Impact of second national fadama development project on income and wealth of crop farmers in Niger State, Nigeria

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ABSTRACT

The impact of the Second National Fadama Development Project on incomes and wealth of fadama crop farmers in Niger State, Nigeria, was investigated. Data were generated from a field survey conducted in the study area. A combination of stratified and multi-stage sampling techniques was used to select 103 household heads who benefitted from Fadama II project in Niger State and 105 who did not..Descriptive statistics, farm budgeting and Chow test were used to analyse the data. The results showed that the Fadama II Project did not significantly increase the income of Fadama II beneficiaries over non-beneficiaries. It however, significantly increased their wealth. Recommendations of the study are that, policies and strategies should be put in place to bring market infrastructures closer to the fadama communities and to enhance group mobilisation and federation of existing groups and farmer's cooperatives for linkages to credit to enhance farm capital assets. Similarly, efforts should be made to establish inputs sales points in the area to enhance the use of improved inputs by the farmers. Ephraim

INTRODUCTION

Fadama is Hausa word for irrigable lands which are flood plains and low-lying areas with shallow aquifers found along Nigeria's river systems and are normally flooded during the rainy season (Baba and Singh, 1998). Baba and Singh (1998) further noted, that in agricultural usage, the word *fadama* commonly refers to all low-lying relatively flat areas either in streamless depressions or adjacent to the seasonally or perennially flowing streams and rivers. These areas are considered to be of high potential for economic development through appropriate investment in infrastructure, production assets and technical assistance. This is underscored by Baba and Singh (1998), who observed that *fadama* lands have high potentials and agriculturally value several times more than the adjacent upland. Citing Singh (1997), they noted that the sale or lease value of *fadama* lands in the erstwhile Sokoto State of Nigeria, was four to five times more than that of the upland.

The *Fadama* farming systems are predominantly subsistence in nature and are highly dependent on the vagaries of the weather, while the potential for irrigation, using underground and surface water, remains under-developed (World Bank, 2003). Niger State Agricultural Development Project (2005) revealed that most farmers in the State (77%)

cultivated farm sizes measuring below a hectare each, with mean cultivated area per farmer of 0.68ha under irrigated farming. This subsistence level of production is characterized by use of rudimentary agricultural production techniques, low mechanization level and limited use of key inputs such as fertilizers and improved seeds, and low irrigation efficiency (about 20 percent) (World Bank, 2003). Consequently, agricultural productivity is low, and most resources are idle. These have resulted in widespread poverty. Nkonya and Pender (2006), citing UNDP (2004), reported that about 70% of Nigeria's population of 135 million live below the poverty line of US $1 a day, putting the country among the 20 poorest in the world.

To reverse this trend and against the backdrop that most of the poor (70% of Nigeria's population) live in rural areas and that rural poverty is deeper than the urban poverty, Nkonya and Pender (2006) suggested that poverty reduction efforts need to be targeted to the agricultural sector, upon which the majority of the rural population depend. In collaboration with development partners, the Niger State Government has implemented several policies and programmes to reduce rural poverty. Such efforts include a number of 'top-down' rural development programmes, such as the defunct Bida Agricultural

Development Project (1980–1988), multi-State Agricultural Development Project II (1989 – 1995), National Agricultural Technology Support Project (1995–1997) and the First National Fadama Development Project (1997–1999). These efforts have not been very successful in tackling the poverty situation.

The Second National Fadama Development Project (Fadama II Project) started in May, 2004, mainly funded by International Development Association represented by the World Bank with counterpart funding from the Federal Government, the participating State Governments, the benefiting Local Governments and the communities. The Second National Fadama Development Project was initiated to address some of the factors that militated against full realization of the potential benefits of agricultural production activities. The World Bank funding envelope was 100 million US Dollars for 11 States in the country and Federal Capital Territory (FCT), viz – Lagos, Ogun, Oyo, Imo, Kebbi, Kaduna, Gombe, Adamawa, Taraba, Bauchi and Niger. The Niger State's share of this 100 million US Dollars was 7 million US Dollars. The Project's objective was to sustainably increase the income of fadama users through expansion and value addition of agriculture and non-farm activities and to reduce conflict among fadama users.

Fadama II Project implementation in Niger State covered 11 Local Government Areas including Agaie, Lapai, Katcha, Lavun, Kontagora, Mariga, Magama, Shiroro, Suleja, Chanchaga and Borgu. It was designed to be implemented in six years (2004 – 2009). The project's investments were in (i) capacity building (ii) rural infrastructure development (iii) productive asset acquisition (iv) demand driven advisory services (v) project management, monitoring and evaluation. The Project adopted the demand driven approach whereby all users of fadama resources were encouraged to develop participatory and socially inclusive Local Development Plans (LDPs), which were the basis for grant provision under the Project.

The Project's activities were centered on fadama user groups (FUGs), having common economic interests. The beneficiaries contributed 10% to investment (subproject) under rural infrastructure development and demand driven advisory services; 30% under productive assets acquisition; and 50% under agricultural input support to the total investment cost.

Given the huge financial investment in the Fadama II Project which aimed at tackling the poverty situation in the State, there is need to assess its impact to see whether the objectives of the project have been achieved. Specifically, it is important to evaluate the impact of the Project on the income and wealth of the farmers. This study is aimed at achieving that objective.

MATERIALS AND METHODS

The Study Area
The study was conducted in Niger State of Nigeria. The State is located within latitudes 8^0 $20\square$ N - 11^0 $30\square$ N and longitudes 3^0 $30\square$ E - 7^0 $20\square$ E. It covers a land area of 80,000km^2 (8 million hectares) which constitutes 8% of the total land area of Nigeria. About 85% of the land is arable. The State also has about 682,531ha of irrigable land with only 25 percent of it developed. The population of the State as revealed by the National Population Commission in 2006 was 3,950,249.

The State experiences distinct dry and wet seasons with annual rainfall varying from 1,100mm in the north to 1,600 mm in the south. The dry season lasts for six to seven months in northern part of the State and four to five months in the southern part. The favourable climate, vast fertile lands and large water bodies make farming the major occupation of 85% of the State's population. An estimated 622,155 farming households now exist in the State, each cultivating three to five hectares under rainfed farming (Niger State Agricultural Development Project, 2005).

Data Sources
The population for the study consists of all fadama farmers in Niger State with focus on beneficiaries and non-beneficiaries of the Second National Fadama Development Project, implemented May 2004– December 2009. A total of 208 respondents were selected through a combination of stratified and multi-stage sampling techniques. The State was stratified into two: the 11 local government areas (LGAs) that benefitted from Fadama II and the 14 that did not. Multi-stage sampling technique was used to select 103 and 105 respondents from beneficiary and non–beneficiary LGAs, respectively. In the first stage three LGAs were selected randomly from each category, while in the second stage, three Fadama Community Associations (FCAs) or Farmer Unions (FUs) were sampled from the selected LGAs. Two Fadama User Groups (FUGs) or Economic Interest Groups (EIGs) were selected in the third stage from each of the selected FCA or FUs through simple random sampling technique. At the fourth stage, five household heads were selected from each of the selected FUGs or EIGs through simple random sampling technique. Structured interview schedule was used to collect cross sectional data from the respondents in 2010 with the assistance of well-trained enumerators

Data Analysis
Statistical tools used in data analysis include descriptive statistics (frequency distribution,

percentage and mean), farm budgeting, t-test and Chow test. The frequencies, percentages and means were used to describe the socio-demographic characteristics of respondents, farm budgeting analysis was used to assess crop enterprises' costs and returns, while the Chow test of covariances was used to measure the impact of Fadama II project on the income of fadama farmers and t-test was used to measure the impact of Fadama II project on their wealth.

To estimate the income of Fadama farmers in the State, a farm budgeting model was used. The model was used to determine the net farm income after deducting the variable and fixed production costs. The model is specified as:

NFI = GFI - TVC - TFC   (1)

Where: NFI = Net Farm Income, GFI = Gross Farm Income, TVC = Total Variable Cost and TFC = Total Fixed Cost

The Chow test was used to measure the impact of Fadama II project on the income of fadama farmers. This was achieved via ordinary least squares (OLS) multiple regression analysis to generate the error sum of squares. To facilitate the use of Chow test for the analysis, four types of regressions were conducted namely those for beneficiaries of the project, non-beneficiaries, pooled sample (i.e beneficiaries and non-beneficiaries combined) without dummy and pooled sample with dummy. The regression functions were specified generally as follows:

Beneficiaries: $Y_1 = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7)$ - (2)
Non-Beneficiaries: $Y_2 = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7)$ (3)
Pooled sample without dummy: $Y_3 = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7)$ (4)
Pooled sample with dummy: $Y_4 = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, D)$ (5)

Where:
Y_1 = Income of beneficiaries
Y_2 = Income of non-beneficiaries
Y_3 = Income from pooled sample without a dummy variable
Y_4 = Income from pooled sample with dummy variable
X_1 = farm size (hectares)
X_2 = family labour (man-days)
X_3 = hired labour (man-days)
X_4 = fertilizer (kg)
X_5 = cost of improved seeds
X_6 = cost of agrochemicals (₦))
X_7 = capital input cost (depreciation on fixed capital items e.g machinery, equipment such as hoes, cutlasses, oxen etc, rent on land, interest on borrowed capital)

D = Farmer category dummy variable (beneficiaries = 1, non–beneficiaries = 0)

The three models were estimated in the linear and log-linear (Cobb-Douglas) functional forms. Thereafter, the form that gave the best fit in terms of the usual econometric and statistical criteria was selected as lead equation for further analysis.

The F- statistic for the Chow test was calculated as follows:

$$F = \frac{\left[\sum e_3^2 - \sum e_{1-}^2 - \sum e_2^2\right] \Big/ [k_3 - k_1 - k_2]}{\left[\sum e_1^2 + \sum e_2^2\right] \Big/ [k_1 + k_2]}$$

(6)

Where $\sum e_1^2$ and k_1 are error sum of squares and degrees of freedom for the farmers that participated in Fadama II Project, respectively,

$\sum e_2^2$ and k_2 are error sum of squares and degrees of freedom for the farmers that did not participate in Fadama II Project

$\sum e_3^2$ and k_3 are error sum of squares and degrees of freedom, for pooled data without dummy variable

To test for the homogeneity of slopes, the F- statistics was calculated as follows:

$$F = \frac{\left[\sum e_4^2 - \sum e_{1-}^2 - \sum e_2^2\right] \Big/ [k_4 - k_1 - k_2]}{\left[\sum e_1^2 + \sum e_2^2\right] \Big/ [k_1 + k_2]} \quad (7)$$

Where $\sum e_1^2$, $\sum e_2^2$, $\sum e_3^2$, k_1, k_2, k_3 are as previously defined

$\sum e_4^2$ and k_4 are the error sum of squares and degrees of freedom for the pooled sample with dummy

To test for differences in intercepts, the F- statistics was calculated as follows:

$$F = \frac{\left[\sum e_3^2 - \sum e_{4-}^2\right] \Big/ [k_3 - k_4]}{\sum e_4^2 \Big/ k_4} \quad (8)$$

If the calculated F exceeds the tabulated F value, then the intercepts are assumed to be different between the categories of respondents. This test was conditional on a common slope, so the test for differences in slopes is performed first before testing for differences in intercepts.

RESULTS AND DISCUSSION

Socioeconomic and Demographic Characteristics of Respondents

Socioeconomic and demographic characteristics of fadama farmers are shown in Tables 1-3.

Table 1: Distribution of farmers according to age, sex, marital status, household size and educational status

Variable	Beneficiaries		Non-beneficiaries		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Age						
21-30 years	0	0.00	3	2.86	3	1.44
31-40 years	7	6.80	31	29.52	38	18.27
41-50 years	59	57.28	40	38.10	99	47.60
51-60 years	26	25.24	26	24.76	52	25.00
>60 years	11	10.68	5	4.76	16	7.69
Total	103	100.00	105	100.00	208	100.00
Mean	49.51		46.47		47.99	
Sex						
Male	93	90.29	104	99.05	197	94.70
Female	10	9.71	1	0.95	11	5.30
Total	103	100.00	105	100.00	208	100.00
Marital status						
Married	103	100.00	75	71.42	178	85.58
Single	0	0.00	9	8.57	9	4.33
Widowed	0	0.00	12	11.43	12	5.77
Divorced	0	0.00	9	8.57	9	4.33
Total	103	100.00	105	100.00	208	100.00
Household size						
1-5	13	12.62	3	2.86	16	7.69
6-10	60	58.25	49	46.67	109	52.40
11-15	20	19.42	39	37.14	59	28.37
16-20	10	9.71	14	13.33	24	11.54
Total	103	100.00	105	100.00	208	100.00
Mean	8.38		9.64		9.01	
Educational status						
Primary	9	8.74	16	15.24	25	12.02
Secondary	19	18.45	25	23.81	44	21.15
Tertiary	5	4.85	7	6.67	12	5.78
Adult Education	8	7.77	14	13.33	22	10.57
Vocational	1	0.97	1	0.95	2	0.96
Quranic Education	43	41.75	27	25.71	70	33.66
None	18	17.47	15	14.29	33	15.86
Total	103	100.00	105	100.00	208	100.00

Source: Field survey, 2010

The age distribution reveals that majority of the respondents (64.08% and 65.87% for fadama II beneficiaries and non-beneficiaries, respectively) were within the age range of 31–50 years. This is in line with the findings of Ngaski et al. (2009) and Tanko et al. (2010) who indicated that the age of a typical farmer participating in Fadama II project is 34 years. This implies that productivity of fadama crop farming in the study area can be greatly improved upon, since it is concentrated mostly in the hands of young and agile individuals who are assumed to be less averse to taking risk in adopting new technologies. Table 1 also indicates that most of the fadama farmers were male (90.29% and 99.05% for beneficiaries and non- beneficiaries, respectively). The large male – female margin shows that fadama crop farming is not popular among the women folk in the study area. This may be due to the dominant inheritance land tenure system that mostly favours the male, the tediousness of fadama crop farming operations as well as some cultural and religious barriers in the study area. Furthermore, about 96 % of

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respondents were married. This is in line with Ojo and Mohammed (2008) and Sada (2006), who in different studies revealed that more than 96% of their respondents were married. The implication is that the respondents are likely to have children which may be a source of family labour in their fadama crop farming activity. Majority of the respondents had household sizes of 6-10 persons with 8 and 10

persons as mean household sizes for beneficiaries and non-beneficiaries, respectively. This agrees with Tanko *et al.* (2010) who reported an average of 10 household members in their study of impact of Fadama II project on income of tomato farmers in Niger State.

Table 2: Distribution of respondents according to major occupation, farming experience and membership of association

Variable	Beneficiaries		Non-beneficiaries		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Major occupation						
Crop farming	98	95.15	96	91.43	194	93.27
Trading	0	0.00	2	1.90	2	0.96
Civil servant	5	4.85	7	6.67	12	5.77
Total	103	100.00	105	100.00	208	100.00
Farming experience						
1-5	1	0.97	0	0.00	1	0.49
6-10	0	0.00	3	2.86	3	1.44
11-15	0	0.00	5	4.76	5	2.40
16-20	8	7.77	17	16.19	25	12.02
>20	94	91.26	80	76.19	174	83.65
Total	103	100.00	105	100.00	208	100.00
Mean	35.83		31.13		33.48	

Source: Field survey, 2010

Table 3: Distribution of respondents according to House ownership, house type and distance to nearest market

Variable	Beneficiaries		Non-beneficiaries		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
House ownership						
Owned	67	65.05	40	38.10	107	51.44
Inherited	33	32.04	38	36.19	71	34.14
Rented	3	2.91	27	25.71	30	14.42
Total	103	100.00	105	100.00	208	100,00
House type						
Mud, thatched roof	1	0.97	1	0.95	2	0.96
Mud, zinc roof	86	83.50	54	51.43	140	67.31
Mud brick with thatched roof	1	0.97	2	1.90	3	1.42
Mud brick with zinc roof	9	8.73	29	27.62	38	18.26
Cement brick with zinc roof	6	5.83	19	18.10	25	12.05
Total	103	100.00	105	100.00	208	100.00
Distance to nearest market(km)						
≤1.0	14	13.59	39	37.14	53	25.48
1.1 – 2.0	41	39.81	17	16.19	5	27.88
2.1 – 3.0	3	2.91	2	1.90	5	2.40
>3.0	45	43.69	47	44.77	92	44.24
Total	103	100.00	105	100.00	208	100.00

Source: Field survey, 2010

About three–quarter of the respondents had one form of education or another. However, 41.75% and

25.71% for beneficiaries and non-beneficiaries, respectively, had only Quranic education. Only

18.45% and 23.81% of beneficiaries and non-beneficiaries, respectively, had Secondary education. This agrees with the findings of Ndanitsa (2005), who reported that rural farmers are characterised by low level of literacy. This low literacy level of the respondents, could negatively affect their choice and utilization of existing inputs and also their willingness to adopt improved technologies. The average years of experience of the respondents in the study area were 35.83 and 31.13 for beneficiaries and non-beneficiaries, respectively. This implies that the fadama farmers in the study area can be considered to be quite knowledgeable on the operations and constraints of fadama farming. In addition to crop farming as the primary occupation, 4.85 and 6.73% of beneficiaries and non-beneficiaries, respectively, had non-farm activities as secondary occupation.

Most (65%) of the Fadama II beneficiaries owned their houses, while 32% lived in inherited houses and 2.9% stayed in rented houses. The non-Fadama II respondents had their house ownership almost equally distributed among owned (38%), inherited (36%) and rented (25%).

The major house type for beneficiaries (84%) and non-beneficiaries (50%) was mud house with zinc roof. The dominance of mud type of houses rather than cement brick may be an evidence of the prevailing poverty among fadama farmers. The major crop enterprises of the fadama farmers were rice (24.01 and 21.32% for beneficiaries and non-beneficiaries, respectively), maize (16.67 and 25.71 % for beneficiaries and non-beneficiaries, respectively), sorghum (17.23 and 19.12 % for beneficiaries and non-beneficiaries, respectively) and groundnut (9.32 and 11.91 % for beneficiaries and non beneficiaries, respectively).

Impact of Fadama II Project on Income
Costs and returns analysis
Results of the costs and returns analysis for four major crops of rice, maize, sorghum and groundnut are given in Tables 4-7.

Table 4: Costs and returns of fadama farmers in sorghum enterprise in Niger State

	Beneficiaries		Non-beneficiaries	
Item	Cost (₦/ha)[*]	% of total cost	Cost (₦/ha)	% of total cost
Variable Costs				
Cost of labour	7752.02	37.38	7044.03	24.93
Seeds	1046.15	5.04	1203.73	4.26
Seed dressing chemical	0.00	0.00	0.14	0.00
Inorganic fertilizer	7759.44	37.41	13377.99	47.35
Agrochemicals	1033.56	4.98	2297.13	8.13
Packaging materials	1297.48	6.26	1329.66	4.71
Total Variable Cost	18888.65	91.07	25252.68	89.37
Fixed Costs				
Depreciation on oxen & implement	0.00	0.00	7.95	0.03
Depreciation on other farm tools	672.44	3.24	878.43	3.11
Interest on loan	560.82	2.70	1278.41	4.52
Depreciation on sprayers	493.83	2.38	837.56	2.96
Depreciation on irrigation pump	124.03	0.60	0.00	0.00
Total Fixed Cost	1851.12	8.93	3002.35	10.63
Total Cost	20739.77	100.00	28255.03	100.00
Returns				
Gross Income	55008.39		84803.83	
Gross Margin	36119.74		59551.15	
Net Farm Income	34268.62		56548.80	
Return on Naira invested	1.81		2.24	
Operating Ratio	0.34		0.29	
Gross Ratio	0.38		0.33	

[*]US$1 = ₦160, Source: Field survey, 2010

Table 5 : Costs and returns of fadama farmers in rice enterprise in Niger State

Item	Beneficiaries		Non-beneficiaries	
	Cost (₦/ha)	% of total cost	Cost (₦/ha)	% of total cost
Variable Costs				
Cost of labour	10425.57	27.15	6484.91	19.80
Seeds	7878.10	20.52	5374.73	16.41
Seed dressing chemical	19.34	0.05	86.15	0.26
Inorganic fertilizer	11387.23	29.66	13831.30	42.23
Agrochemicals	4997.08	13.01	3311.20	6.62
Packaging materials	1611.46	4.20	1286.79	3.93
Total Variable Cost	36318.78	94.58	30375.08	92.73
Fixed Costs				
Depreciation on oxen & implement	0.00	0.00	3.62	0.01
Depreciation on other farm tools	838.58	2.18	1040.22	3.18
Interest on loan	736.17	1.92	796.24	2.43
Depreciation on sprayers	413.67	1.08	540.09	1.65
Depreciation on irrigation pump	91.41	0.24	0.00	0.00
Total Fixed Cost	2079.83	5.42	2380.17	7.27
Total Cost	38398.61	100.00	32755.25	100.00
Returns				
Gross Income	89574.45		82771.72	
Gross Margin	53255.67		52396.64	
Net Farm Income	51175.84		50016.47	
Return on Naira invested	1.41		1.65	
Operating Ratio	0.41		0.37	
Gross Ratio	0.43		0.39	

Source: Field survey, 2010

Generally, it is evident from the tables that labour cost dominated production costs accounting for 49.05 and 37.65% of total cost for the beneficiaries and non-beneficiaries, respectively. Labour cost accounted for 37.38, 27.15, 28.79 and 38.10 % of total cost in sorghum, rice, maize and groundnut enterprises, respectively, for the beneficiaries. For the non-beneficiaries, it accounted for 24.39, 19.80, 30.84 and 27.07% of total cost in sorghum, rice, maize and groundnut enterprises, respectively. The high cost of labour is attributable to the fact that most farm operations in the area are accomplished manually. Most of the cost however, comprises of opportunity cost of unpaid family labour.

Furthermore, fixed cost representing depreciation on farm fixed assets was low, accounting averagely for 13.89 and 15.12% of total cost for beneficiaries and non-beneficiaries, respectively. The fixed cost in sorghum, rice, maize and groundnut enterprises of beneficiaries were 8.9, 5.4, 8.6 and 23.42%, respectively. On the other hand, the fixed cost proportions for the non-beneficiaries were 10.63, 7.27, 9.67 and 24.25% for sorghum, rice, maize and groundnut enterprises, respectively. This is in line with the findings of Baba (2010) who also reported

low fixed cost. The implication of this is that there is low investment in fixed capital items. Similarly, the costs and returns analysis on the four major crop enterprises revealed that the farmers earned positive net income in all the crop enterprises. This agrees with Baba (1993) who, in his comparative study of traditional and modern irrigation systems in Bauchi State of Nigeria, reported positive net income in fadama enterprises.

Chow Test Results
(i) Generation of error sums of squares via OLS multiple regression analysis
Lead equations were determined for the four categories of farmers as presented in Table 8 through OLS multiple regression analysis in order to generate the error sums of squares. Linear model was the lead equation for the Fadama II beneficiaries, while the Cobb-Douglas model was the lead equation for the remaining three categories viz non-beneficiaries, pooled sample without dummy and pooled sample with dummy.
The results in Table 8 suggest that most of the explanatory variables were significant in explaining the income of crop farmers. Except fertilizer and

hired labour, all variables of farm size, family labour, improved seeds, agro–chemicals and capital input had positive and significant influence on income in all cases. The coefficient of fertilizer was negative and significant for the beneficiaries and insignificant in other cases. Similarly, hired labour was not significant in any of the cases.

Table 6: Costs and returns of fadama farmers in maize enterprise in Niger State

Item	Beneficiaries		Non-beneficiaries	
	Cost(₦/ha)	% of total cost	Cost(₦/ha)	% of total cost
Variable Costs				
Cost of labour	5349.48	28.79	9091.56	30.84
Seeds	1528.26	8.22	1786.03	6.06
Seed dressing chemical	9.92	0.05	88.50	0.30
Inorganic fertilizer	6731.82	36.23	10985.46	37.26
Agrochemicals	1831.40	9.86	3188.05	10.81
Packaging materials	1540.66	8.29	1492.41	5.06
Total Variable Cost	16991.54	91.44	26632.01	90.33
Fixed Costs				
Depreciation on oxen & implement	0.00	0.00	1.89	0.01
Depreciation on other farm tools	397.95	2.14	852.94	2.89
Interest on loan	500.02	2.69	1065.34	3.61
Depreciation on sprayers	518.79	2.79	931.42	3.16
Depreciation on irrigation pump	173.41	0.93	0.00	0.00
Total Fixed Cost	1590.17	8.56	2851.59	9.67
Total Cost	18581.71	100.00	29483.60	100.00
Returns				
Gross Income	74317.36		99171.93	
Gross Margin	57325.82		72539.92	
Net Farm Income	55735.65		69688.33	
Return on Naira invested	3.28		2.62	
Operating Ratio	0.23		0.27	
Gross Ratio	0.26		0.29	

Source: Field survey, 2010

(ii) Test for Homogeneity of Slopes
The results of the test for homogeneity of slopes between the two groups of farmers are presented in Table 9. The Chow's F statistic was statistically significant (P<0.05). This implies that the slopes of the functions for the two groups of farmers are heterogeneous, which indicates factor bias. This result is in line with findings of Tanko *et al*., (2010) that the slopes of the production function are heterogeneous, thus significant and implying factor bias. In plain language, it implies that the incomes of the beneficiaries and non-beneficiaries are not the same. This further indicates that Fadama II project did not increase the income of beneficiary crop farmers significantly and non-beneficiaries even earned higher income.
(iii) Test for Differences in Intercept

Table 10 shows the results of the statistical test for the difference in intercepts of the two groups. The results show that the calculated chow's F statistics of 0.3008 was not statistically significant. This indicates homogeneity of intercepts. It implies that Fadama II Project did not bring about structural shifts in the intercept of the income equation, meaning again that Fadama II Project did not bring about significant increase in the level of income of beneficiaries as compared to non-beneficiary crop farmers. This finding is contrary to the findings of Tanko *et al.,* (2010) who found that Fadama II Project brought about structural shifts in the intercept of the income equation in their study of impact of Fadama II Project on income of tomato farmers in Niger State.

Impact of Fadama II Project on Wealth of Fadama Farmers in Niger State

Table 11 shows t-ratio computed on the wealth of fadama farmers in Niger State. Wealth was defined to include both productive and non-productive assets including housing and means of transportation. The mean values of wealth were ₦2,715,846 and ₦1,881,361 for beneficiaries and non-beneficiaries, respectively. The t-ratio shows that the mean wealth of beneficiaries was significantly higher than that of non-beneficiaries (P<0.01). This result is in agreement with findings of Nkonya *et al.* (2008) that there were large and statistically significant impacts of Fadama II Project on the change in value of both group and individual owned productive assets, compared to non-beneficiaries. This could be attributed to the pilot productive asset component of Fadama II project that provided grants for beneficiaries to acquire productive assets such as irrigation pumps and accessories, knapsack sprayers, oxen and implements, agro-processing machines and market infrastructure. With this ownership of productive assets, it is expected that beneficiaries have the potential to generate more income in the future.

Table 7: Costs and returns of fadama farmers in groundnut enterprise in Niger State

Item	Beneficiaries		Non-beneficiaries	
	Cost(₦/ha)	% of total cost	Cost(₦/ha)	% of total cost
Variable Costs				
Cost of labour	7376.68	38.10	6830.67	27.07
Seeds	2731.29	14.11	5427.53	21.51
Seed dressing chemical	0.00	0.00	30.76	0.12
Inorganic fertilizer	3108.91	16.06	3390.76	13.44
Agrochemicals	205.94	1.06	1933.85	7.66
Packaging materials	1403.96	7.25	1503.23	5.96
Total Variable Cost	14826.78	76.58	19116.80	75.75
Fixed Costs				
Depreciation on oxen & implement	0.00	0.00	11.67	0.05
Depreciation on other farm tools	1127.25	5.82	1871.89	7.42
Interest on loan	1988.36	10.27	1875.00	7.43
Depreciation on sprayers	1112.61	5.75	2360.86	9.36
Depreciation on irrigation pump	305.19	1.58	0.00	0.00
Total Fixed Cost	4533.41	23.42	6119.42	24.25
Total Cost	19360.19	100.00	25236.22	100.00
Returns				
Gross Income	61150.50		49392.31	
Gross Margin	46323.72		30275.51	
Net Farm Income	41790.31		24156.09	
Return on Naira invested	2.82		1.26	
Operating Ratio	0.24		0.39	
Gross Ratio	0.32		0.51	

Source: Field survey, 2010

CONCLUSION AND RECOMMENDATIONS
The study assessed the impact of Second National Fadama Development Project (Fadama II) on income and wealth of fadama farmers in Niger State, Nigeria. It demonstrated that the Fadama II Project has impacted positively on the wealth of the fadama

farmers. The implementation of the project has however, not yet increased the income of crop farmers studied. But because the beneficiaries of the project possess more wealth, including productive assets, they have the capacity to generate more income in the future. Furthermore, the effort of the Fadama II project to mobilise farmers into groups is appropriate.

Table 8: Results of the regression analysis (parameters and t-ratios) on determinants of income of fadama farmers in Niger State

Variable	Beneficiaries	Non-beneficiaries	Pooled sample without dummy	Pooled sample with dummy
	Linear	Cobb-Douglas	Cobb-Douglas	Cobb-Douglas
Constant	37552.253	8.241	8.480	8.592
	(1.184)	(10.755)***	(21.857)***	(19.588)***
Farm Size	36229.021	0.768	0.633	0.637
	(6.686)***	(8.777)***	(9.780)***	(9.767)***
Family Labour	100.494	0.117	0.096	0.095
	(2.047)**	(2.793)***	(2.869)***	(2.826)***
Hired Labour	-3.810	0.25	0.019	0.025
	(-0.991)	(0.940)	(1.202)	(1.312)
Fertilizer	-78.807	0.057	-0.0001	-0.004
	(-2.088)**	(1.552)	(-0.052)	(-0.133)
Improved seeds	3.687	0.84	0.169	0.169
	(13.962)***	(1.939)*	(6.318)***	(6.289)***
Agro chemicals	3.448	0.80	0.60	0.057
	(2.825)***	(2.674)***	(4.043)***	(3.620)***
Capital Inputs	11.065	0.94	0.075	0.065
	(2.552)**	(1.395)	(2.676)***	(2.004)**
Dummy				-0.036
				(-0.552)
R^2	0.786	0.698	0.637	0.637
Adjusted R^2	0.770	0.676	0.624	0.623
F-Statistic	49.732***	31.971***	50.112***	43.734***

***, **, * implies significant at $p<0.01$, $p<0.05$ and $p<0.10$, respectively.
Source: Field survey, 2010

Table 9: Test for homogeneity of slopes

Category of Farmers	Error sum of squares	Degrees of freedom	F calculated	Decision
Beneficiaries	760000000000	95		
Non-beneficiaries	10.348	97	27.429**	Reject
Pooled data	23.188	200		

**implies statistically significant at $p<0.05$
Source: Field survey, 2010.

Table 10: Test for shifts in the intercept

Category of Farmers	Error sum of squares	Degrees of freedom	F calculated	Decision
Beneficiaries	760000000000	95		
Pooled data without dummy	23.188	200	0.3008ns	Accept
Pooled data with dummy	23.153	199		

ns implies not significant
Source: Field survey, 2010.

Table 11: Result of t-test on wealth of fadama farmers in Niger State

Category of farmers	Mean	N	Std. Deviation	Std.Error Mean
Beneficiaries	2715846	104	1444100.137	43.734
Non-beneficiaries	1881361	104	908313.698	

Paired sample test

	Paired Differences						
Pair 1 Fadama wealth – non Fadama wealth	Mean	Std. Deviation	Std. Error Mean	T	Df	Sig. (2-tailed)	Decision
	834485.1	1756561.527	172245.0	4.845	103	0.000	Reject

Source: Field survey, 2010.

However, the capacity of the groups should have been sufficiently developed to enable them acquire production inputs and credit from external sources on their own as a group. Considering the fact that improved inputs such as fertilizer, seeds and agrochemicals positively influenced income of the crop farmers in this study, efforts should be made in partnership with the private sector to establish agro-service centres which would bring the inputs closer to the farmers. Furthermore, farmers in the area currently encounter problems in the disposal of their farm products. This problem could be alleviated through group marketing of their products. The efficiency of products marketing in the area could also be increased through provision of more all-weather rural roads, other marketing infrastructure and marketing information in the area.

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