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Full Length Research Paper

Effectiveness of Direct Resource Delivery Policy to Crop Farmers: A Case of Fadama III Project in Enugu State, Nigeria

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This work measures the effectiveness of direct resource delivery on food production evaluating the Fadama III project in Enugu State of Nigeria. The study estimated annual incomes and productive resources used by the farmers before and after joining the project and identified constraints to the realization of project objectives. Descriptive statistics such as frequency counts, means and percentages, as well as multiple regression model using the ordinary least squares (OLS) approach were used to analyze data obtained. Hypotheses were tested using t-statistic in Two-Sample T-test. Chow-statistic was used to test for differences in the coefficients of the regression variables. Findings indicated that the farmers realized Mean incomes and productive resources of ₦169,139.44 and ₦521,042.36; and ₦67,313.45 and ₦242,307.12 were respectively estimated for farmers before and after joining the project. There were significant differences between incomes and productive resources of the farmers before and after joining the project implying goodness of the policy. The crop farmers' annual incomes before and after joining the project were significantly determined by distance to the market, farm size, extension visits and value of productive resources. Irregular fund disbursement topped the list of nine constraints to effective realization of project objectives arranged in descending order of seriousness. Early and prompt release of productive resources and cash counterpart contributions to the farmers, provision of more extension agents, services and logistics for the farmers and reduction of users' cash contribution will ensure improved productivity, income and project sustainability

Keywords: Cassava; Co-operatives; Enugu State; Fadama III project; Income; Productive resources; Significant; Sustainable; Yams

INTRODUCTION

The Nigerian agricultural sector has continued to be characterized by increasing reduction in production and productivity thereby limiting the ability of the sector to perform its traditional role in economic development including an enhanced income for the farmers. In order to break this low productivity cycle and improve on the performance of the agricultural sector, Nigerian government over the years introduced and implemented several policies and programmes aimed at revamping the sector (Ajibefun and Aderinola, 2004). Attempts in the past aimed at poverty alleviation, increase in productivity, and enhancement of farmers income, according to Henri-Ukoha, *et al* (2011) include:

- i. National Agricultural Research Projects—World Bank Assisted (1991),
- ii. National Agricultural support Programme (1992),
- iii. National Programme on Food Security (1999), and
- iv. Presidential Initiative on Livestock and other agricultural sectors for production, processing and export (2002).

Self-sufficiency in food production based only on rainfed agriculture is difficult to achieve. This is particularly true for Nigeria. Therefore, for self-sufficiency in food production, there is need to extend the farming season beyond the rainy season through irrigated agriculture (Ajayi and Nwaleji, 2010). This is one major thrust of Fadama Projects. These farmers have limited access to supplementary services and facilities needed to procure, transform, and deliver productive resources to improve on their output and by extension, their income. The inadequacy of productive resources is exacerbated by lack of credit facilities for small farmers, the shortage of marketing centres, inefficient transport system, poor communications, insufficient physical infrastructure and dearth of agricultural extension services. Amelioration of these handicaps in order to increase food security, reduce rural poverty and improve on rural infrastructure by directly delivering resources to the benefiting rural farmers efficiently and effectively; and empowering them to collectively decide on how resources are allocated and managed constitute Fadama III Project's hallmark objective.

The development objective of Fadama III is to increase the income of the users of rural land and water resources on sustainable basis. It relies on the facilitation of demand-driven investment and empowerment of local community groups and to improve productivity and land quality.

Successive governments, collaborating with various development partners, have invested huge sums of

money in poverty reduction projects especially in rural areas but not much have been achieved in terms of sustained growth and improved living standard in the rural communities. It is against this background that the Third National Fadama Development project was embarked upon by the 36 states and the Federal Capital Territory (FCT) (Enugu State Fadama Coordination Office, 2008).

Enugu State Fadama III Context

Fadama III Project is a comprehensive five-year action programme developed by the then Federal Ministry of Agriculture and Water Resources (FMAWR) in collaboration with the Federal Ministry of Environment (FME) and other federal and state government ministries, local governments and key stakeholders (donors, private operators, NGOs). The Project which is anchored on community-driven development (CDD) approach is a World Bank assisted project implemented beginning from July 2008 and terminating in December 2013. It is one of such projects enunciated by the Federal government of Nigeria predicated on the development of the rural areas for the reduction of poverty, unemployment and inequality. It was established to ensure all year round production of crops in all the states of the federation through the exploitation of shallow aquifers and surface water potentials in each state

The word "Fadama" is a Hausa name for irrigable land, usually low-lying, and flood plain areas underlined by shallow aquifers found along Nigeria's river system (Echeme and Nwachukwu, 2010). According to Nwachukwu, *et al*, (2009), Fadama also refers to a seasonally flooded area used for farming during the dry season. When Fadama spread out over a large area, they are often called 'wetlands' [Blench and Ingawa, (2004 and Nkonya, *et al*, (2008)]. Wetlands are recognized by the Ramsar 3 Convention of 1971, according to Anon (2004), as areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters. The Fadama Project adopts community-driven development approach such that the benefitting groups – Fadama Users Groups (FUG) have the opportunity of choosing adoptable activity that can attract the support of the World Bank according to Echeme and Nwachukwu, (2010).

According to United Nations (2010) the Fadama III

Project development objective is to increase the income of users of rural land and water resources on a sustainable basis in order to reduce rural poverty, increase food security as well as contribute to the achievement of the Millennium Development Goals (MDGs). Its Community Driven Development (CDD) approach is meant to concede project initiation, planning and implementation to the benefiting communities with the assistance of facilitators. Local communities, under the umbrella of Fadama Community Associations (FCAs) and Fadama User Groups (FUGs), oversee the design and implementation of the project and are empowered through skills and capacity-building to improve their livelihoods by increasing income generating activities.

One major thrust of Fadama Projects is to extend the farming season beyond the rainy season through irrigated agriculture (Ajayi and Nwalieji, 2010). The NFDP has the general goal of increasing food production in the states through expanded cultivation, using simple small-scale irrigation facilities with appropriate technologies. It was aimed at increasing the land area under cultivation by providing an all-year round cropping of marketable and high-valued crops such as cereals (maize and rice). The increase in the total population of these crops annually would increase the incomes of the farmers and raise their standard of living. Furthermore, NFDP would serve as an insurance against crop failure as a result of environmental hazards. The disturbing demand-supply gap for agricultural products was meant to be narrowed and relative price stability ensured over time (Anambra State Agricultural Development Programme (ASADP), 1995). In all, the socioeconomic life of the farmers would be improved. The strategies for achieving the above objectives involved the delivery of several inputs and services that would generate desired outputs directly to the benefitting communities. These included:

- (i) development of requisite infrastructure such as access roads, culverts, tubewells and pumps, within the fadama areas in the state;
- (ii) provision of marketing/storage facilities such as storage sheds; and
- (iii) organizing farmers into Fadama Users Associations (FUAs) for irrigation management, better access to credit, cost recovery and training on improved technologies (Ajayi and Nwalieji, 2010).

This study was carried out in Enugu State of Nigeria. Enugu State was created on August 27, 1991 with the city of Enugu, euphemistically referred to as the "coal city", as its capital. The state derives its name from the capital city which was established in 1912 as a small coal mining town, but later grew to become the capital of the former Eastern Region of Nigeria. Enugu remained the capital of the East Central State of Nigeria, one of the

three states carved out of the former Eastern Region in 1967. Enugu State shares boundaries with Anambra on the West, Abia State on the South, Kogi on the North with Benue and Ebonyi on the East. The State occupies an area of approximately 7,161 km² with a population of over 3.3 million by 2005 estimation (Online Nigeria, 2013). The State has a total of 17 local government areas: Agwu, Aninri, Enugu North, Enugu South, Enugu East, Ezeagu, Igbo-Eze North, Igbo-Eze South, Isi-Uzo, Igbo-Ekiti, Nkanu, Nkanu East, Nsukka, Oji-River, Udenu, Udi and Uzo-Uwani,

The State is located in a tropical rain forest zone which means that it has a tropical savanna climate. The climate is humid and this humidity is at its highest between March and November. For the whole of Enugu State the mean daily temperature is 26.7 °C (80.1 °F). Enugu State is traversed by a number of rivers and streams prominent among them are Adada, Iyoko, Idodo, Ekulu, Oji, Ebonyi Rivers and Mamu/Ezu River which is the natural boundary between the State and Anambra State

Economically, the state is predominantly rural and agrarian, with a substantial proportion of its working population engaged in farming, although trading (18.8%) and services (12.9%) are also important. The main produce are yam tubers, palm produce and rice. Besides coal, new mineral deposits have recently been discovered in Enugu State. These include limestone, iron ore, crude oil, natural gas and bauxite (Adeyemi, 2011). A major cultural festival in the state is the New Yam festival. The new yam festival also known as 'iwa ji', is held between August and October marking the beginning of the harvest season.

Theoretical Framework

This work was based on Collective Action Theory. Collective action is traditionally defined as any action aiming at improving the group's conditions (such as status or power), which is enacted by a representative of the group (Wright, Taylor, and Moghaddam, 1990). Tajfel and Turner (1979) posited that people strive to achieve and maintain positive social identities associated with their group memberships.

Pandolfelli, Meinen-Dick, and Dohrn (2007), saw collective action as both the process by which voluntary institutions are created and maintained and the groups that decide to act together. Collective action plays a vital role in many people's lives, through such areas as income generation, risk reduction, public service provision, and the management of natural resources. Integrating both women and men into collective action can lead to greater group effectiveness. In many

instances, the gender composition of groups is an important determinant of effective collective action, especially for natural resource management in two key dimensions: (i) the ability of groups to meet their immediate purposes, whether that purpose is the management of a natural-resource or the disbursement of funds to members of a burial group, and (ii) the process by which the group works to meet that purpose. Specific measures of effectiveness might include tangible indicators such as economic returns to group members, compliance with rules, transparency and accountability in managing funds, or the incidence and severity of conflicts, as well as less tangible indicators, such as members' satisfaction with the group (Pandolfelli, Meinzen-Dick, and Dohrn, 2007). This conforms with the co-operative principles of open membership and gender equality. Marshall (1988) suggests that collective action is an action taken by a group (either directly or on its behalf through an organization) in pursuit of member's perceived shared interest. He went on in his work to maintain that collective action requires involvement of a group of people; share of interest within the group; common action which works in the pursuit of the shared interest and voluntary action to distinguish it from hired labour. Collective action is also seen as a voluntary action taken by a group of people to achieve common interest. Co-operative, as voluntary association of independent individuals who come together in order to solve their socio-economic problems, requires collective action to succeed. Okechukwu (2001) stated that all known definitions of co-operative tend to highlight the following about co-operatives: co-operation is a form of organization of people; the people are rational beings; they are together on equality basis; are there for the promotion of socio-economic interest of themselves; and are democratically managed.

Based on the premise above, the theory of collective action becomes apt in this work especially as Fadama Users' Groups are organized, incorporated and managed as co-operative organisations. This is buttressed more by Chavez (2003) who opined that collective theory definition, principles and practice directly or indirectly relate to co-operative seven internationally recognized principles of voluntary and open membership, member economic participation; co-operation among co-operatives, concern for community etc. According to Dick, Gregorio, and McCarthy (2004) collective action theory is a theory that is very useful in agriculture, rural resource management, and rural development programmes. These are the hallmark of Fadama Users Groups.

MATERIALS AND METHODS

This study centered on Fadama User Groups (FUGs) crop farmer-members within Enugu State of Nigeria. It was aimed at determining if their performance was in tune with the objective of Fadama III Project of increasing the income and productivity of the member-farmers sustainably by direct delivery of productive resources to them. The study tried to determine if there is any significant difference between the fortunes of farmer-members of the FUGs before and after joining the scheme with respect to their income and values of productive resources used as well as output performance of various crops under the project.

The population for this study consisted of all the FUG crop farmer-members within the 17 Local Government Areas in Enugu State spread through the three Agricultural Zones (Enugu, Nsukka, and Awgu) of the State. A multistage and random sampling method were adopted to select 1 L.G.A from each agricultural zone in the first stage to get a total of 3 LGAs, in the second stage, 4 Fadama User Groups (FUGs) were selected from each of the selected LGAs to arrive at a total of 12 FUGs. In the third stage, 6 crop-farmers were selected from each FUG to give a total of 72 crop farmer-members for the study. This constituted the final sample size for the study.

Primary data were collected from crop farmer-members of the FUGs using well structured and pre-tested questionnaires, scheduled interviews and panel discussions. Primary data were collected on socio-economic characteristics of the respondents, their income, access to productive resources and constraints to effective realization of the project objectives. Data on constraints were collected by means of a 5-point Likert Scale. Members of the FUGs responded to any of the five response ratings of *Strongly Agree* (4), *Agree* (3); *Disagree* (2); *Strongly Disagree* (1) and *Indifferent* (0);

Descriptive statistics such as frequency counts, means and percentages, were used to analyze data on socio-economic characteristics of the respondents, their incomes, outputs and constraints to effective realization of the project objectives while multiple regression model using the ordinary least squares (OLS) approach was used to determine the influence of socio-economic characteristics of the farmers on their income before and after joining the project.

The multiple regression model is implicitly specified as follows:

Table 1: Socio-economic characteristics of the FUG crop farmers

Variables	(N= 72)	Percentage	Averages
Gender			
Male		75	
Female		25	
Age (years)			
20 — 39		09.72	
40 — 59		55.56	
≥ 60		34.72	51
Marital status			
Married		94.44	
Single		05.56	
Family size			
1 — 4		08.33	
5 — 9		76.39	
≥ 10		15.28	7
Education (years)			
0 — 6		16.67	
7 — 12		63.89	
≥ 13		19.44	9
Farming Experience (years)			
1 — 20		22.78	
21 — 40		45.83	
41 — 60		03.13	24
Farm size (hectares)			
0.1 — 2		56.96	
2.1 — 4		38.88	
≥ 4.1		04.16	1.9
Distance to Market (km)			
1—5		80.56	
6—10		13.88	
> 10		05.56	
Average			4

Source: Field survey 2013.

INC = f(EDU, AGE, ASI, DTM, FFS, FAS, ETV, GEN, EXP, PDR) + e

Where:

INC = Income generated by the FUG crop farmers;

EDU = Education level (years);

AGE = Age of the farmer (years);

ASI = Availability of special infrastructure (dummy: available = 1; otherwise = 0);

DTM = Distance to market (kilometers);

FFS = Farmer's farm size (hectares);

FAS = Family size (number);

ETV = Extension visit/contacts (number);

GEN = Gender (Male = 1; Female = 2);

EXP = Farmer's farming experience (years); and

PDR = Productive resources (available = 1; otherwise = 2)

Four functional forms of the regression model were tried, namely, linear, exponential, semi-log, and double-

Table 2. Estimated income of the farmers before and after joining the Fadama Project

Variables	Before		After	
	Amount (₦)	% of total	Amount (₦)	% of total
Yam	7,150,660	58.72	18,408,750	49.07
Cassava	3,950,270	32.44	16,515,800	44.02
Rice	889,640	7.31	1,752,000	4.67
Plantain	187,470	1.53	838,500	2.24
Total	12,178,040	100	37,515,050	100
Mean income	169,139.44		521,042.36	

Source: Field survey, 2013.

Table 3. Estimated difference in means of income of farmers before and after joining the project

Variable (N= 72)	Mean means	Difference between	T	P	df
IAP	521,042.36				
IBP	169,139.44	351,902.92	-7.07**	0.000	125

Notes: IAP = Income after joining the project; IBP = Income before joining the project. N = Number of respondents. ** =Significant at 5% level.

Source: Field survey, 2013

Table 4. Estimated value of productive resources of the farmers before and after joining the Fadama Project

Before			After		
Amount Variables	(₦)	% of total	Variable	Amount (₦)	% of total
Yam	1,385,543.8	28.59	Yam	4,823,600	27.64
Fertilizer	1,339,750	27.64	Fertilizer	4,797,800	27.50
Cassava	873,628.75	18.03	Cash	4,584,053	26.27
Rice	763,150	15.74	Cassava	1,466,050	8.29
Agrochemicals	343,496	7.08	Agrochemicals	1,103,150	6.32
Cash	122,900	2.53	Rice	615,160	3.53
Labour	18,100	0.47	Labour	56,300	0.45
Total	4,846,568.5	100	Total	17,446,113	100
Mean value	67,313.45		Mean value	242,307.12	

Source: Field survey, 2013.

log. Output of the form with the highest value of coefficient of multiple determination (R^2), highest number of significant variables and F-statistics value were selected as the lead equation. The explicit versions of the four functional forms are as follows:

Linear: $INC = b_0 + b_1EDU + b_2AGE + b_3ASI + b_4DTM + b_5FFS + b_6FAS + b_7ETV + b_8GEN + b_9EXP + b_{10}PDR + e_i$
 Exponential: $\ln INC = b_0 + b_1EDU + b_2AGE + b_3ASI + b_4DTM + b_5FFS + b_6FAS + b_7ETV + b_8GEN + b_9EXP + b_{10}PDR + e_i$

Semi-log: $INC = b_0 + b_1\ln EDU + b_2\ln AGE + b_3\ln ASI + b_4\ln DTM + b_5\ln FFS + b_6\ln FAS + b_7\ln ETV + b_8\ln GEN + b_9\ln EXP + b_{10}\ln PDR + e_i$

Double-log: $\ln INC = b_0 + b_1\ln EDU + b_2\ln AGE + b_3\ln ASI + b_4\ln DTM + b_5\ln FFS + b_6\ln FAS + b_7\ln ETV + b_8\ln GEN + b_9\ln EXP + b_{10}\ln PDR + e_i$

The b_0 and the b_i s are the parameters to be estimated and the e_i is the error term meant to capture errors arising from mistakes in specifications, exclusions, inclusions, data collection. \ln is the logarithm to base 10. The

Table 5. Estimated differences in means of productive resources of farmers before and after joining the project

Variable (N= 72)	Mean means	Difference between	T	P	df
PRA	242,307.12				
PRB	67,313.45	174,993.67	-5.83**	0.000	106

Notes: PRA =Productive resources after joining the project PRB = Productive resources before joining the project. N = Number of respondents. ** =Significant at 5% level.

Source: Field survey, 2013

Table 6. Estimated determinants of farmers' income before joining the project

Parameter	Linear	Exponential	Semi-log	Double-log
Constant	165167 (1.79)	3.1241 (18.32)	-276814 (-1.17)	2.7132 (5.06)
EDU	-786 (-0.20)	-0.008342 (-0.58)	-13622 (-1.48)	-0.0123 (-0.07)
AGE	993 (0.54)	0.001213 (0.56)	6756 (0.61)	0.0563 (1.15)
ASI	-13223 (-0.44)	-0.001679 (-0.42)	-2667 (-0.54)	-0.0452 (-0.31)
DTM	3472 (1.86)*	0.00822 (0.74)	3365 (0.56)	0.08996 (1.08)
FFS	40992 (2.39)**	0.06814 (2.05)**	188642 (2.38)**	0.2856 (2.04)**
FAS	-4149 (-0.62)	-0.006341 (-0.81)	-2761 (-0.46)	-0.09888 (-1.13)
ETV	13939 (2.40)**	0.009956 (2.13)**	2448 (2.11)**	0.2496 (1.87)*
GEN	-21155 (-0.93)	-0.002113 (-0.82)	-30176 (-1.14)	0.03842 (0.32)
EXP	321 (0.19)	0.002711 (0.58)	2746 (0.38)	0.0866 (0.78)
PDR	85850 (1.89)**	0.000145 (1.14)	8965 (2.13)**	0.3049 (2.11)**
R ²	68.7%	62.5%	65.3%	64.5%
R ² (adj)	64.7%	60.1%	62.7%	62.6%
F-statistic	4.79	4.12	4.23	4.13
D-W statistic	1.78	1.56	1.67	1.47

Notes: * = Significant at 1% level; ** = Significant at 5% level. Figures in () are t ratios. EDU, AGE, ASI, DTM, FFS, FAS, ETV, GEN, EXP and PDR are as earlier defined. D-W statistic = Durbin-Watson statistic.

Source: Field survey 2013.

acronyms – INC, EDU, AGE, ASI, DTM, FFS, FAS, ETV, GEN, EXP, PDR- are as earlier defined.

RESULTS AND DISCUSSIONS

Socio-economic characteristics of the FUG crop-farmers

A summary of the socio-economic characteristics of the crop farmers is shown in Table 1. The results reveal dominance of men (75%) over women (25%) in crop

farming in Enugu State. The average age of the farmers was 51years. The fact that 65.28% of the respondents fell within this working age bracket showed prospects for greater productivity which the Fadama III project tends to achieve. The study revealed that 94.44% of the respondents were married and an average family size of 7 persons. Large household sizes have been noted to have correlation with food insecurity and poverty especially when the household head is engaged in agriculture as the main source of livelihood and income (Ike and Uzokwe, 2011). On the other hand large family size will add to the family labour and reduce production

Table 7. Estimated determinants of farmers' income after joining the project

Parameter	Linear	Exponential	Semi-log	Double-log
Constant	644672 (1.81)	2.7812 (13.14)	-23614 (-0.98)	1.9431 (4.07)
EDU	-16054 (-1.80)	-0.00813 (-0.63)	-13438 (-1.25)	-0.0112 (-0.08)
AGE	6233 (1.23)	0.00213 (0.55)	5667 (0.73)	0.0449 (1.13)
ASI	-10398 (-0.12)	-0.00412 (-0.47)	-1769 (-0.57)	-0.0461 (-0.42)
DTM	9755 (1.98)*	0.00916 (0.77)	2887 (0.61)	0.0761 (1.11)
FFS	39989 (2.40)**	0.07116 (2.07)**	176178 (2.09)**	0.2671 (1.98)**
FAS	-15795 (-0.85)	-0.00043 (-0.68)	-2476 (-0.52)	-0.0891 (-1.14)
ETV	8322 (1.83)**	0.08341 (2.14)**	23641 (2.08)**	0.2187 (1.94)*
GEN	-68232 (-1.09)	-0.00781 (-0.69)	-33672 (-1.08)	0.0271 (0.46)
EXP	-2776 (-0.61)	0.00347 (0.64)	2697 (0.51)	0.0674 (0.83)
PDR	55461 (2.15)**	0.00136 (1.12)	7729 (2.11)**	0.1973 (1.96)**
R ²	74.6%	68.4%	65.9%	70.7%
R ² (adj)	70.4%	64.4%	63.4%	68.2%
F-statistic	8.09	4.21	4.14	7.04
D-W statistic	1.86	1.58	1.63	1.92

Notes: * = Significant at 1% level; ** = Significant at 5% level. Figures in () are t ratios. EDU, AGE, ASI, DTM, FFS, FAS, ETV, GEN, EXP and PDR are as earlier defined. D-W statistic = Durbin-Watson statistic.

Source: Field survey 2013

cost. The average number of education years attained by the farmers was 9, implying a post primary education. Good education enhances managerial, organizational effectiveness and efficiency of the farmer. These attributes will be manifested in his productivity and net income. The average farming experience was 24 years with an average farm size of 1.9 hectares in the State. The study also revealed that an average distance from the farmers' farm site to the market was 4 kilometers.

Income and productive resources of the Farmers before and after Joining the Fadama Project

Table 2 presents the result of the estimated income of the farmers before and after joining the project. The study revealed that before joining the project yam earned the farmers highest income accounting for 58.72% of the total income, followed by cassava with 32.44%, rice with 7.31% came third and plantain contributed the least with 1.53%. The estimated income of the farmers after joining

the project revealed that yam maintained its lead with 49.07%, followed by cassava with 44.02% rice contributed only 4.67% while plantain earned only 2.24%. Table 4 shows the mean values of productive resources available to the farmers before and after joining the project to be ₦67,313.45 and ₦242,307.12 respectively with a significant mean difference of ₦175,342.98 as shown in Table 5. The significant increase in the value of productive resource delivery reflected in the very significant increase in the mean income of the farmers from ₦169,139.44 before joining the project to ₦521,042.36 after joining the project as shown in Table 2 and a mean difference of ₦351,902.92 as revealed by Table 3.

This impression was further substantiated with the result of the test of hypothesis, there is no statistically significant difference between mean incomes of the FUG crop farmers before and after joining the project (Table 3) which indicated a remarkable difference between the mean incomes levels of these crop farmers before and after joining the Fadama project at 5% level.

Table 8. Constraints to project realization

Variable	Mean score	Rank
Irregular fund disbursement method	3.83	1 st
Late release of government cash contribution	3.44	2 nd
Demand for users' cash contribution	3.12	3 rd
Non payment of beneficiary contribution	3.09	4 th
Misconception of the project by benefiting communities	2.82	5 th
Inadequacy of facilitators	2.61	6 th
Inadequate logistics for facilitators/officers	2.60	7 th
Internal wrangling/suspicion among benefiting communities	1.56	8 th
Poor leadership/management by officers of FCAs/FUGs	1.40	9 th

Source: Field survey, 2013.

Estimated influence of socio-economic characteristics of the FUG Crop Farmers on their annual incomes before and after joining the project

The multiple regression analysis was used to establish the influence of socio-economic factors of the farmers on their annual incomes. Four functional forms (Linear, exponential, semi-log and double-log) of the regression model were fitted with the data and tried using the MANITAB statistical software. It could be seen from Tables 6 and 7 that the output of the linear form gave the best result in terms of number, sizes and signs of significant parameter estimates as well as R^2 , R^2 (adjusted), F-statistic and Durbin-Watson statistic. It was therefore adopted as the lead equation. The regression equation is stated as:

$$INC = 165167 - 786EDU + 993AGE - 13223ASI + 3472DTM + 40992FFS - 4149FAS + 13939ETV - 21155GEN + 321EXP + 85850PDR + e^i$$

A total of 10 regressors were included in the model and four of them, distance to the market (DTM), farmers' farm size (FFS), extension visits (ETV) and productive resources (PDR) were statistically significant. Distance to the market was significant at 1% level of probability at

both before and after joining the Fadama project. This factor is an important determinant of the income of any farmer in that should there be no market for his products, the products will either spoil or he will be forced to give them away at any offer without an opportunity to optimize his income from the sales. Again the nearer the market the smaller the transportation cost and the higher the net income. This is probably the reason behind the construction of Fadama markets in some communities as community projects.

Farmer's farm size, extension visits and productive resources were significant at 5% level of probability. This implies that the FUG crop farmers who used more of these resources were likely to realize more income. This result agrees with Kern and Paulson (2011) who postulated that profit does vary with farm size as larger farms may be able to more efficiently use larger equipment complements or obtain discounts by buying larger volumes of inputs resulting in lower capital and/or variable input costs per acre.

Improved farming technologies such as high yield crop varieties, chemical fertilizers, and irrigation techniques have been central in raising yields, however, farmers have been much slower in adopting these new methods

because of lack of information regarding how to apply the improved inputs (Betz, 2007). Consequently, access to reliable information is an integral part in any farmer's ability to raise productivity. This probably explains the significance of extension visits (EVT) in this result. Application of high yield crops, good irrigation and suitable agrochemicals will increase the productivity of any farmer; tractorization will save time and cost cumulating in improved income. This underlines why in this result, productive resources (PDR) was significant.

The R² values of 68.7% and 74.6% before and after joining the project respectively showed that 68.7% and 74.6% of the variations in the income levels were explained by the explanatory variables and buttressed by R²(adj) of 64.7% and 70.4% for before and after joining the Fadama project respectively. It also showed an F-statistic of 4.79 and 8.09 respectively significant at 5% level implying the goodness of fit of the model and confirmed by Durbin-Watson statistic of 1.78 and 1.86 respectively which signify the absence of auto-correlation among observations of the independent variables. The result led to the rejection of the null hypothesis that the socio-economic characteristics of the FUG crop farmers have no statistical and significant effects on their incomes and the acceptance of the alternative hypothesis which is that socio-economic characteristics of the FUG crop farmers have statistical and significant effects on the farmers income both before and after joining the Fadama Project.

Difference of the estimated variables influencing the income of the FUG crop farmers before and after joining the project

The Chow-statistic was used to test for the coefficients of the regression variables. In this work it was used to determine whether the independent variables have different impact on the crop farmers' income before and after joining the project.

$$\text{The Chow-test} = \frac{\{S_{ABP} - (S_{AP} + S_{BP})\} / (K)}{(S_{AP} + S_{BP}) / (N_{AP} + N_{BP} - 2K)}$$

Where

S_{ABP} = Sum of squared residuals from the pooled data of the crop farmers' income regression output before and after joining the project;

S_{AP} = Sum of squared residuals from the crop farmers' income regression output after joining the project;

S_{BP} = Sum of squared residuals from the crop farmers' income regression output before joining the project;

N_{AP} = Number of observations after joining the project;

N_{BP} = Number of observations before joining the project;

K = Total number of parameters.

S_{ABP} = 3.07612

S_{AP} = 2.04844; S_{BP} = 0.8249689

N_{AP} = 72; N_{BP} = 72; K = 10

Substituting into the formula

$$= \frac{\{3.07612 - (2.04844 + 0.8249689)\} / 10}{(2.04844 + 0.8249689) / 124} = \frac{0.02027111}{0.02317265} = 0.87$$

The Chow-statistic gave a p value of 0.87 which is greater than 0.05 at 5% level of significance. This shows that there is no statistical significant difference in the impact of the socio-economic variables on the income of the crop farmers before and after joining the project.

Estimated Values Of Productive Resources Of The Farmers Before And After Joining The Fadama Project

Productive resources of the farmers before and after joining the Fadama Project

The estimated values of the productive resources of the farmers before and after joining the Fadama project is presented in Table 4.

In Enugu State, yam seeds topped the list with 28.59%, followed by fertilizer with 27.64%, cassava accounted for 18.03% while labour that accounted for 0.47% was the least. A mean value of ₦67,313.45, was expended on productive resources accessed by the FUG crop farmers in Enugu State before the advent of Fadama III Project. Estimated values of productive resources used by the farmers after joining the Fadama Project revealed that seed yams still topped the list with 27.64%. Fertilizer had 27.50%, while labour with 0.45% occupied the least position. After joining the Fadama project, the FUG crop farmers in Enugu State expended a mean value of ₦242,307.12 on the productive resources which is more than double the ₦67,313.45 expended by the farmers before joining the project. This is a confirmation of the achievement of the project's objective of delivering resources directly to the farmers effectively in order to

sustainably increase their income, food security and productivity.

Difference in mean values of productive resources of the FUG Crop Farmers before and after joining the Fadama Project

Hypothesis II, mean values of productive resources of the FUG crop farmers before and after joining the Fadama project are not significantly different was tested with Paired Samples T-test of the MINITAB statistical packages. The result in Table 5 showed existence of significant differences between the mean values of productive resources of the crop farmers before and after joining the Fadama project in Enugu State (T-cal 5.83 > T-tab 2.10) at 5% level of significance. The alternative hypothesis which implied that the Fadama project provided the FUG crop farmers more productive resources that enabled them to realize more income and better standard of living was accepted.

Constraints To Project Realization

Crop farmers within Enugu State posited that Fadama III Project could have recorded more successes if not for some constraints. Analysis of the constraints posited by the farmers as being detrimental to the success of the project was done by comparing the calculated mean scores of the variables with the critical mean of 2.0 obtained using a 5-point Likert scale and presented in Table 6 ranked in order of seriousness. The crop farmers considered irregular fund disbursement method as the greatest set back, other problems listed in a descending order were late release of government cash contribution, demand for users' cash contribution, nonpayment of beneficiary contribution, misconception of the project by benefiting communities, inadequacy of facilitators, inadequate logistics for extension staff/officers, internal wrangling/suspicion among benefiting communities and poor leadership/management by officers of Fadama Community Associations (FCAs)/Fadama User Groups (FUGs).

CONCLUSION

Fadama III is an applaudable intervention project which has adopted the direct and effective resource delivery to the farmers approach to improve on rural development, food security, productivity and enhanced income for farmers in Enugu State as evidenced by significant

increase in the estimated mean productive resources and income from ₦67,313.45 to ₦242,307.12 and ₦169,139.44 to ₦521,042.36 respectively. This has satisfied a cardinal objective of the project of sustainably increasing the incomes of Fadama resource users through effective and efficient delivery of productive resources directly to them. The Community –Driven Development (CDD) approach of Fadama III project has motivated the communities to take their destinies in their hands. The project has not only been favourable to the active age population but had been reasonably gender sensitive because as much as 25% of the farmers were females.

It will be very ideal if the Project allocates its resource delivery for the production of crops in the State in order of their income yielding capabilities with yam topping the list. Early and prompt release of productive resources and cash counterpart contributions to the farmers, provision of more extension agents, services and logistics for the farmers and reduction of users' cash contribution will ensure improved productivity, income and project sustainability.

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