Rural infrastructural development and profitability of farmers under Fadama II project in Oyo state, Nigeria

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Abstract: The study examines rural infrastructural and profitability of farmers under National Fadama II Project in Oyo State Nigeria. Primary data was collected from two hundred and sixty-four farmers using multistage sampling technique. The analytical framework used for the study include: descriptive statistic, infrastructure index and gross margin. The result showed an average infrastructural index of 0.42. Forty-four villages were classified as infrastructural developed villages (IDV) while the remaining were infrastructural under-developed villages (IUV). It was observed that 59.1% of the villages in Fadama LGAs are infrastructural developed while 41.2% in non Fadama LGAs. The gross margin for IDV was ₦445, 968.30 while for IUV for under-developed in Fadama villages is ₦357, 805.00. Gross margin was higher for Fadama II farmers than non fadama II farmers in IDV. The study recommends the need for more private and public sectors attention to infrastructural facilities in rural areas in Nigeria, to enhance sustainable agricultural development and productivity.
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1. Introduction:

Rural infrastructural development in Nigeria has long been neglected, yet investments in health, education and water supply have largely been focused on the cities. Consequently, the rural population has limited access to services such as schools and health centers, and about half of the population lacks access to safe drinking water. Nigeria's rural road network has been identified as one of the poorly developed infrastructures in sub-Saharan Africa (Fakayode et.al 2008). The poor tends to live in isolated villages that can become virtually inaccessible during the rainy seasons. When there is a post-harvest marketable surplus, it is not always easy to reach the markets on time most especially, the perishable and has also cut off small-scale farmers from sources of inputs, equipment and new technologies.

According to FAO (2005), rural infrastructure plays a crucial role in poverty reduction, economic growth and empowerment for the rural poor in Africa (Nigeria inclusive). The lack of adequate and reliable infrastructure touches the life of every rural African family daily. Rural households' efforts to escape poverty and lift themselves above subsistence levels are limited by the poor access to market, supplies and vital information: investments in rural infrastructure, particularly rural roads, storage, processing and marketing facilities will therefore be required to support the anticipated growth in agricultural production. Since rural infrastructure is one of the several subsets of activities that are essential elements for African rural transformation, the existence of poor quality or inadequate infrastructure will inevitably have a negative impact on agriculture. The provision of adequate and cost effective infrastructure will clearly therefore underpin the development of agriculture in general and facilitate lower cost of production. Moreover, the provision of basic rural infrastructures is also a prerequisite for enabling developing countries to stimulate economic growth and to reach the targets for economic recovery and poverty alleviation by 2015 through increasing and diversifying agricultural output.

Infrastructure plays role that can be likened to secondary and tertiary arteries of the body system which are crucial as the main arteries for blood circulation (PCU-NFDO, 2005). Some of the difficulties arising as a result of inadequate infrastructure include non-availability of hand pumps, tube wells, collection centers for products, lack of storage facilities, and inadequate processing facilities, poor linkage with the market and bad roads. These problems affect the level of productivity and inhibit full utilization of potentials of farm households thereby leading to low agricultural productivity, low level of income and poor standard of living.

It has also been established that infrastructure imparts welfare in three basic respects: First, it has basic consumption value and as such affects utility

derivable from existing and budgeted income. Second, its availability affects productivity and capacity to earn income. Third, it affects households and national stock real wealth in the rural and urban economies.

Economists have long been working to discover why some countries move fast, while others lag behind on the path of economic development. The role of infrastructure facilities in economic development remains to be fully unfolded or has been unraveled with considerable degree of ambiguity. The Impact evaluation report by IFPRI in 2008 shows that the economic rate of return at completion of Fadama I project was 40% compare to an estimated 24% at appraisal level. However, the remaining 60% of the project output was claimed up through post harvest losses resulting from poor transportation infrastructure and the non-inclusion in Fadama I such as processing, storage and other downstream activities. In addition, because of poor post harvest handling of the output, the products lost quality and could not fetch the best price available in the markets. In response, the Nigerian Government launched the Second National Fadama Development Project (Fadama II) in 2005 as a follow up of first phrase (1992-1999) with the main goal of sustainably increase the income of the users with its five key components. This study therefore focused the on impact of the community infrastructure provided by the project on profitability of farmers under National Fadama II Project in Oyo State Nigeria.

1.2 Conceptual framework and literature review

Theoretically, economists proceed from the premise that the creation of infrastructure by generating external economies leads to widespread benefits. For example; Figure 1 shows how traditional theory conceptualizes the effect of infrastructural development on production for a competitive market economy. In a situation of inadequately developed infrastructure, firms are confronted with higher marginal cost (MC1) at every level of production, and, given the market price of their output, produce at Q_1 with an improvement in infrastructure, the marginal cost curve shifts downward to the right (MC_2), resulting in a total cost savings of area abcd for the earlier level of output, Q_1, and an increase in output from Q_1 to Q_2. The cost reduction occurs through the interaction of infrastructure with directly productive inputs of firms/farms thereby increasing efficiency of production. This may, however, come in a variety of ways, such as reduction in transfer costs, improved diffusion of technology, new combinations of inputs and outputs, better input prices, increased specialization and commercialization, and improved entrepreneurial capacity, all realized through infrastructural investment. The cost reduction is the outcome of an interaction between directly productive inputs of other firms.

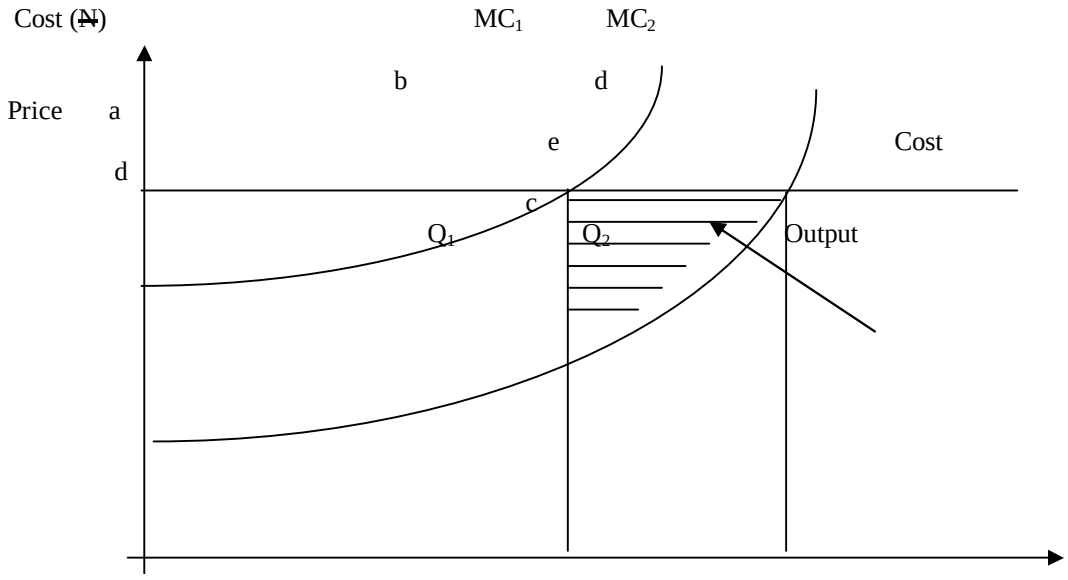

Figure 1: Infrastructure Provision and Efficiency of Production
MC_1 = Marginal Cost with infrastructure deficiencies, MC_2 = Marginal Cost with adequate infrastructure

Empirical evidence of the impact of infrastructural development on agricultural productions in Nigeria by Fakayode et.al (2008) using farm level data surveyed eight infrastructures: roads, health centers, market centers, water supply, electricity supply, banks, communication gadgets, and education, and their influence on the agricultural productivity in Ekiti State. The study employed Total Factor Productivity (TFP) and the Ordinary Least Squares (OLS) regression analyses. Results indicate that the infrastructural index computed for the study area was low (0.32). The food farm TFP for the farm households averaged 2.4 while land size, fertilizers and rural infrastructure indices were shown to significantly influence farms productivity levels.

Studies in other countries like Mundlak, Larson and Butzer (2002); Fan Zhang and Zhang (2002) and Fan and Zhang (2004) demonstrate that investment in infrastructures is essential to increase farmers' access to input and output markets, to stimulate the rural non-farm economy and vitalize rural towns, to increase consumer demand in rural areas, and to facilitate the integration of less-favoured rural areas into national and international economies.

1.3 Hypothesis

There is no significant difference between agricultural productions of fadama II beneficiaries and non beneficiaries.

2. Methodology

The study was carried out in Oyo State one of the states selected for Fadama II project in the south western geo-political zone, Nigeria. It is bounded in the west by Benin Republic, in the south by Ogun State, in the east by Osun State and in the north by Kwara State. According to the 2006 Census, the Oyo State population stood at 5,591,589. Oyo State has thirty-three Local Government Areas (LGAs) in which only 10 participated in Second National Fadama project. Agriculture is the major source of income for the greatest number of people of the State. Apart from the primary roles of providing food and shelter, employment, industrial raw materials, it remains an important source of internally generated revenue in the State. The state has distinct wet and dry seasons, which characterize its humid tropical climate, with the dry season extending from November to March. Annual rainfall varies from about 500 mm in the northern belt to 1,100 mm in the forest belt. The climate favours the growth of food crops like yam, cassava, millet, maize, fruits, rice and plantains. Cash crops such as cocoa, citrus, tobacco and timber also abound in the state.

2.1 Source of data and sampling procedure:

Primary data was collected for the purpose of this study using structured questionnaire. Some of these include: socio economic and demographic characteristics, Infrastructure proxy variable (such as distance of getting to various infrastructure such as road, market facilities, processing equipment and the access to sanitation etc.) and total production inputs and output quantities and their respective prices of Fadama and non-Fadama crop farmers. A multi-stage stratified random sampling procedure was adopted for the study. The stratification sampling procedure helped in avoiding selection bias that could arise from comparison between participating and non-participating Fadama II project LGAs. The sampling frame was stratified into two strata: Beneficiaries' local government areas and Non -beneficiaries' local government areas (LGAs) that have some social economic and biophysical characteristics comparable to the beneficiaries' LGAs. The first stage of selection involved random selection of two LGAs out of ten that participated in Fadama II project and two LGAs from the remaining twenty-three local government areas that are non participants. In the next stage, 17 villages were randomly selected from each of these LGAs. The last stage involved selection of 4farmers from each village. In all, a total of 160 farmers/respondents were chosen in each stratum (given total of 320 farmers/respondents for Fadama II and non-Fadama farmers). A total of 320 respondents were interviewed, while two hundred and sixty four questionnaires contained information for meaningful analysis.

2.2 Analytical tool:

The analytical techniques in the data analysis include: descriptive statistics, infrastructure index and gross margin.

2.2.1 Descriptive statistics:

Descriptive statistics (mean, frequency table, percentages).

2.2.2 Composite measure of infrastructure development (Infrastructure Index):

The infrastructural index used for this study is based on the sampled village level data adopted from Fakayode et.al (2008) and comparable to method developed by Sen (1990). A total cost of access (TC) was computed by summing the individual cost of access (TC_i) to the some six basic infrastructure elements in the study area. These six are those provided by Fadama II project. These infrastructure elements/facilities include market, motorable road,

potable borehole, box Culvert, VIP toilet and processing unit.

A total cost of infrastructure availability (TC) was computed by summing the average cost (AC_i) of getting a particular infrastructural facility in the 68 villages. AC_i was however obtained as an average individual transportation cost was (ID_{ci}) of the respondents in each of the 68 villages. The use of transportation cost was based on the fact that an interaction exists between transport facilities and institutional infrastructures, Ahmed and Hossain (1990). For instance, a village may be located 2 kilometers from processing unit center and yet access to the center may be difficult than for a village located 5 kilometers away, if the latter has a better transport system, which is normally reflected in the transportation cost.

An Average Total Cost (ATC) of getting to each of the six infrastructure elements across the villages was obtained by dividing the total cost (TC) by the total number of village (N). AC_i was finally weighted with ATC to obtain the weight W_i for each infrastructure and across all the villages. The infrastructure index (INF) was finally obtained by finding the average of the W_{is} of the six infrastructural facilities for each of the 68 villages.

Algebraically:

$$ACi = \frac{\sum_{i=1}^{n} IDi}{n} \quad \text{..... (1)}$$

$$TC = \sum_{i=1}^{N} ACi \quad \text{.....(2)}$$

$$ATC = \frac{TC}{N} \quad \text{.....(3)}$$

$$Wi = \frac{ACi}{ATC} \quad \text{.....(4)}$$

$$INF = \sum_{1}^{6} (Wi.TCi \sum_{1}^{6} Wi \quad \text{..... (5)}$$

Where:

ID_{ci} = Individual transportation cost of getting to each Infrastructure by the respondents in each village
AC_i = Average cost of transportation in each village.
TCi= Total cost of transportation to a particular infrastructure i across villages.
ATC= Average total cost of transportation across villages.
W_i = Weight of Average transportation cost in each village.
INF = Infrastructural Index
N = Total number of villages.
M = Total number of infrastructure facilities.
n = Number of respondents in each village.

The infrastructural Index (INF) indicates the degree of under-development, thus, the higher the value of the INF, the less developed the village considered. Further approach to grouping the villages into developed and underdeveloped areas was to sum the infrastructural index for all the 68 villages and the average obtained. The villages with value above the average were said to be under-developed and those below average were said to be developed.

2.2.3 Gross Margin Analysis:

The gross margin of an enterprise is the difference between the total value of production and the variable cost. In this study, the gross margin/farmer in the developed and underdeveloped areas for both Fadama and non-Fadama farmers were estimated and compared to determine the profitability of their enterprises.

Gross Margin can be expressed mathematically as;

GM = TR – TVC …… (5)

Where:

GM = Gross Margin/farmer (₦)

TR = Total Revenue (₦)

TVC = Total Variable Cost (₦)

TVC includes the cost of: Land area (ha), Labour (man-days), Chemical, Seeds and Fertilizer, Land clearing etc

TR includes the cost of all sales in the production

T-test analysis: T-test analysis was used for the testing of hypothesis that rural infrastructure has a significant effect on agricultural production between the beneficiaries and non-beneficiaries or otherwise.

$$t = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$$

Where $\bar{x}$ is the sample mean x_1, x_2 …. x_n taken from a normal distribution of μ and σ^2. σ^2 is an estimate of σ n is sample size. μ is the mean while σ is the estimated variance.

Test of Difference between Means: Test of difference between means was employed to determine whether the difference in the profit made by Fadama II beneficiary and non –beneficiary farmers in the developed and underdeveloped areas was significantly different from zero. The null hypothesis stated as; there is no significant difference in the average profit of Fadama II beneficiary and non–beneficiary farmers in the developed and underdeveloped areas is given by;

H_O: XP ≠ XNP

Where:

$$XP = \frac{\sum \Pi P}{nP} \quad \text{and} \quad XNP = \frac{\sum \Pi NP}{nNP}$$

The relationship for the test of difference between means is given by:

$$Z_{score} = \frac{XP - XNP}{S(XP - XNP)}$$

Where the standard error; S(XP – XNP) is given by:

$$\frac{\sqrt{S2P}}{NP} + \frac{S2NP}{NNP}$$

XP = Average profit of Fadama II participated farmers

XNP = Average profit Non-fadama participated farmers

SP and SNP = Standard deviations of XP and XNP

3. Results and discussions

Table 1 presents the distribution of respondents by marital status. The bulk of the respondents (87.1%) are married regardless of the category of respondents (81.1% for Fadama and 98.8% for non-Fadama farmers). The implication of this is that, there is likely to be more family labour available for farm work. However, majority of respondent farmers (fadama and non fadama) farmers are older than 50 years. This is the active age when farmers can carry out the physical rigor of farm activities. This has implication for agricultural production because farm work requires physical energy and strength. Education status shows that the largest percentage of the respondents (83.3%) had primary education and more. Education has an important implication particularly for the adoption of new technology and practice (Akinbile and Ndaghu, 2000). In all, most of the households have at least 6 members which is higher than the national average for all respondents (Fadama and non-Fadama). The national average household size is 5 (NBS, 2007). The size of the household is an importance variable especially in a situation where human power is a major source of power for carrying out farming activities.

Notwithstanding Fadama respondents shows a relatively higher percentage of women participation in the farming activities than men. This was attributed to their participation in Fadama I project, a project that gave equal chances to both man and woman and with the provision of some incentives such as market expansion and rehabilitation/construction of rural roads that links to the city, which particularly motivate women to agricultural activities. The implications of more women participation in farming activities increases the population in the agricultural production, thereby reduces food prices, by making food available and improves the standard of living Nkonya et al 2008).

Table 1: Socio-economic Characteristics of the Respondents

Variable	Fadama	Non -Fadama	All
Marital status			
Single	1.7	1.1	1.5
Married	81.1	98.8	87.1
Widowed	12.1	-	8.0
Divorced	5.2	-	3.4
Total	**100.0**	**100.0**	**100.0**
Age			
< 30	1.7	1.1	1.5
30-50	62.6	50.0	58.3
51-70	35.6	48.9	40.2
Total	**100.0**	**100.0**	**100.0**
Educational level			
No Formal	20.7	8.9	16.7
Primary	39.1	65.6	48.1
Secondary	29.9	24.4	28.0
Tertiary	10.3	1.1	7.2
Total	**100.0**	**100.0**	**100.0**
Household size			
1-5	16.1	2.2	11.4
6-10	73.0	84.4	76.9
11-15	8.6	13.3	10.2
> 15	2.3	-	1.5
Total	**100.0**	**100.0**	**100.0**
Gender			
Male	69.0	88.9	75.8
Female	31.0	11.1	24.2
Total	**100.0**	**100.0**	**100.0**
Membership of organization			
Members	66.7	46.7	59.8
Non members	33.3	53.3	40.2
Total	**100.0**	**100.0**	**100.0**
Farm size(ha)			
< 1.00	8.0	7.8	8.0
1.00-2.00	66.7	60.0	64.4
2,00- 4.00	21.8	31.1	25.0
> 4.00	3.4	1.1	2.7
Total	**100.0**	**100.0**	**100.0**
Farming experience			
<10	42.5	20.0	34.8
11-12	36.8	38.9	37.5
21-30	17.2	36.7	23.6
>30	3.4	4.4	3.8
Total	**100.0**	**100.0**	**100.0**
Employment status			
Full time	55.20	80.0	63.6
Part time	44.80	20.0	24.4
Total	**100.0**	**100.0**	**100.0**

The result further shows that majority of respondents/farmers belonged to organization. Membership of associations is common among Fadama II more than non-fadama farmers. Belonging to farmers' organization enable respondents/farmers to have access to information, cheaper inputs, extension services, profitable and other intangible benefits that enhance efficiency in production. The distribution of the respondent's farm size shows that average farm size for the entire groups was 2 hectares and most farmers have farming experience of at least 10 years while majority of respondents/farmers are full time farmers.

Table 2 shows that infrastructure facilities in the study are those related to agriculture available in both Fadama and non-Fadama areas. These include: Market, motorable road, Boreholes, VIP toilet, Box culvert and processing services center. Fadama farmers spent an average of N44.44 and 27.02 minutes respectively to access market infrastructure provided by the project in beneficiary communities while in non-beneficiary communities spent more on the average to access the same facility. The infrastructure facilities in the study are those related to agriculture available in both Fadama and non-Fadama areas. These include: Market, motorable road, Boreholes, VIP toilet, Box culvert and processing services center. The study revealed that Government and Non-Governmental agents provided available infrastructure facilities in non- Fadama areas.

Fadama farmers spent an average of N44.44 and 27.02 minutes respectively to access market infrastructure provided by the project in beneficiary communities while in non-beneficiary communities spent more on the average to access the same facility. It shows that Fadama farmers spent the least average amount to various infrastructure elements. Thus the distance barrier is reduced, as transport cost is at minimal in Fadama participating LGAs. Thereby, Fadama participating villages had better access to various infrastructural facilities provided and they were found to be significantly better off in a number of areas including agricultural production, household incomes, and health. The findings support Bhatia and Rai 2008, Wanmali 1985, that the measure of access to various infrastructures is the physical distance in kilometers or transport cost between the households and the centers where these services are provided.

Table 2: Average Amount Spent on Market in the study Area

Status	≤ ₦ 40	₦41- ₦ 60	₦ 61-. ₦ 80	≥ ₦80	**Average**	
Fadama	**₦ 8.42**	₦52.00	₦74.29	₦133.5	₦44.44	
	0.55km	27 km	3.36 km	24.25km	22.27km	
	0 mins	0.82mins	19.23 min	61.25min	27.02min	
Non-fadama	₦20.86	₦53.57	₦80.00	₦100.00	₦55.23	
	1.47 km	3.00km	3.00km	4.71km	2.56km	
	0.16 min	6.67 min	NA	16.67min	7.03min	
All	₦ 12.97	₦52.65	₦74.69	₦126.80	₦32.39	
	1.1 km	2.24 km	2.0 km	2.66 km	1.50km	
	3.53 min	20.58min	22.01min	27.60min	9.05min	

Average Amount spent on Motor able Roads

Status	≤ ₦ 40	₦ 41- ₦ 60	₦ 61-. ₦ 80	≥ ₦80	**Average**
Fadama	₦ 11.91	₦50.00	₦72.00	₦138.24	₦28.58
	1.11 km	1.50 km	2.80 km	4.94 km	4.25 km
	2.10 mins	7.50 mins	19.00 mins	12.94 mins	4.25 mins
Non-fadama	₦14.05	₦50.00	NA	₦185.00	₦34.02
	0.92 km	2.00 km	NA	3.10 km	1.18km
	0.0.45 mins	7.50 mins	NA	18.50mins	2.61 mins
All	₦ 12.67	₦ 50.00	₦ 72.00	₦ 155.56	₦ 30.38
	1.04 km	1.67 km	2.80 km	4.26km	0.45 km
	0.26 mins	7.50 mins	19.00 mins	21.67 mins	3.63 mins

Average Amount spent on Water

Status	≤ ₦ 40	₦ 41- ₦ 60	₦ 61- ₦ 80	≥ ₦80	**Average**
Fadama	₦ 0.77	₦ 0.77	₦ 100	₦2.66	₦50.04
	0.33km	0.30 km	3.00 km	0.510 km	0.13 km
	0.63 mins	1.00 mins	3.00 mins	0.70 mins	2.06 mins
Non-fadama	₦ 0.23	₦ 0.200	₦ 80	NA	₦ 32.34
	0.30 km	0.30km	NA	NA	0.2.02 km

	NA	NA	NA	NA	NA
All	₦ 2.55	₦ 2.00	0.8	₦ 9.20	₦ 4.03
	0.24 km	0.50km	2.00km	5.00 km	5.00 km
	2.55mins	0.30mins	3.00mins	0.32mins	0.32mins
Average Amount Spent on Box culvert in the study Area					
Status	≤ ₦ 40	₦ 41- ₦ 60	₦ 61-. ₦ 80	≥ ₦80	**Average**
Fadama	Na	NA	NA	NA	NA
	1.12km	NA	NA	NA	NA
	NA	NA	NA	NA	NA
Non-fadama	Na		NA	NA	
	NA	NA	NA	NA	NA
	NA	NA	NA	NA	NA
All					
	NA	NA	NA	NA	NA
	NA	NA	NA	NA	NA
	NA	NA	NA	NA	NA
Average Amount Spent on Possessing unit in the study Area					
Status	≤ ₦ 40	₦ 41- ₦ 60	₦ 61-. ₦ 80	≥ ₦80	**Average**
Fadama	**₦ 8.42**	₦52.00	₦74.29	₦133.5	₦44.44
	0.55km	27 km	3.36 km	24.25km	22.27km
	0 mins	0.82mins	19.23 min	61.25min	27.02min
Non-fadama	₦20.86	₦53.57	₦80.00	₦100.00	₦55.23
	1.47 km	3.00km	3.00km	4.71km	2.56km
	0.16 min	6.67 min	NA	16.67min	7.03min
All	₦ 12.97	₦52.65	₦74.69	₦126.80	₦32.39
	1.1 km	2.24 km	2.0 km	2.66 km	1.50km
	3.53 min	20.58min	22.01min	27.60min	9.05min

Source: Field Survey (March 2009)
Note: NA – NOT AVAILABLE

Table 3 shows the average length of time individuals wait for motor vehicle. It was observed that average waiting time for Fadama LGAs is lower compare to non-Fadama LGAs at 10.44 minute, compared with Fadama LGAs of 5.70 minutes. Across LGAs it is 6.80 minutes.

In order to have a vivid exposition of the degree of under-development, index of infrastructure.

Table 3: Average time taken to wait for motor vehicle transport

Status	Average waiting time (Minute)	Standard Deviation (Minute)
Fadama	5.70	4.5462
Non – Fadama	10.44	4.8452
All	6.80	5.0182

Source: Field Survey (March 2009)

Table 4 shows that the index of infrastructure ranges between 0.04 and 0.53 for all the LGAs with an average of 0.17, 0.24 and 0.42 for fadama, non-fadama and the entire 68 villages respectively. It further reveals that Fadama villages were more highly infrastructural developed compared with non-Fadama villages.

Cost structure and Gross margin were analyzed and compared to isolate the effect of rural infrastructural development on the profitability of Fadama beneficiaries and non–beneficiaries in developed and underdeveloped areas In Fadama LGAs, cost of labour is higher in developed villages than in the underdeveloped villages and for all other variable input, except for the Cost of land clearing. Total variable cost is however higher in the developed villages than in the underdeveloped villages. Despite the higher total variable cost in the developed villages, gross margin was higher in the developed villages than in the underdeveloped villages.

Table 4: Distribution of Villages by Degree of Infrastructure Development

Range of index Number	Number of Villages			Percentages			Ranking Level
	Fadama	Non-Fadama	All	Fadama	Non-Fadama	All	
≤0.10	20	3	23	29.41	4.41	32.35	Highly developed
0.11-0.3	13	8	21	19.12	11.76	32.35	Moderately developed
0.31-0.5	9	12	21	13.24	17.64	30.88	Moderately Under-developed
≥0.51	2	1	3	2.94	1.47	4.41	Highly Under-developed
Total	44	24	68	64.71	35.28	100	

Source: Field Survey (March 2009)

Table 5 shows that the total variable cost was estimated at ₦100,601.70 in the developed villages and ₦86635.00 in the underdeveloped villages while the gross margin was estimated in Fadama community to be ₦445,968.30 in the developed villages and ₦357,805.00 in the underdeveloped villages.

On the other hand, all variable factors cost is lower in the developed villages except for the cost of labour under non-fadama LGAs. Thus, total variable cost is however higher in the underdeveloped villages than in the developed villages. Despite the higher total revenue in both developed and the underdeveloped villages, gross margin/farmer was lower because of the higher total variable cost in both developed and the underdeveloped when comparing villages. The result further shows that the total variable cost was estimated at ₦135, 001.80 in the developed villages and ₦143, 790.30 in the underdeveloped villages while the gross margin was estimated in Non-Fadama community to be ₦364,148.20 in the developed villages and ₦ 342,569.70 in the underdeveloped villages. This result therefore, shows a higher return for Fadama participants in both developed and underdeveloped villages than the non-Fadama, a result, which must have been made possible by the presence of infrastructure provided by Fadama II project.

Table 5: Gross Margin Analysis

	Developed (naira)		Under-developed (naira)	
Variable inputs	Fadama	Non-fadama	Fadama	Non-fadama
Cost of Labour	49481.0	41350.10	31464.00	22000.00
Cost of Fertilizer	17148.00	25850.50	13660.00	34640.30
Cost of planting mats	7103.70	17801.20	11056.00	19650.00
Cost of land clearing	26869.00	50,000.00	30455.00	67500.00
Total Variable Cost	100,601.70	135,001.80	86,635.00	143,790.30
Total Revenue	546,570.00	499,150.00	4.44,440.00	486,360.00
Gross Margin	445,968.30	364,148.20	357,805.00	342,569.70

Source: Field Survey (March 2009)

Test of difference between the gross margins of Fadama beneficiaries and non–beneficiaries is shown in Table 6. Result shows that there is significant different in the gross margins of Fadama beneficiary and non–beneficiary farmers at 1% level and the gross margin for Fadama beneficiaries are higher than that of the non-beneficiary.

Table 6:Test of Difference between Means

Status	Mean Gross Margin N	Mean Difference N	T -value	Prob.
FADAMA Developed Underdeveloped	88,163.3 445,968.30 357,805.00	66584.8	3.216	0.000
NON-FADAMA Developed Underdeveloped	21,578.50 364,148.20 342,569.70			

Source: Field Survey (March 2009)

4. Conclusions and policy recommendations

Cost of transportation, is a direct function of status of rural road networks and it has been employed in this study as a measure of underdevelopment. There is therefore needful by public and private to make construction and rehabilitation of rural roads and transportation the first point in any developmental agenda, this would result in reducing the cost transportation of goods and passengers. This will tends to increase the share of farmers in the final realization of farm produce, therefore increasing their welfare.

Fadama participating villages had better access to various infrastructural facilities provided and they were found to be significantly better off in a number of areas including agricultural production, household income and also the participation of women in the economy also they obtain higher price for produce and to buy a larger proportion of consumption needs from the market when compared to non-Fadama participating villages. Thus development of infrastructure has a positive effect/impact on the wholesome lives of the people in the areas. Therefore more infrastructural facilities should be provided by government and private organization in Nigeria to enhance development most especially in non-Fadama areas.

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