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IMPACT OF NATIONAL FADAMA DEVELOPMENT PROJECT II ON SMALL-SCALE FARMERS' INCOME IN OGUN STATE: IMPLICATIONS FOR AGRICULTURAL FINANCING IN NIGERIA

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Abstract

Inadequacy and frequent dearth of credits for financing agriculture have been major constraints to agriculture and rural development in most developing countries. Recognizing credit as a critical factor in agricultural development, governments in developing countries keep implementing various projects and programs as important policy instruments for the rural poor. The impact of the Fadama Development Project Phase II on farmers income, as well as the problems and constraints to efficient production and productivity in the Fadama endowed Communities in Obafemi-Owode local government area of Ogun State, Southwest, Nigeria was studied using multi-stage stratified random sampling technique to select three villages each for both beneficiaries and non-beneficiaries from the area. Systematic random sampling of respondents was conducted for 90 respondents, with an average age of 46.3 years and 43.6 years, respectively, with a majority of the farmers' age between 40 and 59 years. A majority of the respondents had no formal education, large household sizes (an average of 10 members/household), and the vast experience of the respondents in farming (an average of 12.5 years) has been a facilitating factor in productivity improvement in the localities. Some of the problems discovered on the operation of farms in the communities are inadequate infrastructural and storage facilities, inadequate capital for the farm operations, insufficient access to micro-credit facilities and other support services by members of the Fadama endowed communities. Better performance, resource use efficiency, and participation of the farmers could be enhanced if relevant policies are formulated and geared towards support for agricultural sectors. This would enhance the

net farm income of farmers in such a way that the marginal income will increase and more investments on agriculture and rural infrastructures will increase. The need to implement policies, through mandatory bank lending to agricultural sector participants, would help to ensure sustainable integration of the Fadama Users' Association's capital needs into the operations of the community and other banks.

Introduction

Traditional agricultural production system, practiced nationwide, involves the use of land holdings of less than two hectares committed to mixed cropping. In Nigeria, the adoption of the cropping system, by most farmers, is based on sound biological principles, experiences, and a relatively higher level of output that could result when compared with the cultivation of the component crops separately (Andrews & Kassan, 1976). Studies have shown that agriculture is the locus of poverty in Nigeria (World Bank, 1996), as farm incomes are generally very low due to declining productivity. This is particularly serious as agriculture remains the mainstay of Nigerian economy, contributing about 77 percent of the working population (UNICEF, 1995). The low farm income, resulting from declining productivity in the agricultural sector, could be attributed to the dependence on rainfall for production in some parts of the country, the scarcity of which becomes a critical limiting factor to all-year-round cultivation.

Agricultural production in the southern part of Nigeria is mainly rain-fed with annual rainfall ranging between 750mm and 1500mm and is concentrated between March and September (Daramola, 1998). Given the need for all-year-round cultivation to exploit the potentials of the dry seasons for farm income generation and the campaign for food security and poverty alleviation, the Nigerian Government, in collaboration with the World Bank and the Agricultural Development Bank (ADB), initiated the small-scale farmer-managed irrigation schemes to develop the Fadama lands nationwide. In addition, it was realized that increased agricultural production was necessary to make the rate of growth in food production faster than the population growth rate. This cannot be attained

without recourse to supplementary irrigation for the major food production areas of the country (Adeolu & Taiwo, 2004), hence, the need for the initiation and implementation of the National Fadama Development Project (NFDP) in the country.

'Fadama' is a Hausa name for 'wetlands', and means 'Akuro' or 'Abata' in the Yoruba language. These are low-lying flood plains with easily accessible shallow ground water. Though the surfaces of these flood plains become dry during the dry seasons, appreciable amounts of water can be trapped from shallow aquifers that abound around the plains (leading the development of tube wells by drilling). The water obtained from the tube wells is used for the development of small-scale irrigation schemes to boost dry season crops production (Journal of Agricultural Development Project in Nigeria, 2006).

The National Fadama Development Project II (NFDP II) is a follow-up to the successfully implemented Phase I Project, executed between 1983 and 1999, to achieve the objective of sustainable increase in the income of farmers in Fadama areas through the expansion of farm and non-farm activities that could result in high value-added outputs. The NFDP II covers twelve states in Nigeria, including the Federal Capital Territory. The states include Adamawa, Bauchi, Gombe, Imo, Kaduna, Kebbi, Lagos, Niger, Ogun, Oyo, and Taraba States (Fadama, 2007).

The National Fadama Development Project I (NFDP I) focused mainly on the promotion of simple low-cost irrigation technologies in the bid to increase food production, but largely neglected the down stream activities such as processing, preservation, conservation, and rural infrastructures meant to ensure efficient evacuation of farm produce to the markets. Also, the project did not take into consideration the farmers involved in other areas of agriculture, like livestock and fisheries. This resulted in not only perpetual conflicts between the users, but restricted benefits to only those who were involved in crops production (Fadama, 2007).

At the completion of the project phase, in 2001, the Nigerian government adopted new rural development strategies to address most of the discovered flaws and constraints to implementation. The new strategy, which was in line with the African Development Bank's strategic plan, had as its focus, a number of approaches to development. The plan stressed the need for consistency, sustainability, and greater equity in the access to benefits of the land resources in Fadama areas of the country. Consequently, the bank found it necessary to agree to the Nigerian government's request for funding phase II of the project, not only as a follow-up to Phase I but also to expand it in scope and size (NFDP Appraisal Report, 2003).

The design of phase II of the project, therefore, incorporated a community-driven development (CDD) approach in which various fadama users (crop farmers, hunters, pastoralists, women, youths, vulnerables and the marginalized), operating through their respective Fadama Users Groups (FUGs) and Fadama Community Associations (FCAs), could reach consensus on how to use the common resources to their mutual advantages. Through this process communities decided on which advisory services and infrastructures they needed to attain developmental goals based on their efforts (NFDP Appraisal Report, 2003). With these in mind, the study was therefore focused on the impact of the National Fadama Development Project II on the income of small-scale crop farmers in the Obafemi-Owode Local Government Area of Ogun State. Efforts were made to investigate how the project benefited the farmers and the impact of the funding assistance, and other benefits from the project, on the beneficiaries in the study area.

Justification for the Study

One of the major goals of any country is to provide adequate food for its citizens. Underlying the trend of poor performance in the agricultural sector, is the problem that

the farming systems are upland subsistence agriculture that depend mainly on vagaries of weather while the potentials for irrigation using underground and surface water remain underdeveloped. With the growing awareness to maximize welfare through economic development, there is a need to reduce unemployment, the rapid population growth rate, and poverty among rural dwellers. Various agricultural programs and policies have been instituted in the past, and were meant to improve sustainable productivity and farmers' income, consequently the quality of lives of the rural households. One of such projects is the National Fadama Development Project II.

However, despite the beneficial goals of the project in phases, some communities are yet to participate and benefit from the services offered in the study area. This is because they lack the required basic infrastructures, reducing their production efficiencies and capacities to meet market demands. It is believed that if all the farmers were aware of the potential benefits of participating in the project, they would get more involved. The study will provide information on the impact of the National Fadama Development Project II services on the beneficiaries, in comparison to the non-beneficiaries in the study area. The study will also bridge knowledge gap on the socio-economic factors that could enhance economic efficiency of beneficiaries in the study area. Meaningful policy recommendations will be made from the findings of the study and the outcome will serve as a guide to policy makers on issues relating to financial supports for agricultural development programs in Nigeria and world wide. In addition, the findings from the study will contribute to increasing literature on agricultural financing in Nigeria and the world at large.

Objectives of the Study

The major objective of the study is to assess the impact of the National Fadama Development Project II on the income of the small-scale crop farmers in the Obafemi-Owode local government area of Ogun State. Specifically, the study is to:

(i) investigate the socio-economic characteristics of the small-scale Fadama crop farmers in the study area;

(ii) identify the funding and assistance derived by the respondents through participation in the Fadama project ;

(iii) compare the farm income of both beneficiaries and non-beneficiaries of the Fadama project in the study area;

(iv) identify the constraints to participation in the Fadama project in the study area; and to

(v) make recommendations based on the findings from the study.

Methodology

Study Area: The study was conducted in Obafemi–Owode local government area of Ogun State, Southwest Nigeria. The state is situated in the tropics, covering a land mass of 16,409.26 square kilometers and an estimated population of over 3 million people (2006, NPC Estimates). Ogun State shares its boundaries in the west with the Republic of Benin, in the east with Ondo State, and in the north with Oyo State. Obafemi-Owode local government area of Ogun State is made up of a land mass of 104787.04 hectares, with the major part used as agricultural land. The study area lies between latitudes 03^0 6' and 07^0 3', and longitudes 03^0 2' and 03^0 8' east of Greenwich Meridian; bounded in the

north by Odeda local government area and Oyo State, in the east by Sagamu and Ikenne local government areas, and in the south by Ifo local government area and Lagos State.

The study area is endowed with a vast area of fertile land for the cultivation of arable crops such as rice, maize cassava, tomatoes, a variety of vegetables and cash crops like sugar-cane, kolanuts, cocoa, and oil palm. The area is particularly regarded as the "Home of Ofada Rice". The people residing in the area are mostly "Egbas", who speak Yoruba, as the common language with the egba dialect. Most of the residents of the area are farmers who are noted for arable crops and vegetable production, though some also engage in livestock and fishing. The study area is noted as the best in Fadama farming in the State (OGADEP, 2005).

Sources of Data: For the study, both primary and secondary data were used. Primary data were obtained with the aid of pre-tested, well structured questionnaire/interview guides administered to small-scale farmers (beneficiaries and non-beneficiaries) in six (6) communities in the study area. Information collected from farmers, Fadama project facilitators, and desk officers, bothered their socio-economic characteristics, production, and revenue data, as well as constraints to production in the Fadama area. Secondary data were sourced from the Ogun State Fadama Development Office (OGSDO), anchored at the Ogun State Agricultural Development Programs Office (OGADEP), Annual Reports and periodic evaluation papers on the project, journals, internet, and other electronic library on the subject matter. Attendance at several Fadama Community Associations (FCAs) meetings also assisted in capturing salient information relating to the study.

Sample Size and Sampling Techniques: The study area consists of several communities of which only ten (10) benefited from the National Fadama Development Project II. The sampling technique used was multi-stage, stratified random sampling. The

communities were stratified into two, as benefiting and non-benefiting communities. From the list of communities in the study area, three (3) Fadama Community Associations (FCAs) and three (3) non-benefiting communities were selected to give the six communities explored. The randomly selected FCAs were Ifeparapo Eriti FCA, Ifesowapo Aluoge FCA, and Irewolede Ijana–Alapako FCA. The non-benefiting communities are Abata, Ajade-Ogundipe, and Lemomu communities. The sample size used for the study was ninety (90) respondents, selected from both benefiting communities and non- benefiting communities, making up of 45 farmers from each stratum and 15 farmers from each of the selected communities in the study area.

Analytical Procedures: A combination of statistical, budgetary, and parametric analyses were used to analyze the data. These include descriptive statistics, gross margin analysis, analysis of difference of means, as well as multiple regression analysis.

Descriptive Statistical Ttools: Tables, frequencies, and percentages were used to describe the socio-economic characteristics of the respondents. The characteristics included the ages of the farmers, marital status, educational attainment, off-farm/minor occupation, farming experience, gender etc.

Gross Margin Analysis: The budgetary technique was used to determine the gross margin income per hectare of land at various scales of operation, cultivated by both beneficiaries and non-beneficiaries of the project using t-test for two sample assuming unequal variances.

*Model used in estimating the **Gross Margin** is:*

$GMI = \sum TR - \sum TVC$ ……..…..(i)

$TR = P_y . Y_i$…….…….....(ii)

$TVC = P_x . X$ ……...(iii)

$TC = TVC + TFC$……..(iv)

NFI = GM – TFC……..…(v)

Where:

GMI = Gross Margin Income (₦)

TR = Total Revenue (₦)

TVC = Total Variable Cost (₦)

TC = Total Cost (₦)

NFI = Net Farm Income (₦)

P_y = Unit Price of Output Produced (₦)

Y = Quantity of Output (Kg)

P_{xi} = Unit Price of Variable Inputs Used (₦)

X_i = Quantity of Variable Inputs (Kg)

Multiple Regression Analysis: Multiple regression analysis was also used to estimate the magnitude of significance and relationship of the factors affecting total revenue of the farmers and the independent variables affecting production in the area. In implicit form, the regression model is represented by:

$Y = f(X_1, X_2, X_3, X_4, X_5, U)$…….....(vi)

Where X_{is} are the explanatory variables, i = 1 - 5

U = Random Error Term

In estimating through the regression analysis, the four functional forms used to estimate the relationship are:

Linear function:

$Y = a + b_1 X_1 + b_2X_2 + b_3 X_3 + b_4X_4 + b_5 X_5 + b_6 X_{6+} b_6 X_{6+} b_7 X_{7+} U$…….(vii)

Semi-log function:

$Y = \ln a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_{6+} b_7 X_{7+} \ln U$……....(viii)

Double log (Cobb-Douglas):

$\ln Y = \ln a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_{6+} b_7 X_7 + \ln U$……..(ix)

Exponential function:

$Y = X^b$ ……..……..(x)

Where:

Y = Total Revenue (₦)

X_1 = Farm Size (FSz) (ha.)

X_2 = Cost of Farm Tools (Ft) (₦)

X_3 = Cost of Planting Materials (Seeds) (₦)

X_4 = Cost of Agro-chemicals (Fertilizer, Herbicides, Pesticides, Insecticides) (₦)

X_5 = Cost of Labor (₦)

U = Error term

From these, the equation of best fit was chosen. *Z*-tests were also used to test the levels of significance of the co-efficient; R^2 and F-test were also used to determine the extent to which the explanatory variables (X_i's) could explain the relationship in the revenue-cost function.

Difference of Means of Income: The difference of means in income of the beneficiaries and non-beneficiaries was computed to test for significant difference in income of Fadama project beneficiaries and non-beneficiaries in the study area.

Model specification is:

$$Z = \frac{\mu_1 - \mu_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} \quad \text{……...……(xi)}$$

Where:

μ_1 = Mean Gross Margin Income of benefiting Fadama crop farmers in the study area

μ_2 = Mean Gross Margin Income of benefiting Fadama crop farmers in the study area

σ^2 = Variance of Gross Margin Income of benefiting Fadama crop farmers in the study area

n_1 = Number of benefiting Fadama crop farmers sampled in the study area

n_2 = Number of non-benefiting Fadama crop farmers sampled in the study area

Z = Test Statistics used for the sample n ≥30

Hypothesis:

Ho_{1A} : $b_o, b_1, b_2, b_3, b_4, b_5 = 0$

Hi_{1B} : $b_o, b_1, b_2, b_3, b_4, b_5 > 0$

Ho_{2A} : There is no significant difference in the income of Fadama Project beneficiaries and non-beneficiaries in the study area.

Hi_{2B} : There is a significant difference in the income of Fadama Project beneficiaries and non-beneficiaries in the study area.

The prior expectation is that the parameters are significantly different from zero

$b_o > 0, b_1 > 0, b_2 > 0, b_3 > 0, b_4 > 0, b_5 > 0.$

Results and Discussion

The socio-economic and demographic variables investigated are the age of the respondents, gender, educational level, farming experience, occupation (major and minor), farm size, as well as the problems limiting the productive capacities of the farmers in the Fadama area and suggested solutions considered. Findings from the study

revealed that the majority of both beneficiaries and non-beneficiaries fell between 20 years and over 85 years; with a majority (41 [91.1%], 37 [82.2%] respectively) that fell between the ages of 30 and 59 years, with an average of 45.5 years for beneficiaries and 43.8 years for non-beneficiaries in the study area (Table1). This implies that most of the farmers are still within a productive and active working age range, hence their ability to participate or produce to earn some revenue in the Fadama project area.

Most of the respondents are males (57.8%) and 88.9% of the beneficiaries are married (Table1). The average household size in the locality was found to be 8.7 and 8.4 persons, for both the beneficiaries and non-beneficiaries respectively; with the majority of the beneficiary households (86.7%) and non-beneficiary households (75.6%) having 4-12 members. The implication is that the relatively large household size may likely enhance family labor supply on the farms, hence supporting the favorably, productive capacities of the farmers already enhanced by their ages. This corroborates (Adegbite & Oluwalana 2004; Adegbite et al, 2007; Agbamu, 1993; Okweche et al, 1998) that the larger the household size, the higher the likelihood of sustainable labor efficiency on farmers' farms, given the constant labor supply.

The occupational experience of the farmers (40% without formal education and 31.1% with just primary school education) was a mean of 15.2 years among the benefiting farmers, having implications on their productivity. Consequently, this may have enhanced their on- and off-farm income-generating capacities to service their counterpart contributions to asset acquisition of individuals in the Fadama Users' Groups (FUGs) (Table 1). The study further revealed that all the respondents are farmers, though they handle other minor jobs to supplement their farm income. For instance, 20% participate in petty trading, 4.4% are artisans, and 75.6% are in other forms of income-generation for the benefiting farmers. The average farm size was 1.47 hectares, though

most benefiting farmers (about 82.2%) manage between 0.1 and 1.99 hectares of farm lands on vegetables and food crops in scattered holdings.

A majority of beneficiaries (82.2%) preferred to use hired labor (Table 1). This could be attributed to their access to regular financial and other supports from the project, unlike the non-beneficiaries who sourced their labor mainly from family members. Both groups asserted that their sources of funds for farm operations were from diverse sources in different proportions, as stated on Table 1.

Table 1: Socio-Economic and Demographic Characteristics of Respondents

Characteristics	Fadama Beneficiaries		Mean	Std. Dev	Non-Fadama Beneficiaries		Mean	Std. Dev.
	Freq.	%			Freq.	%		
Age (Years)								
20-29	-	-			3	6.7		
30 -39	13	28.9			14	31.1		
40- 49	15	33.3			15	33.3		
50-59	13	28.9			8	17.8		
60-69	2	4.4			2	4.4		
≥70	2	4.4			2	6.7		
Total	45	100	45..5	10.3	45	100	43.8	13.96
Gender (No.)								
Female	19	42.2			18	40.0		
Male	26	57.8			27	60.0		
Total	45	100			45	100		
Marital Status								
Married	40	88.9			41	91.1		
Divorced	1	2.2			1	2.2		
Single	2	4.4			3	6.7		
Widow	2	4.4			0.0	0.0		
Total	45	100			45	100		
Household size								
1-3	1	2.2			3	6.7		
4 -6	12	26.7			16	35.6		
7-9	14	31.1			11	24.4		
10-12	12	26.7			7	15.6		
13-15	5	11.1			5	11.0		
>15	1	2.2			3	6.7		
Total	45	100	8.7 ≈9	3.53	45	100	8.4 ≈ 8	4.47
Occupational experience(Years)								
Fadama Farming								
1-5	7	15.6			6	13.3		
6-10	14	31.1			15	33.3		
11-15	7	15.6			9	20.0		

Cont.

16-20	12	26.7			4	8.9		
21-25	3	6.7			4	8.9		
≥25					7	5.6		
Total	45	100	15.2 yrs.	9.8	45	100		
Minor occupation Trading	9	20.0			10	22.2		
Laborers	29	64.4			31	68.9		
Driving	2	4.4			1	2.2		
Food and Fish processing	1	2.2			0.0	0.0		
Artisans	2	4.4			2	4.4		
Others	2	4.4			1	2.2		
Total	45	100			45	100		
Educational Level Attainment No Formal Education	18	40.0			14	31.1		
Adult Literacy Education	1	2.2			0.0	0.0		
Primary Education	17	37.8			24	53.3		
Secondary Education	7	15.6			7	15.6		
Higher Education	2	4.4			2	4.4		
Total	45	100			45	100		
Farm size (hectares) 0.1-0.99	22	48.9			20	44.4		
1.0-1.99	15	33.3			13	8.9.		
2.0-2.99	2	4.4			2	4.4		
3.0-3.99	1	2.2			0.0	0.0		
4.0-4.99	3	6.7			6	13.3		
>4.99	2	4.4			1	2.2		
Total	45	100	1.47hect	1.44	45	00		
Sources of Labor Hired Labor	37	82.2			6	13.3		
Family labor	3	6.7			35	77.8		
Family and hired labor	5	11.1			4	8.9		
Total	45	100			45	100		
Sources of Capital Friends & Family	6	13.3			8	17.8		
Banks	16	35.6			45	100		
Fadama	45	100			0.0	0.0		
Personal Savings	30	66.7			31	68.9		
Cooperatives	25	35.6			16	35.6		

Source: Field Survey, 2007

Regression Analysis Result

The lead equations chosen for both the beneficiaries and non-beneficiaries are double-log functions (Table 2 and Table 3). The functions have at least three of the variables significantly different from zero with relatively high R^2 and F values. The Cobb Douglas function showed four of the parameters significantly different from zero, but it was rejected because the sign of b_1 negates the a priori expectation on tools. Though the semi log function has four of its variables significant at different probability levels (0.01 to 0.1), the relatively lower values of the co-efficient of determination, R^2 at 52.9%, and its adjusted value at 46.9% (when compared with the values recorded for the double log function at 72% and 68.4%), conferred the choice of the equation of best fit on the double log function for the beneficiaries. The result of the regression analysis also showed that three of the parameters (b_1, b_4, and b_5) are significantly different from zero at 1%, 5%, and 1% probability levels, respectively. However, the overall significance of the variables used in all of the models were reflected in their F-values, ranging from 6.41 to as high as 20.06 at a 1% level of significance (Table 2).

From Table 2, the adjusted R^2 value of the lead equation is 0.684. This implies that the regressors had explained about 68.4% of the total variation in the regress (total revenue), while the remaining 31.6% remained unexplained variables. Therefore, the lead equation chosen is a double-log equation represented as:

$$Y = 6.03 + 0.4338\ X_1^{***} - 0.2671\ X_2 + 0.1589\ X_3 + 0.0518\ X_4^{**} + 0.5718\ X_5^{***}$$

$(b_o = 2.64)$, $(b_1 = 3.13)$, $(b_2 = -1.27)$, $(b_3 = 1.12)$, $(b_4 = 2.07)$, $(b_5 = 3.50)$

***Significant at 1%, **Significant at 5%, *Significant at 10%, F-value = 20.06, $R^2 = 0.72$, Adj. $R^2 = 0.68$, Prob. > F = 0.0000

Table 2: Result of Regression Analysis on Factors Affecting Farm Revenue Generated by Beneficiaries

Model Specification	b_o	b_1	b_2	b_3	b_4	b_5	R^2 value	Adj. R^2 value	F-value
Linear t-value	3861.8 (0.02)	154054.7* (1.71)	39.141 (0.59)	-2.362 (-0.64)	28.203** (2.61)	-0.9474 (-0.84)	0.451	0.381	6.41
Semi-log t-value	563554.5 (0.30)	348244.7*** (3.01)	-566549 (-3.24)	86393.72 (0.73)	35810.96* (1.72)	281815.3** (2.07)	0.469	0.529	8.78
Double-log t-value	6.029.7*** (2.64)	0.3338*** (3.13)	-0.2671 (-1.27)	0.1586 (1.12)	0.05165** (2.07)	-0.57175*** (3.50)	0.720	0.684	20.06

Source: Field Survey, 2007

The double-log model was selected as the equation of best fit because:

(i) It has the highest F and Adjusted F- values

(ii) It has more number of significant b_i values, both at 1% and at 5%.

Therefore, the estimated model is given as :

$Y = 6.03 + 0.4338\ X_1^{***} - 0.2671\ X_2 + 0.1589\ X_3 + 0.0518\ X_4^{**} - 0.5718\ X_5^{***}$

($b_o = 2.64$), ($b_1 = 3.13$), ($b_2 = -1.27$), ($b_3 = 1.12$), ($b_4 = 2.07$), ($b_5 = 3.50$)

***Significant at 1%, **Significant at 5%, *Significant at 10%, F-value = 20.06, $R^2 = 0.72$, Adj. $R^2 = 0.68$, Prob. > F = 0.0000

Table 3: Result of Regression Analysis on Factors Affecting Farm Revenue Generated by Non-Beneficiaries

Model specification	b_o	b_1	b_2	b_3	b_4	b_5	R^2 value	Adj. R^2 value	F-value
Linear t-value	-2062.221 (-0.11)	21205.98 (2.58)	-1.3300 (-0.69)	0.7356 (0.65)	7.0119 (4.04)	1.234*** (3.37)	0.775	0.746	26.88
Semi-log t-value	-860585.8*** (-2.95)	24025.64 (1.50)	-12010.1 (-1.27)	52185.7* (2.85)	4640.421 (1.65)	54523.84* (1.83)	0.621	0.572	12.77
Double-log t-value	2.3497** (2.17)	0.00648 (1.09)	0.0852** (2.43)	0.234*** (3.44)	0.2327* (2.23)	0.5651 (5.10)	0.879	0.864	56.76

Source: Field Survey, 2007

The double-log model was selected for non-beneficiaries as the equation of best fit:

$$Y = 2.35 + 0.648\ X_1 + 0.852\ X_2^{**} + 0.234 X_3^{***} + 0.0233\ X_4^{***} + 0.5651\ X_5^{***}$$

(b_o = 2. 17), (b_1 = 1.09), (b_2 = 2.43), (b_3 = 3. 44), (b_4 = 2. 23), (b_5 = 5 .10)

***Significant at 1%, **Significant at 5%, *Significant at 10%, F-value = 56.76, R^2 =87.9 %, Adj. R^2 = 86.4%

From the lead equation, all of the variables are positively correlated with the regressand except X_2, which is the cost of irrigation incurred by the beneficiaries. This indicated their importance in determining the total revenue, hence in line with the a priori expectation ($b_{is} > 0$). The result of the regression analysis for the beneficiaries revealed that, holding other variables constant, a 1% increase in land area (X_1), cost of farm tools (X_2), cost of planting materials (X_3), cost of agro-chemicals (X_4), and cost of labor (X_5) will result in a 0.43% increase for X_1, 0.26% decrease for X_2, 15.9% increase for X_3, 5.2% increase for X_4, and a 57.2% decrease for X_5, respectively, in revenue accruing from vegetable output (Table 2).

For the non-beneficiaries, the functions have at least three of the variables significantly different from zero, with relatively high R^2 and F values. The Cobb Douglas function showed only two variables (X_3 and X_5) as significant at different probability levels (between 0.01 and 0.1), and relatively lower values of the co-efficient of determination (R^2 value) at 62.1% and the adjusted value at 57.2%. These values were compared with the values recorded for the double log function (87.9% and 86.4%) and conferred the choice of the equation of best fit on the double log function for the non-beneficiaries. The result of the regression analysis also showed that four of the parameters (b_2, b_3, b_4, and b_5) were found to be significantly different from zero at 5%, 1%, 5%, and 1% probability levels, respectively. However, the overall significance of the variables used in all the models, were reflected in their F-values, ranging from 26.88 to as high as 56.76 at a 1% level of significance (Table 3). Also, the adjusted R^2 value of the lead equation was 0.729; implying that the regressors had explained about 72.9% of the total variation in the regressand (total revenue), while the remaining 27.1% remained unexplained variables. Therefore, the lead equation chosen is double-log equation represented as:

$Y = 2.35 + 0.\ 648\ X_1 + 0.852\ X_2^{**} + 0.\ 234\ X_3^{***} + 0.0233\ X_4^{***} + 0.5651\ X_5^{***}$

$(b_o = 2.\ 17), (b_1 = 1.09), (b_2 = 2.43), (b_3 = 3.\ 44), (b_4 = 2.\ 23), (b_5 = 5\ .10)$

***Significant at 1%, **Significant at 5%, *Significant at 10%, F-value = 56.76, R^2 = 87.9 %, Adj. R^2 = 86.4%

Gross Margin Analysis

Profitability of a farm serves as one of the indicators used in decision-making on the increase or decrease in output of the farming enterprise. The gross margin analysis of beneficiaries and non-beneficiaries from the findings of the study, as presented in Table 4, revealed a nominal difference between the income of both the beneficiaries and non-beneficiaries, cultivating less than one hectares of farm land. Although the analysis of the difference of means using the two sample t-test, assuming unequal variances, revealed that there is no statistically significant difference in the incomes of groups of respondents at that level of operation (Table 5).

Table 4: Gross Margin per Hectare at Different Scales of Operation

	0.1-0.99 ha		1.0 -1.99 ha		≥2.0 ha	
	Benefs.	**Non-Benefs.**	Benefics.	Non-Benefs.	Benefs.	Non-Benefs.
No. of Farmers	22	20	15	13	8	12
Av. Farm size (ha.)	0.51	0.40	1.07	1.28	5.15	3.47
Av. Total variable cost ~~₦~~	119,551.14	84,552.55	149,180.67	128,569. 23	417,890. 00	178,481.25
Av. Total Revenue (~~₦~~)	289,886.36	90,009.10	266,953.33	160,380 .77	987,041. 63	230,975.00
Av. Gross Margin (~~₦~~)	170,335.23	5,456. 55	117,772.67	31,811. 54	569,151. 63	52,493.75
Av. Gross Margin (~~₦~~/ha~~)~~	224,980.46	17,721.95	117,257.50	31,434. 03	131,622. 61	15,694.88

Source: Field Survey, 2007

Analysis of the gross margin per hectare at various scales of operation confirms that the null hypothesis (Ho) is accepted. This may be attributed to the beneficiaries'

access to the pilot acquisition facilities and the capacity of building training opportunities offered by the project, unlike the non-benefiting groups. However, as reflected in the gross margin analysis for less than 2 hectares and ≥2.0 hectares of land for both groups (Table 4), the analysis of the difference of means at the same scale of operation showed significant differences at 5% and 10% levels of probability, respectively, giving the t-values of 0.0411 and 0.0504, respectively (Table 5). The null hypotheses are rejected and the alternatives are accepted for both levels of operation.

Table 5: Test of Difference of Means between Beneficiaries and Non- Beneficiaries

	0.1-0.99 ha		1.0 -1.99 ha		≥2.0 ha	
	Benefs.	Non-Benefs.	Benefics.	Non-Benefs.	Benefs.	Non-Benefs.
Mean (GM/ha)	224,980.46	17,721.95	117,257.50	31,434. 03	131,622. 61	15,694.88
Variance	4.26509E+11	224826988	19108024587	338724158	1931725597	1472825181
observations	22	20	15	13	8	12
Hypothesized Mean Diff.	0		0		0	
Df	21		19		8	
t Stat.	1.4842		2.1910**		2.3014*	
P(T≤ t), one tail	0.0763		0.0206		0.0252	
t critical, one tail	1.7207		1.7291		1.8595	
P(T≤ t), two tail	0.1526		0.0411		0.0504	
t critical, two tail	2.0796		2.0930		2.3060	
Av. Hectarage	0.51	0.40	1.07	1.28	5.15	3.47
Remarks	t stat , not significant		t stat ,significant at 5%		t stat , significant at 10%	

Source: Field Survey, 2007

Implications for Financial Support

To produce a hectare of vegetables in Fadama communities, farmers may require between ₦85,000.00 and ₦420,000.00 of financial assistance (depending on the proposed scale of operation) from efficient micro-credit delivery from government and other non-governmental agencies poised towards agricultural sector and rural development. This

will be required to provide the necessary capital for farm operations and post-harvest handling of the produce. Any strategy on Fadama for pilot asset acquisition and infrastructural development and capacity building will enhance continued participation of farmers in Fadama areas of the country. There is, therefore, a strong need to enlist the participation of more communities and encourage financial empowerment and access to capital sourcing from formal credit institutions, such as the Nigerian Agricultural Credit and Rural Development Bank (NACRBD) and the Ogun State Agricultural and Multi-purpose Credit Agency (OSAMCA).

Table 6: Problems Faced by Respondents

Problems faced by Respondents	Beneficiaries		Non-Beneficiaries	
	Frequency	% of Total	Frequency	% of Total
Labor Problems				
Unavailability of Labor	29	64.4	27	60
Nonchalant Attitude of Labor	11	24.4	25 36	55.6 80
High Cost of Labor	5	11.2		
Capital Problems				
Lack of mechanization and irrigation Equipment	21	46.7	42	93.3
Lack of Collaterals	16	35.6	7	15.6
High rates of interest	8	17.8	8	17.8

Source: Field Survey, 2007

Table 7: Constraints Limiting Increased Production of Respondents in the Fadama Area

Constraints	Beneficiaries		Non-Beneficiaries	
	Frequency	% of Total	Frequency	% of Total
Lack of Infrastructure	45	100	45	100
Inadequate Capital	8	17.8	31	68.9
Lack of Markets	14	31.1	29	64.4
Lack of Mechanization	28	62.2	20	44.4
Lack of Water Pumps	3	6.6	30	66.7
Lack of storage facilities	41	91.1	45	100
Limited Access to Agro-chemicals	16	35.6	8	17.8
Poor Extension Services and Training	4	8.8	11	24.4
Inefficient transportation network	38	84.4	33	73.3
Tenure system of Land Ownership	20	44.4	12	26.7
Inadequate access to improved seed varieties	9	20.0	42	93.3

Source: Field Survey, 2007

Table 8: Suggested Solutions to Limiting Increased Production of Respondents in the Fadama Area

Constraints	Beneficiaries		Non-Beneficiaries	
	Frequency	% of Total	Frequency	% of Total
Provision of good roads	45	100	45	100
Financial Assistance by Government	45	100	37	82.2
Establishment of central Markets	31		29	64.4
Provision of farm Machinery for farm operations	42	93.3	40	88.8
Easy access to regular Extension Services	8	17.8	27	60.0
Provision of Water Pumps by Government at subsidized prices	3	6.7	25	55.6
Easy access to Agro-chemicals	9	20	8	17.8

Source: Field Survey, 2007

Summary and Recommendation for Policy Implementation

The study explored the impact of National Fadama Development Project II on farmers' income in Ogun State. Evidence from the study revealed that more income is earned by the beneficiaries of the project than the non-beneficiaries. The socio-economic characteristics investigated all ran in line with a priori expectations on the study. The various problems and constraints limiting production could be reduced or avoided if the project implementers harness resources towards rural infrastructural development of the communities, empowerment of the farmers through capacity building on integrated pest management, improved cultural practices to reduce their cost of production, and enhance their capacities to manage their farm holdings without much dependence on agro-chemicals, thus increasing the total revenue accruable from any production.

Based on the findings the study, financial institutions need to be encouraged by the government to provide financial assistance to farmers in the Fadama communities. This is expected to increase in their capital base, enhance economic empowerment, and expand their production capacities in the rural areas. Efficient transportation and road network, as well as proximal markets, should be established to facilitate transportation and marketing of produce with reduce losses due to spoilage.

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Agricultural development and agricultural development programe in anambra state (a case study of governor willie obianoâ€™s administration). Agriculture financing in nigeria problems and prospect.Â Agricultural public spending in nigeria. Analysis of food safety among dried fish sellers in akure, ondo state.Â Resource use efficiency among fadama crop farmers in ibadan/ibarapa agricultural zone of oyo state, nigeria. Resource productivity in ornamental plants production in jos metropolis, nigeria.Â Impact of fertilizer policy on crop production in nigeria. This paper examined the impact of National Fadama Development Project III on their socio-. economic status, poverty issues and equally assesses the extent to which participation in the programme has reduce poverty among participants. The study relied primary data collected using structured questionnaire and personal interview.Â Most of the rice produce in Nigeria is accredited to small scale farmers. The small scale farmers operate in small distantly fragmented farm land with technical and allocative inefficiencies in the use of available farm resources (Hamidu, 2000). With the growing awareness to maximize welfare through economic development, there is need to reduce unemployment, the rapid population growth rate, and poverty among rural dwellers.