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Increasing Agricultural Productivity Through Rural Infrastructure: Evidence From Oyo and Osun States, Nigeria

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Abstract

The study examined access to infrastructure and its effects on agricultural productivity in Surulere and Ife East Local Government Areas (LGAs) of Oyo and Osun States. Using multistage sampling procedure, data were collected through the use of structured questionnaires administered on one hundred and sixty respondents from the study areas. The data collected were analyzed using descriptive statistics and total factor productivity model to explain the effects of the available infrastructure on the farmers' productivity. The findings on socio-economic characteristics of the respondents revealed that 92.9 and 86.3 percent of the respondents were male for Surulere and Ife East LGAs respectively. Above 56 and 35 percent of the respondents were in the age range of 41-50 years and have household sizes that were between 6 and 8 respectively in both LGAs. Majority of the respondents had formal education and took farming as primary occupation. The total factor productivity model used revealed that farm size and labour were positive and significantly affected productivity at 5% and 1% levels of probability respectively. It was however observed that the contribution of female labour in Ife East LGA was higher than that of male, thus introducing gender productivity differential into the production process. With regards to the infrastructural elements, improvement in soil practices and extension visits had positive significant effects on productivity and were statistically significant at 5 % level of probability in both LGAs. It is recommended that more infrastructure be provided to further improve the agricultural productivity of the rural farmers.

Key words: Agricultural productivity, Rural infrastructure, Rural farmers

Introduction

Agriculture in Nigeria employs about two-thirds of the total labour force of the nation, and provides a livelihood for the bulk of the rural population as nearly three-quarters of the poor live in the rural areas. However, the sector's potential contribution to the economic growth and sustained rural development is yet not fully exploited. Agriculture in the country faces a number of challenges, as the majority of the farmers still depend on subsistence agriculture for their livelihood. More than 64 per cent of people in the rural areas are not able to meet their basic food needs, and well over 50 per cent of women still engage in subsistence agriculture for survival (Babatunde *et al.*, 2008). Other challenges include under-developed land property rights, infrastructural inadequacies, limited irrigation and inadequate storage facilities (Onwuemenyi, 2008). The state of

infrastructure in Nigeria has remained a matter of concern, given the importance of infrastructure in economic well being of the populace and the growth and development process of the economy. Unfortunately, various performance indicators in respect of these infrastructural facilities point to the fact that their performances remained unsatisfactory. It seems to be a well-known fact that infrastructural facilities in this country are grossly inadequate to meet the needs of industries; both old and new, especially the agricultural sector, and the population at large.

According to Fakayode *et al.* (2008), provision of efficient infrastructure is now widely recognized as indispensable to agricultural progress as it is a known fact that infrastructure can support economic growth, reduce poverty and make development environmentally sustainable. In any modern society, infrastructure plays a pivotal, and often a decisive, role in determining the overall productivity and development of a country's economy as well as the quality of life of its citizens. The role of infrastructure such as electricity, transportation networks, safe water, and good health centre in promoting development cannot be overemphasized. Its improvement increases the efficiency of production and contributes to standards of living (PCU-NFDO, 2005). Rural infrastructure and development have enormous implications on production outcomes in the agricultural sector and overall significant development of the country. Rural infrastructure plays a crucial role in poverty reduction, economic growth and empowerment for the African rural poor (Ahmed and Rustagi, 1987). The lack of adequate and reliable infrastructure touches the life of every rural African family daily. Family efforts to escape poverty and lift themselves above subsistence levels are limited by the present 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 (FAO, 2005).

Infrastructure is known to impact welfare in three basic respects. It has basic consumption value, and, as such, affects utility derivable from existing and budgeted incomes. Its availability affects productivity and capacity to earn income, which is of concern in rural agriculture. It also affects households and national stock real wealth in the entire economy. It has multiple effects on health and quality of life. Kessides (1993) and Alaba (2001) pointed out that individuals are poor because they do not have access to infrastructure services of necessary quality. Infrastructure's ability to reduce the cost of marketing agricultural products is obvious and well known through intensification of agricultural practices / activities, increased investments in monitoring of the quality of farm inputs, decentralized public agricultural extension system among others (KIPPRA 2007). Patel (undated) identified the components of infrastructure as three; namely capital-intensive, capital-extensive and institutional infrastructure. The capital-intensive infrastructures are those which involve reproducible capital for the provision of the services. Examples are irrigation/public water, transport, storage and processing facilities and power. The capital-extensive infrastructure are those in which less capital would be required; these are extension education services, soil conservation services, credit institution, health facilities

and crop and animal protection programme. The institutional infrastructure are legal, political and socio-cultural in nature. Examples are general law and order, property and land rights and personal safety. Agricultural infrastructure primarily includes wide range of public services that facilitate production, procurement, processing, preservation and trade. According to Patel (undated), it can be grouped into, input based infrastructure (seed, fertilizer, pesticides, farm equipment and machinery etc), resource based infrastructure (water/irrigation, farm power/energy), physical infrastructure (road connectivity, transport, storage, processing, preservation) and institutional infrastructure (agricultural research, extension & education technology, information & communication services, financial services, marketing, etc). According to Rahji (2007), rural infrastructures are classified under physical, social and institutional forms of capital. The main components of physical infrastructure include transport (road), storage, processing, irrigation and flood control, water resources development and social conservation facilities. Social infrastructure include health and education facilities and rural utilities such as electricity and water supply, while institutional infrastructure includes the cooperative societies, farmers' unions, financial institutions such as bank, microfinance facilities, agricultural research facilities, agricultural extension and trading facilities, marketing / agricultural markets etc.

The insensitivity of the government to provide adequate basic infrastructure may impose additional stress on the available ones which are not regularly maintained, leading to eventual breakdown in many instances. This has accounted for substantial loss of productive time, low productivity and poverty in Nigeria. Apart from the general infrastructural problem experienced nationwide, the entire rural areas are specifically worse-off, and this has accounted for poverty differentials between the rural and urban Nigeria (Fakayode *et al,* 2008).

Problem Statement

The inadequacy and low quality infrastructure in many communities have serious implications on rural welfare and persistence of poverty in Nigeria. Infrastructural development in rural Nigeria has long been neglected, while investments in road construction, health, education and water supply are the focus of the government for urban areas. Alaba (2001) stated that the poor tends to live in isolated villages that can become virtually inaccessible during the rainy seasons. They have limited education opportunities, inadequate or lack of potable drinking water and poor health facilities. The primitive state of rural roads constitutes perhaps the most important single factor which underlies the underdevelopment of rural sector in Nigeria. This, combined with inflation, produces a double cost-price squeeze by which high transportation cost of farm inputs results in high farm gate costs of farm inputs; depressing farm output and productivity. When there is a post-harvest marketable surplus, it is not always easy to reach the markets and this limits market accessibility and also cuts off small-scale farmers from sources of inputs, equipment and new technologies. Crop yields may therefore be low because farmers lack these inputs, particularly inadequate access to fertilizer which is a

real problem in many parts of the country where farmers have to cope with diminishing soil fertility. The situation is further aggravated by the fact that many farmers have access only to small parcels of land for cultivation (Fakayode *et al*., 2008).

Most empirical studies are concerned with the measurement of the impact of a discrete element rather than of the components of the infrastructural elements on agricultural production (Rahji, 2007). In view of this, this study examined infrastructure availability vis-à-vis agricultural productivity using Oyo and Osun states as a case study. The study examined the socio-economic characteristics of farm household in the study area, identified the components of rural infrastructure available and examined the effects of these infrastructure components on agricultural productivity in the areas of study.

Methodology

Study Area: The study focuses on Oyo and Osun States, Nigeria. Oyo state is located between latitudes 2^0 38' and 4^0 35' east of the Greenwich Meridian and longitudes 7^0 5' and 9^0 10' north of the equator while Osun state is located between longitudes $5^0$4' to East 4^0 to West and latitudes 8^0 l5' to the North and 6°5 to the South. The states are agriculture-based economies, while production of food crops provides employment and income for more than 75.0 percent of the population. Agriculture is rain-fed in both states. Women also engage in food processing, trading in addition to farming.

*Method of Data Collection***:** Primary data were collected using structured questionnaires. A multistage sampling procedure was used in selecting the respondents for this study. The first stage involved a random selection of one Local Government Area (LGA) in each of the states. These were Surulere and Ife East LGAs in Oyo and Osun States respectively. The second stage was the random selection of five villages from each of the LGAs. The villages from Surulere LGA were Iresaadu, Iresaapa, Ayanyan, Mayin and Okin while, Mosarajo, Iyanfoworogi, Abayagani, Oyeere and Koola villages were selected from Ife East LGA. The third stage was the random selection of sixteen farmers from each village to make a total population of 160 farmers.

Methods of Data Analysis: Descriptive statistics such as frequency counts and percentages. A Total Factor Productivity Model as used by Key and McBride (2003) and Rahji (2007) was adopted for data analysis. Total Factor Productivity (TFP) is a method of calculating agricultural productivity by comparing an index of agricultural inputs to an index of outputs (Laurits, 1975; Jean-Paul, 2009). This measure of agricultural productivity was established to remedy the shortcomings of the partial measures of productivity (Wikipedia, 2010). Total factor productivity is therefore measured as the inverse of unit cost following Key and McBride (2003). This is the ratio of outputs in grain equivalent to the total variable cost (TVC) of production. This translates to the inverse of the average variable cost (AVC) of production.

$$TFP = \frac{Q}{TVC} \quad \text{.....} \text{ Equation (1)}$$

The model is therefore written thus:

$$\mathbf{A+}\ \sum_{i-1}^{5} \boldsymbol{b_i X_I} + \sum_{i-1}^{7} \theta_i R_I \text{.....}$$

.....Equation (2)

Where TFP = Total Factor Productivity
X_1 = Farm size (hectares)
X_2 = Household labour (mandays)
X_3 = Number of years in school
X_4 = Farming Experience (Years)
X5 = Age of head (Years)

R_1 = Soil conservation practices (number)
R_2 = High cost disease (Present = 1, absent = 0)
R_3 = Household with ill-health (number during the year)
R_4 = Extension agent visit (number)
R5 = Volume of Credit received
R6 = Distance to Markets
R7 = Membership of Cooperative Society
Where R_i (i = 1 to 7) are the rural infrastructure

Results and Discussion

Socio-economic characteristics

The socio-economic characteristics of the respondents in the study area are presented in Table 1. Over 80 percent of the respondents in both LGAs were male. More male might have been sampled due to the roles they play as heads of households and for the physical strength needed for farming activities. About 10 percent of the respondents from Surulere LGA were below or thirty years old, while only 6.3 percent were over 60 years of age. The average age was about 50 years; an indication that most of the farmers were leaving their active age and this has a serious implication for agricultural production. On the other hand, respondents from Ife-East LGA had a representation of 6.3 percent for farmers that were under thirty years of age. The mean age was 47 years, indicating that they were still in their active ages and therefore could still do rigorous work like farming activities. The average household sizes for respondents were 7 and 6 for Surulere and Ife East LGAs respectively. This implies that respondents had a large family which could be source of family labour thereby reducing cost of production and this can also help to boost agricultural production. However, large farms may be costlier to maintain in terms of poor resource availability. The educational level as presented in the Table 1 reveals that 16 percent of the Surulere LGA respondents had no formal education while just 1.3 percent had above first degree. The average years spent in school was 7.6 years. With the Universal Basic Education system in Nigeria, an average respondent in the study area had 6 years of primary education and one and half years secondary education while respondents in Ife East LGA had basically 6 years of primary education. Majority of the respondents in both LGAs were primarily farmers (73.7 and 55.0 percent of the respondents) engaged in farming activities in Surulere and Ife-East LGAs respectively. About 90 percent of Ife East respondents had farmlands that were less than two hectares while only 8.8 percent of respondents from Surulere LGA had over five hectares of land for farm activities. This shows that farmers in both LGAs were producing at subsistence level.

Table 1: Distribution of respondents by socio-economic characteristics

Socio-economic characters		Surulere LGA	Mean	Ife-East LGA	Mean
Sex	Male	65 (81.3)		69 (86.3)	
	Female	15 (18.7)		11 (13.8)	
Age	< =30	8 (10.0)	49.8	5 (6.3)	47
	31-40	10 (12.5)		16 (20.0)	
	41-50	34 (42.5)		30 (37.5)	
	51- 60	23 (28.7)		14 (17.5)	
	60 And Above	5 (6.3)		15 (18.7)	
Marital Status					
	Single	31 (38.7)		13 (16.3)	
	Married	49 (61.3)		67 (83.7)	
Household Size					
	< =5	24 (30.0)	7.1	22 (27.6)	6.0
	6-8	41 (51.2)		45 (56.3)	
	8-10	14 (17.5)		9 (11.3)	
	Above 10	1 (1.3)		4 (5.0)	
Educational Level (Yrs)					
	None	13 (16.3)	7.6	0 (0.0)	6.3
	1-6	29 (36.2)		52 (65.0)	
	7-12	23 (28.7)		7 (8.8)	
	13-18	14 (17.5)		17 (21.2)	
	Above 18	1 (1.3)		4 (5.0)	
Primary Occupation					
Farming		59 (73.7)		44 (55.0)	
Civil service		10 (12.5)		5 (6.3)	
Artisan		6 (7.5)		10 (12.5)	
Trading		5 (6.3)		13 (16.2)	
Transporter		0 (0.0)		8 (10.0)	
Farm size (Ha)	< 2	46 (57.5)		72 (90.0)	
	2 -5	27 (33.7)		5 (6.3)	
	above 5	7 (8.8)		3 (3.7)	

Source: Field survey, 2012

Available Rural Infrastructure

The distribution of the respondents according to availability of infrastructure in the study area is presented in Table 2 below. The table reveals that electricity was available in both LGA areas, although some of them claimed that power supply was erratic, and when available, it was of low voltage. On the other hand, the situation was worse with water supply as higher

percentages, 62.3 and 68.8, did not have access to potable water in Surulere and Ife East LGAs respectively. All the respondents from Ife-East LGA indicated that they had transportation network while only13 percent did not have access to transportation network in Surulere LGA. On the average both LGAs claimed to have health facilities within their localities, although all of them were not functional. While 64 percent of the respondents from Surulere LGA had access to storage facilities, only about 31 percent respondents had storage facilities in Ife-East LGA. Majority of the farmers in both LGAs did not have easy access to research institutions. About 72.5 percent of the respondents in Surulere LGA revealed that they had access to extension services through extension officers while 80 percent of respondents from Ife-East LGA did not have access to extension services on their various farm enterprises. With regards to availability of infrastructure in the two LGAs, it was observed on a general note that the availability of the infrastructures mentioned was below average.

Table 2: Distribution of Respondents by Availability of Infrastructure

Infrastructure	***Surulere LGA Available***	***Ife East LGA Available***	***n = 80***
Electricity	52 (65.0)	54 (67.5)	
Water supply	30 (37.5)	25 (31.3)	
Transportations network	67 (83.7)	80 (100.0)	
Health care facilities	55 (68.8)	60 (75.0)	
Storage facilities	64 (80.1)	25 (31.3)	
Research Institution	14 (17.5)	2 (2.5)	
Extension officers	58 (72.5)	16 (20.0)	

Source: Field survey, 2012

Extent of Availability of Infrastructure

Table 3 presents the consistency of the infrastructure available to the respondents. In Surulere LGA, only 5 percent of the respondents indicated that they regularly had electricity and water supply, 30 percent informed that they never had power supply and more than half of the respondents (56 percent) could not access potable water. None of the respondents from Ife-East LGA had regular power supply while only 7.5 could access water supply regularly. While 33.8 percent of the respondents had regular transportation network in Surulere LGA, only 7.5 percent had regular transportation network in Ife East. Although, both LGAs seldom had access to health services, this facility was more regular in Surulere LGA than in Ife-East LGA. The pattern was similar for storage facilities in both LGAs. Surulere LGA seemed to be better-off in terms of regularity of available infrastructures. Majority of the respondents from Ife-East LGA did not have access to research institute and storage facilities. This would be expected to negatively affect agricultural productivity in the area as most farmers may tend to sell their products at ‘give away' prices in order to prevent spoilage. Transportation facility ranked highest in the consistency of infrastructures in both states,

and this was followed by the provision of extension and health care services in Surulere and Ife-east LGAs respectively. The least ranked were water supply (Surulere LGA) and electricity and research institute in Surulere LGA and Ife East LGA respectively.

Table 3: Distribution of Consistency of Rural Infrastructure

Infrastructure	Surulere LGA				Ife East LGA			
	Regular	Seldom	Never	WMS(Rank)	Regular	Seldom	Never	WMS(Rank)
Electricity	4(5.0)	46(57.5)	30(37.5)	1.68(5)	-	59(73.8)	21(26.3)	1.00(6)
Water supply	4(5.0)	20(25.0)	56(70.0)	1.34(7)	6(7.5)	38(47.5)	36(45.0)	1.62(3)
Transportations	27(33.8)	39(48.7)	14(17.5)	2.14(1)	6(7.5)	74(92.5)	-	2.70(1)
Health care	13(16.3)	53(66.2)	14(17.5)	1.36(6)	2(2.5)	70(87.5)	8(10.0)	1.92(2)
Storage facilities	13(16.2)	55(68.8)	12(15.0)	2.01(3)	4(5.0)	9(11.3)	67(83.8)	1.21(5)
Research institute	13(16.2)	50(62.5)	17(21.3)	1.95(4)	-	-	80(100.0)	1.00(6)
Extension officer	14(17.5)	57(71.2)	9(11.3)	2.06(2)	-	37(46.3)	43(53.8)	1.46(4)

Source: Field survey, 2012

Effect of infrastructure on productivity of farmers

The effect of infrastructure on productivity of farmers was elicited and the result is as presented in Table 4. The adjusted R^2 for Surulere LGA and Ife East LGA were 0.6945 and 0.7834 respectively. This indicates that 69.45 percent and 78.34 percent of the variations in the productivity of the farmers in the study area could be explained by the considered explanatory variables (socio-economic and Infrastructure). A striking feature in the results is that, among the socio-economic factors, the same variables, namely; farm size, household labour and number of years spent in school were all statistically significant and positively influenced productivity in the two LGAs.. This could be attributed to homogeneity in farm ownership dimensions, labour use and availability in the two LGAs. While soil conservation practices and number of extension agents' visits were also significant and positively affected productivity, distance to markets (-0.1361) was negatively significant only in the case of Surulere LGA. This occurrence could be traced to poor access to feeder roads that could impair decisions towards increased output. This is in agreement with the findings of Rahji (2007). Membership of farmers' cooperative (0.0137) also significantly increased productivity in Ife East LGA. This could probably justify the genuineness of group formations among the farmers as this could facilitate the flow of information and financial assistance, amongst others. Membership of farmers' cooperative was not significant in the case Surulere LGA, but had a positive implication on farmers' productivity.

Table 4: Effect of Infrastructure Components on Agricultural Productivity

	Surulere LGA		*Ife East LGA*	
Variables	Coefficients	t-values	Coefficients	t-values
Constant	1.0469	1.142	2.0164	1.5455
Socio-Economic:				
X_1 = Farm size (hectares)	0.3457***	3.0976	0.0317**	2.5643
X_2 = Household labour (mandays)	0.0963**	2.5916	0.0415**	2.6512
X_3 = Number of years in school	0.0672**	2.6723	0.2361**	2.7145
X_4 = Farming Experience in Years	0.0212	1.0965	0.2230	0.8756
X5 = Age of head (Years)	-0.1129	1.0129	0.3831	1.1983
Components of Infrastructure:				
R_1 = Soil conservation practices (number)	0.1334***	3.3146	0.4309***	4.1294
R_2 = High cost disease	-0.1721	1.3217	-0.1819	0.9976
R_3 = Household with ill-health	-0.0145	1.0982	-0.6173	1.1143
R_4 = Extension agent visit (number)	0.0816*	1.7998	0.3431*	2.1983
R_5 = Volume of Credit received	0.6231	1.2019	0.2312	0.9934
R_6 = Distance to Markets	-0.1361*	1.1109	0.0943	1.9344
R_7 = Membership of Cooperative Society	0.2888	2.9087	0.0137**	1.2191
	Adjusted R^2= 0.6945		Adjusted R^2= 0.7834	

*** = Significant at P<0.01, ** = significant at P<0.05 and * = significant at P<0.1
Source: Field survey, 2012

Conclusions and Recommendations

The study concluded that most of the farmers were operating on a small scale basis. They were still in their productive years and were of low educational standard. While the most regularly available infrastructure was transportation, infrastructures like electricity, health care and extension agents' visits were never experienced in some farming settlements. Soil conservation practices and number of extension agents' visits were found to increase productivity in the area. While distance to market contributed negatively to productivity in Surulere LGA, membership of farmers' cooperative significantly increased productivity in Ife East LGA. It is recommended that policy towards improving the infrastructure in the farming communities be re-invigorated. Essentially, farmers access to feeder roads, health care services and electricity should be considered as important prerequisites on which the outcome of other agricultural programmes, such as fertilizer subsidy, improved seed and credit programmes can be based.

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