorest tercile of beneficiaries (in terms of value of assets owned before the project) experienced the largest increase of group-owned productive assets (both in absolute and percentage terms): an average increase of 91,780% (from only Naira (₦) 482 to ₦ 470,865). The reason for this massive increase is that ownership of group productive assets was relatively small for those beneficiaries before the project. The large increase in the value of jointly owned productive assets includes the value of the cash transfer (70% of the total productive asset value) from the project to the beneficiaries.

The most common FUG productive assets acquired were water and irrigation equipment. The value of FUG water and irrigation equipment increased by 2,771%, from ₦ 47,475 before the project to ₦1,362,937 by September 2006, highlighting the large impact that the project had on the value of productive assets. Further, privately owned water and irrigation assets more than

doubled in value over the same period. The large increases for individual productive asset types add up to a large increase in the total value of productive assets, especially for beneficiaries in the poorest asset tercile, who had few productive assets before the project.

The increase in value of productive assets among the upper asset tercile was only 63%. The value of productive assets owned by women's economic interest groups participating in the project also increased significantly compared with the value of productive assets belonging to women's groups not participating in the project. These results demonstrate that the pilot asset acquisition component succeeded in its efforts to target poor and vulnerable groups.

Compared with all nonbeneficiaries and with nonbeneficiaries within and outside project communities, beneficiaries experienced greater increases in the value of privately owned productive assets as a result of participating in the project. Comparisons between the male beneficiaries and male nonbeneficiaries also showed significantly greater increases in the value of private productive assets for beneficiaries. However, the increase in the value of productive assets was generally less for privately owned assets than for those owned by economic interest groups. That is because Fadama II supports asset acquisition through economic interest groups rather than individual Fadama users (NFDO, 2005). Nevertheless, FUG members were able to acquire such privately held productive assets through their groups. The individual acquiring the private asset would pay the entire beneficiary contribution in the name of the FUG. Fadama II did not interfere with this practice, which could explain the significant increase in the value of privately owned productive assets for beneficiaries. Another possible explanation is that FUG members were required to buy complementary inputs to support the jointly owned productive assets. For example, FUG members owning irrigation equipment may have needed to buy pesticide sprayers to grow irrigated vegetables. The statistically insignificant impact of

participation in the project on privately owned productive assets for beneficiaries in the poorest asset tercile and for female beneficiaries suggests that the poor and vulnerable were not able to finance both the privately owned productive assets and the beneficiary contribution of group productive assets. However, the estimated magnitude of the mean impacts for these groups was positive and large (128% increase for the poorest asset tercile and 32% for women), even though these estimates were not statistically significant. Therefore, the statistical insignificance of the estimates does not prove that the impacts were nonexistent; rather, it indicates that the variances of the subsample impacts were too large to measure with the sample size we had.

An interesting question to explore is the sustainability of the Fadama II success story beyond the project period and how it can be replicated to other communities. The major constraint faced by poor households is their inability to finance acquisition of high-value assets—even though the project contributed a significant amount of asset costs in grant form—without some form of support from projects or credit services. Fadama II did not involve credit service providers because of the high interest they charge and their limited availability. It is not clear how the poor were able to pay their contributions and if they were able to manage assets efficiently.

Impact of Fadama II on household income: On average, the real incomes of Fadama II beneficiaries increased 58.5% as a result of participation in the project, based on the PSM and double-difference estimation; that is well above the target of a 20% increase that Fadama II set to achieve for 50% of beneficiaries after 6 years of operation (Table 2). By contrast, average real incomes of all nonbeneficiaries increased only 15.5% and even less (12.7%) among nonbeneficiaries outside Fadama II communities (12.7%).

We also examined the spillover effects of the Fadama II project by comparing the changes in income of Fadama II beneficiaries with those of nonbeneficiaries living within and outside communities with Fadama II projects (Table 2). The results show no significant difference between the income changes of Fadama II beneficiaries and nonbeneficiaries living in the same community. These results suggest that nonbeneficiaries in Fadama II communities may have benefited substantially from spillover of the project. For example, nonbeneficiaries used roads, culverts, and other public facilities funded by Fadama II. Nonbeneficiaries could also benefit from services offered by beneficiaries. For example, beneficiaries who acquired milling machines could offer milling services and employment to nonbeneficiaries.

It is likely that the impact of the project on incomes will be larger in the future because of lagged effects of investments in productive assets. Even without longer-term lags, the impacts on incomes in 2005–2006 could be expected to be less than proportionate to the increase in productive assets because many of these investments may not have come soon enough to affect agricultural production and income for one year. We would expect the full effects of productive assets acquired to begin to be felt in the subsequent years. Future research on the impacts of Fadama II is needed to more fully assess income changes resulting from the project.

A comparison of men versus women beneficiaries showed no significant difference in income before or after the project. This could be due to the special preference that Fadama II gives to women whose incomes are usually lower than those of men. By targeting women, Fadama II may have enabled women to catch up with men in terms of income. The income change for female beneficiaries was significantly greater than the income change for female nonbeneficiaries. That was expected given the significant change in the value of productive assets for female nonbeneficiaries. We also find that the project significantly increased income

for male beneficiaries relative to male nonbeneficiaries, with a higher estimated percentage ATT for men than women.

Surprisingly, the Fadama II beneficiaries in the second tercile increased their incomes significantly more than the nonbeneficiaries in that tercile. That finding indicates that the project had a less immediate impact on poverty reduction among the poorest households, possibly because of the initial investments that the poor had to make to participate in the project. Such investments could have crowded out short-term investments for the poorest, most liquidity-constrained households that could have otherwise increased income in the first year of participation.

3. Conclusions and Policy Implications

In its first year of operation, the Fadama II project realized significant positive impacts on household income and productive asset acquisition. Using propensity score matching and double-difference methods to control for project placement and self-selection biases, we find that participation in the Fadama II Increased dramatically the value of productive assets, especially for the poorest households, largely because of the subsidy provided to help finance acquisition of such assets. Household incomes improved substantially more for Fadama II beneficiaries than for nonbeneficiaries, with an average increase in real income resulting from participation in Fadama II of about 60%, well above the target of at least 20% increase in income that Fadama II set to achieve in six years for 50% of the beneficiaries.

Comparison of the income impacts of the project across asset terciles showed that the project did not have a statistically significant impact on income among the poorest tercile, despite the large and significant impacts on productive assets reportedly available to the poor. However, the project may have a much bigger impact among the poorest beneficiaries in the

future because of the lagged effect of productive asset acquisition. Thus, a follow-up study is needed to capture the longer-term effects of productive assets and other changes that farmers experienced as a result of participating in the Fadama II project.

The impact of the Fadama II project on productive asset acquisition is large and statistically significant across all asset terciles, and genders. However, the change in the value of productive assets caused by participation in Fadama II was larger and more significant for jointly owned productive assets. This reflects the policy that the project used to implement the pilot asset acquisition component. The dramatic increase in the value of productive assets resulting from participation in the project was mainly caused by the cash transfer from the 70% matching funds that the project provides to FUGs. The large cash transfer used to implement this project raises the important question of whether this success story can be replicated. Fadama II did not involve credit service providers to help beneficiaries to pay for their contribution. There is need to involve credit service providers by helping them to offer credit at competitive interest rates to the poor using collateral substitutes such as group repayment incentives. For example, the project could help to strengthen the provision of credit services in rural areas by using strong rural associations, as done by the Grameen Bank. The project could also help to foster credit intermediaries or to promote rotating savings and credit associations that can help the poor to access productive assets. Addressing the low capacity of the poor and vulnerable to manage productive assets efficiently also calls for increased training and development of complementary services, such as advisory services.

The unique feature that could have contributed to the significant impact of the project in a short time is its broad-based approach, which addresses the multiple constraints which the poor often have and enables building synergies across different intervention components. This has

implications on planning poverty reduction efforts in low-income countries, and suggests the need for the government and donors to pool resources and initiate multipronged programs rather than many isolated projects.

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Table 1: Value of productive assets before and after Fadama II across agro-ecological zones, genders, and asset terciles

Treatment type	Value of individually owned assets ('000 Naira)				Value of group-owned assets ('000 Naira)			
	Before project	After project	ATT[1]	%[1]	Before project	After project	ATT[1]	%[1]
Fadama II beneficiaries	47.37	62.42			52.09	350.80		
Nonbeneficiaries	46.83	53.45	22.96***	48.50	5.96	4.69	307.50	590.30
Nonbeneficiaries within FII LGAs	45.82	40.15	26.16***	55.2	9.29	4.62	303.65***	582.90
Nonbeneficiaries outside FII LGAs	47.91	67.83	30.09***	63.5	2.46	4.77	271.08***	520.40
Genders								
Women only								
Fadama II beneficiaries	51.57	74.20			28.65	505.38		
Nonbeneficiaries	63.53	55.32	16.70	32.4	6.83	6.53	448.25***	1,565
Men only								
Fadama II beneficiaries	55.06	62.26			6.58	260.596		
Nonbeneficiaries	49.81	53.05			5.72	4.18		
			41.50**	75.4			217.44***	331
Asset terciles								
Tercile 1 (the poorest)								
Fadama II beneficiaries	5.23	52.94			0.48	470.87		
							442.47 ***	91,780
Nonbeneficiaries	7.64	47.47	6.68	127.8	0.12	3.69		
Tercile 2								
Fadama II beneficiaries	44.55	44.70			3.57	213.48		
Nonbeneficiaries	51.05	42.40	27.84***	62.5	1.46	1.92	104.92***	2,937
Tercile 3								
Fadama II beneficiaries	99.58	124.72			236.79	130.16		
Nonbeneficiaries	114.51	95.85	80.17***	80.5	31.45	11.76	149.80***	63

[1] "ATT" and the corresponding "%" refer to the change in productive assets resulting from participation in Fadama II compared with the corresponding group of nonbeneficiaries. Thus, they should not be interpreted as referring to the change in the productive assets of the corresponding control group of nonbeneficiaries.
* Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level

Table 2: Impact of Fadama II on household income across agro-ecological zones, genders, and asset terciles

Treatment type	Net real annual income ('000 Naira/household)		ATT[1,2]	% net change due to participation in project[3]
	Before project	After project		
FII beneficiaries (n=621)	79.99	108.63		
All nonbeneficiaries (n=1107)	75.99	87.70	46.77**	58.5
Nonbenficiaries within FII LGAs (n=568)	62.35	70.91	32.35	40.5
Nonbeneficiaries outside FII LGA (n=539)	38.43	43.30	74.95*	93.7
Genders				
Male beneficiaries (*n* = 311)	83.69	107.45		
Female beneficiaries (*n* = 198)	74.28	110.45	-0.75	-0.9
Gender (women only)				
FII beneficiaries (*n* = 198)	74.33	110.38		
Nonbeneficiaries (*n* = 178)	35.41	48.35	51.30**	69.1
Gender (men only)				
FII beneficiaries (*n* = 674)	83.70	107.50		
			84.83***	101.3
Nonbeneficiaries (*n* = 267)	86.26	98.250		
Asset terciles				
Tercile 1 (the poorest)				
FII beneficiaries (*n* = 293)	70.851	82.75		
Nonbeneficiaries (*n* = 505)	76.83	77.,51	31.78	*44.9*
Tercile 2:				
FII beneficiaries (*n* = 93)	93.85	119.01		
Nonbeneficiaries (*n* = 191)	74.71	104.99		
			94.75**	101.0
Tercile 3				
FII beneficiaries (*n* = 96)	122.07	154.89		
Nonbeneficiaries (*n* = 139)	126.47	128.27	1.18	1.0

Same notes as those under table 1.