2011 2nd International Conference on Agricultural and Animal Science
IPCBEE vol.22 (2011) © (2011) IACSIT Press, Singapore

Fadama Land-Efficiency, Income and Quality of Life Improvement under the World Bank Intervention in Benue State Nigeria.

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Abstract. This study was conducted in 2010, Benue State Nigeria. The aim was to assess productive-efficiency, income and quality of life improvement. Multistage random selection of respondents with the breakdown of 150 each assisted and non assisted in fifteen local government areas out of the existing total of 23, gave the total sample size of 300 respondents for the study. Using descriptive statistics, stochastic frontier production function, discriminant-function and t-statistics, the result revealed that Fadama land use efficiency improved from 52% to 96%, valued farm firm's – productivity recorded a significant shift from US$ 486.5 to 1120.4 US$ for an average holding of 0.70 hectare. Respondents before assistance spent more on water delivery, had higher off- farm family labor man days (13) as against (6) after intervention. Quality of life score (9) at post intervention was higher than the score (3.0) before intervention. The total distance difference at pre and post-implementation was significant giving the discriminant (Z) score of 80%. The squared correlation coefficient (0.97) was sufficiently indicated that the function sufficiently discriminated between pre and post implementation socioeconomic indicators. The study concludes that World Bank assistance impacted positively on efficiency, productivity, income and quality of life. The research recommends increased financial assistance to Fadama producers for rapid income increase, quality of life improvement, economic growth and development in Nigeria as well as developing economies generally to mellow down poverty.

Keywords: Fadama, Efficiency, Income, Life-quality, Improvement.

1. Introduction

Developing nation's consensus opinion on food security sustenance as the bedrock for poverty reduction strategy is gradually gaining world- wide acceptance. This notion has been strengthened by concerted efforts put in place for expansion of productive realms of developing nations through World Bank support to Fadama. Fadama crops production according to Turner (1977) and Idachaba (2004, is an important human activity restricted to low lying flood prone areas which are very fertile with numerous advantages.

Naturally, dry season farming renders itself easily to the production efforts of small scale producers in Nigeria, since millions are willing to be carried along in harnessing efforts for increased productivity (Ogunfowora, 1972 and Idachaba, 2004). Sustenance of this trend calls for increased output and improved quality of life of assisted Nigerians as suggested by Norman (1973), Adewumi (1989) and Idachaba (1989).

In Benue State, assistance in focus has been small scale dry season Fadama farmers which commenced in 1994. It has engulfed over US$ 1.14 million. There is need to ascertain that assistance has led to high productivity, that has been converted into better quality of life of targeted beneficiaries as opined in (Umeh 1991). It is in view of the need to ascertain improved land use efficiency productivity and life quality among assisted producers that this study was packaged.

This study aimed at establishing the extent to which World Bank assistance exerted positive effects in the Fadama production industry. Specifically the study intends to:

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1. delineate incomes of assisted Fadama producers;

2. quantity life quality and socio-economic indicators of success among Fadama users;

3. establish enterprise size holding and valued productivity following World Bank intervention among producers; and

2. Methodology

Benue State Nigeria has a total land mass of 30.955 million square kilometers with 23 Local Government Areas. Located between Longitudes 6^0 35'E and 10^0 E and between Latitude 6^0 30'N and 8^0 10'N, the State has total land estimated to be 5.09 million hectares with estimated arable proportion of 3.8 million hectares (Benkap, 1998). Major crops include: *Amaranthus, telferia,* okra, pepper, garden eggs, maize and rice. Two major tribes, the Tiv and Idoma exist.

Multiple stage random selection procedure was used to collected primary data. Five local government areas each were selected from the three existing agricultural zones. In each local government, two sites were selected randomly. On each site five respondents each at pre and post assistance were selected totally 300 respondents as study sample. Important variable were: total output valued in US$, inclusive of quantities consumed or given out as gifts, enterprise size in hectares each season, variable labor input cost in US$, total assets valued in US$, water delivery cost in US$, managerial skills through literacy level and organizational membership, educational attainment as years spent in school, sales income in US$, household sleeping-density as household members sleeping in a room or hut. Housing score as numerical value assigned to house type as follows: round hut one, rectangular zinc with mud walls three, rectangular zinc with cement wall and floor five, rectangular zinc house with cement floor, walls and mosquito proof 8 and bungalow twelve. Life quality score was measured as mean score for mobility score and housing type score.

For this study, the production technology of assisted and non assisted Farmer is assumed to be specified by the Cobb Douglas Frontier Production Function as:

$$\text{Log } Y_i = Bo + B_1 \text{Log} X_1 + B_2 \text{Log} X_2 + B_3 \text{Log} X_3 + B_4 \text{Log} X_4 + V_i - U_i$$

where: Y_i = valued productivity Index.

X_1 = Enterprise size in hectares
X_2 = Labor input cost in naira
X_3 = Extension contact score as number of extension visits
H_4 = Household income as Naira earned from products sale
X_5 = Literacy rating as number of years spent schooling.
X_6 = Respondents age in years
X_7 = Household size as household members feeding from one pot

V_{is} are regarded random factors beyond the control of the farmer and U_i are farmer related factors or indicator characteristic adversely affecting farm efficiency termed inefficiency effects. They are assumed to be independent of Vis such that Uis have normal distribution with mean U_i and variance σ,

$U_i = \sigma_o + \sigma_1 Z_1 + \sigma_2 Z_2 + \sigma_3 Z_3$
where
Z_1=Literary rating,
Z_2=Respondent age,
Z_3=Householdsize.

3. Results and Discussion

Details in table 1 show that the difference for water delivery cost (-7), operating labor cost (-302.7) and off -farm family labor man-days (-7) were all negative. Non assisted values for these indicators were higher than assisted. Non-assisted farmers spent more on water delivery and labor with higher off-farm family labor man-days. Contrarily, assisted had bigger enterprise sizes 0.7 hectare compared to 0.3 hectare for non-assisted. Similarly assisted quality of life score (9), extension contact score (3.0) and literacy rating (3.0) were higher than non assisted values of 3.0, 2.0 and 2.0 for quality of life, extension contact score and literacy rating.

In table 2 details on polled respondents show that the quality of life score had the highest contribution (65%), followed by enterprise size (30%). Enterprise difference t-ratio between these groups of producers (1.578) was statistically significant at five percent significance level. The difference was responsible for the big disparity in income earned which led to higher and better quality of life among assisted producers.

TABLE 1: GROUP MEANS AND MEAN DIFFERENCES FOR DISCRIMINANT FUNCTION OF FADAMA FARMERS IN BENUE STATE.

Variable	**Parameter**	**Assisted**	**Non Assisted**	**Difference**
Output value (US$)	Y	2344.83	586.21	1758.62
Enterprise size (hectares)	X_1	0.7	0.3	0.40
Number of Enterprise	X_2	3.50	1.70	1.80
Life quality score	X_3	9	3.00	6
Extension contact score	X_4	3.00	2.00	1.00
Literacy rating	X_5	3.00	2.00	1.00
Water delivery cost (US$)	X_6	2.3	9.3	-7
Asset value (US$)	X_7	216.2	83.9	132.3
Age (years)	X_8	40733	38.54	2.193
Production income (US$)	X_9	1862	534.7	1327.3
Operational labour cost (US$)	X_{10}	1722.5	202.75	-302.7
Off-farm family labour (man-days)	X_{11}	6.0	13.0	-7.00
Farm distance to point of sale (metres)	X_{12}	40.2	21.00	19.20

TABLE 2: CHARACTERISTICS COEFFICIENTS AND THEIR INDIVIDUAL CONTRIBUTION TO THE TOTAL DISTANCE MEASURED WITH THE DISCRIMINANT FUNCTION

Variables	**Coefficients**	**Mean difference**	**Percentage contribution**
Enterprise size (hectares)	0.082	0.40	0.297
Number of Enterprise	0.012	1.80	0.296
Life quality score	0.523	5.63	0.656
Extension contact score	0.115	1.00	0.205
Literacy rating	0.360	1.00	0.233
Water delivery cost (US$)	-0.528	-1314.00	-0.171
Asset value (US$)	0.286	19184.00	0.141
Age (years)	-0.070	2.193	0.035
Production income (US$)	0.330	19946.00	-0.1
Operational labour cost (US$)	-0.332	-439.00	-0.07135
Off-farm family labour (man-days)	-0.123	-7.00	-0.115
Farm distance to point of sale (metres)	-0.165	-19.20	0.203

The discriminant function equation for the total discriminant score is:

$\gamma = 0.062X_1+0.021X_2+0.523X_3+0.115X_4+0.360X_5 - 0.258X_6+0.286X_7 - 0.070X_8 - 0.330X_9 - 0.332X_{10} - 0.123X_{11}+0.165X_{12}$.

The Mahalanobis distance parameter (D^2) statistics (4.58) which is used to judge the effectiveness of the dicriminant analyses and the total discriminant score (80%) obtained for this study is shown in Table 3. It follows that selected independent indicators successfully discriminated respondents up to 80% based on: enterprise sizes, earned income ,quality of life and tendency to be alleviated from poverty, using their output values in US$ as the dependent variable. Relative contributions of the explanatory variables to the total discriminant score can be seen in Table 2. The values were 0.65, 0.297 and 0.296 respectively for life quality score, enterprise size and number of enterprises owned. Similarly the squared value of the correlation coefficient 0.97 in Table 3 was significantly high. This gave evidence that the function sufficiently discriminated between World Bank Assisted and non assisted farmers under the dry season Fadama development project in Benue State, Nigeria.

Stochastic Frontier Production Function analysis in Table 4 established 52% efficiency before and 96% after World Bank intervention respectively. Indicators responsible for respondent's inefficiencies were: illiteracy, respondent's age and household numerical size. Details relating to household efficiencies are presented in Table 4, show that the increase in respondent's efficiencies were mainly due to World Bank intervention because respondents were all in their active age brackets of farming before and after intervention with the means: forty two and forty three years at pre and post intervention respectively.

TABLE 3: ANALYSIS OF VARIANCE FOR ESTIMATED DISCRIMINANT FUNCTION

Source of variation	**Sum of squares**	**Degree of freedom**	**Mean square**	**F-ratio**
Discriminant function	241	13	0.05	41.58
Residual error	2.29	287	79904.25	00
SST	2.64	299	00	00
Correlation	0.987	00	0.974	00
Centroids	6.149 (Assisted)	-6.149 (Non-assisted)		

TABLE 4: MAXIMUM LIKELIHOOD PARAMETER ESTIMATES FOR THE STOCHASTIC FRONTIER PRODUCTION FUNCTION FOR ASSISTED AND NON ASSISTED FADAMA PRODUCERS IN BENUE STATE.

S/no	**Varriable**		**Assisted parameters**	**Non Assisted parameters**
1.	Family Food Security Index Mean	FFSI	0.85	0.60
2.	Constant	Bo	$0.3056x10^{2}$ $(0.35501x10^{2})$**	$0.13001x102$ $(0.2018x10)$**
3.	Farm Size (Ha)	X_1	$0.171x10^{1}$ $(0.1775x10)$*	$0.8530X10^{0}$ $(0.8072x10)$**
4.	Improved Technology cost in Naira	X_2	$0.5072x10^{0}$ $(0.5891x10^{1})$**	$0.2702X10^{-3}$ $(0.8586x10)$**
5.	Labour Input cost in Naira	X_3	$0.3\bar{1}1x10^{3}$ $(0.3182x10)$**	$0.1244X10^{-3}$ $(0.6101x10)$**
6.	Extension Score	X_4	$0.3012x10^{0}$ $(0.35540x10)$**	$0.1203X10^{0}$ $(0.2772x10^{0})$**
7.	Inefficiency model consrant	σ_0	0.2812 (0.2004)	0.1453 (0.1403)
8.	Literacy Rating	σ_1	$-0.1381x10^{1}$ (-0.2570)	-0.1098 $(0.2101x10)$**
9.	Respondents Age in Years	σ_2	$-0.6160x10^{-1}$ $(-0.3665x10^{1})$**	$-0.9220X10^{-4}$ $(0.2021x10)$**
10.	Household Size in numbers	σ_3	$-0.1055x10^{-1}$ $(-0.5552x10^{1})$**	$-0.1011X10^{-1}$ $(-0.1056x10)$**
11.	Gamma	γ	$0.6542x10^{2}$ $(0.511x10^{-1})$*	$0.6741X10^{2}$ (0.2642)

12.	Efficiency percentage	96	52

4. Conclusion

This study in Benue State revealed that 'Fadama' are very important resources that with assistance increase efficiency, productivity, incomes and alleviate poverty. There is need for concerted efforts to assist farmers to increase the use of Fadama to better their incomes and living standard. Hence the discriminant scores (80%) and the transformed Mahalanobis (D^2) statistic (41.58) indentified indicators which caused significant improvement in productivity, income and quality of life of Fadama producers. It also indicated higher incomes (US$1862) compared to lower incomes (US$486.5) at pre-intervention periods respectively. Consequently, quality of life of assisted beneficiaries improved giving a higher score (9) compared to non assisted lower score (3.0). Assisted producers became more efficient with better quality of life due to sudden income increase. Therefore, this research suggests enhanced and sustainable support into Fadama by local, state and Federal government as well as World Bank, to accelerate growth as a pre-requisite to economic growth and development in Nigeria as well as in all developing economies.

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