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Impact of Community and Social Development Projects (CSDP) on the economic performance of Cassava Farmers in Edo State, Nigeria

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Abstract

The dearth of infrastructural facilities in rural communities continues to impede on agricultural productivity, thereby complicating the profitability and efficiency of the rural farmers. This study examined the impact of the Community and Social Development Projects (CSDP) interventions in rural communities on the economic performance of cassava farmers in Edo State, Nigeria. The data used in the study were obtained from a cross-sectional survey of cassava farmers in the state. A multi-stage sampling procedure was used to select 479 farmers for this study. The sampled farmers consist of 245 cassava farmers from CSDP beneficiary communities and 234 cassava farmers from non-beneficiary communities. Net farm income, land, labour productivities and technical efficiency were the key economic performance evaluated. Land productivity ($\bar{x}$ = 8969.97 to 9007.61), labour productivity ($\bar{x}$ =251.22 to 284.52) were significant ($p<0.05$). The difference in beneficiary communities farmers and non-beneficiary farmers net farm income per hectare (₦561,284 to ₦533,448) was significant at $p>0.05$ level. Regression analysis showed that farm size ($b = 1.436$), labour ($b = 0.143$) and cassava cuttings ($b = 0.301$) were significant ($p<0.05$) and positively affected the output of cassava among farmers in the beneficiary communities and recorded higher technical efficiency of 96.5%. Healthcare centres and boreholes projects contributed positively to technical efficiency of the farmers. Thus the paper recommends that Healthcare centres and boreholes should be extended to more farming communities as these increases the efficiency of the farmers. Cassava farming should be encouraged in the state because of the profitability and ability to alleviate poverty among the rural populace. The Community Driven Development (CDD) approach adopted by the CSDP should also be adopted by the State and Local Government in project execution in the State. This bottom – up approach of the CDD gives better access to projects. In CDD programs, communities determine their own development, agenda and implement externally funded development projects by themselves.

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Introduction

The nexus between agriculture, poverty and rural community justify the need for rural development through provision of social infrastructural facilities. Agriculture remains the mainstay of most rural dwellers. The concept of rural development must therefore be considered with particular reference to agriculture, since agriculture is the basis of the livelihood of most rural families. In the last two decades there has been increasing emphasis on rural development program and projects and recognition that the development of rural areas is just as important as the building up of urban and industrial complexes. Ayuk (2014), noted that since a majority of the population lives in rural areas and depends directly or indirectly on agriculture, it is expected to play a central role for livelihood , growth and development . The agriculture sector has a strong rural base; hence agriculture and rural community development have a common root.

According to Organization for Economic Corporation and Development (OECD 2011), poverty is multidimensional in that it encompasses deprivations that relate to capabilities including consumption and food security, health, education, rights, voice, security, dignity and decent work. From this definition, it can be asserted that lack of rural social infrastructures such as healthcare facilities, education facilities and access to water supply constitute poverty, especially in the rural communities where majority of the people subsist on income from agricultural activities that are too meager to sustain them. World Bank (2005) reported the rural community account for 66% of the incidence of poverty, 72% of the depth and 69% of the intensity.

Agriculture has continued to be a major driver of the economy of the third world or developing nation. There is a school of thought that argue that since the majority of the people in most developing countries live in rural communities and are engaged in agricultural production or agriculture related activities, agriculture is the most effective way to reduce poverty. For agriculture to be effective in reducing poverty, rural social infrastructure must be provided as this will help to raise their current production effort for optimum results (Emokaro and Omoregbee, 2011)

Idachaba *et al.,* 1980; Emokaro and Oyoboh, 2016 classified capital intensive infrastructures into three: Rural Social Infrastructure(RST) like health facilities, education facilities, rural utilities such as water and electricity supply; Rural Physical Infrastructure(RPI) like transportation, storage processing, soil conservation and irrigation systems and Rural Institutional Infrastructure (RII) which are institutions established to give support to the agricultural sectors such as research, credit, marketing and cooperative institutions.

In order to address the deficit of infrastructure in rural communities and reduce poverty the Federal Government of Nigeria and the World Bank agreed on the desirability of Community Driven Development (CDD) approach adopted by the CSDP in the overall strategy for rural community development and poverty reduction in the country. The Community and Social Development project (CSDP) emerged in 2009 as a new intervention that was designed to effectively target social and environmental infrastructure at the community level. It is primarily targeted towards the rural poor groups; with projects focused on seven sectorial areas of intervention namely; Education, Health, Rural electrification, Water, Transportation, socio-economic development areas and Environment/Natural resources. Since these interventions are targeted at the rural poor who are predominately farmers, there high expectations that the projects will have a great impact on the economic performance in terms of productivity and profitability of these farmers in general.

Agricultural productivity is considered to be the results of more efficient use of the factors of production. Productivity of land is a very important factor of agriculture because it is the most permanent and fixed factor among the three categories of input, “land, labour and capital” (Dharmasiri, 2009). Productivity of land may be raised by applying input packages consisting improved seeds, fertilizers, agro-chemicals and labour intensive methods, creation of physical infrastructure, like irrigation also help to increase the land productivity. Similarly, Labour productivity is measured by the total agricultural output per unit of labour. It relates to the single most important factor of production. Productivity of labour is greatly affected by the health status of the labour. There is a correlation between the health status of the labourers and output

Farm managers' capacity to transform inputs into outputs through a particular technology is frequently impacted by "exogenous variables" that define the production environment (Coelli et al., 2005). These variables have been referred to by a variety of names in the economic literature, including environmental variables, Z-variables, and determinants of inefficiency. Therefore, a comprehension of variations in the working environment is necessary for an accurate assessment of the crop farms' economic performance.

The environmental factors can be defined as innovations that are not quantifiable but can be partially accounted for by observable variables like age, experience, participation in farm improvement programmes, education, and management skill, or they can be farm-specific factors like management skill, institutional constraints, and attitude to risk. It is reasonable to anticipate that environmental factors will present farmers with a range of opportunities and difficulties, all of which will have an impact on their level of farm performance. In this sense, the environment in which production occurs is also characterised by the availability of infrastructure, including water, electricity, and schools and health centers. Farm economic performance can be easily quantified by comparing farmers' output using a given set of inputs.

This study's primary goal was to assess how the infrastructure supplied by the CSDP affected the financial performance of cassava farmers in the state of Edo. The key economic performance indicators evaluated are profitability, land and labour productivity and efficiency.

Methodology

Study Area: This study was carried out in Edo State and covers two local governments per the three agro ecological zones of the State.

Sampling Procedure and Size: A multi-stage sampling procedure was used to select the respondents for this study. The first stage involved a reconnaissance survey to obtain a sampling frame of CSDP beneficiary and non-beneficiary Local Government Areas in Edo State based on the poverty endemic areas according to CSDP poverty mapping of the State. The second stage involved the purposive sampling of two LGAs from the 3 agro-ecological zones of Edo State, where CSDP projects have been executed; giving a total of 6 LGAs for the study. The third stage involved the simple random proportionate sampling of 2/3 out of the 119 beneficiary communities in the CSDP intervention LGAs in the State. The fourth stage involved a purposive sampling of 80 non-benefitting contiguous counterfactual communities from the selected LGAs in the State. This selection was based on communities with similar socioeconomic attributes with the beneficiary communities serving as the control block. The essence of this is to have a counterfactual effect from communities as close to benefitting communities as possible. The last stage involved a simple random sampling 479 farmers which consisted of 245 farmers from CSDP beneficiary communities and 234 farmers from non-beneficiary communities.

Data Collection: A structured questionnaire was used to help collect primary data for this investigation. Secondary data were gathered from the Community and Social Development Projects (CSDP) Edo State office's monitoring and evaluation data sets.

Data Analysis: budgetary analysis such as gross margin, net farm income and return on investment were used to determine profitability among the farmers as follows

Gross Margin (GM) = TR-TVC.. (1)

Net Farm Income (NFI) = GM-TFC.. (2)

Return on Investment (ROI) =NFI/TC... (3)

Where TR=Total Revenue; TVC=Total Variable cost; TFC= Total Fixed cost

Land and labour productivity of the cassava farmers were estimated as follows

Land productivity = Crop yield (kilogram)/Total Land area (hectares)....... (4)

Labour productivity = Crop yield (kilogram)/Total Labour (man-days)....... (5)

The stochastic frontier production function and cost function were used to estimate the Technical, allocative and economic efficiencies of both farmer groups.as stated

$Yi=\beta o+X\beta i+v_i-\mu_i$... (6)

Where Y_i = output of cassava farmers in Kilograms, X is the vector of inputs used, βi are the parameters to be estimated and v_i = stochastic error term and μ_i=estimate of technical inefficiency.

Technical Efficiency (TE) = $X\beta i+v_i-\mu_i/ X\beta i+v_i$...................................... (7)

The linearized cobb-Douglas production frontier is expressed explicitly as follows

$lnY=\beta_0+\beta_1 lnX_1+\beta_2 lnX_2+\beta_3 lnX_3+\beta_4 lnX_4+\beta_5 lnX_5(v_i-\mu_i)$..............................(8)

Where Y= Output of Cassava (kg)

Ln=natural logarithm

$\beta_0,\beta_1-\beta_5$= unknown parameters to be estimated

X_1=farm size (hectares)

X_2=labour (man days)

X_3=agro chemicals used (litres)

X_4=cassava cuttings (bundles)

X_5=Fertilizer Used (kg)

V_i=the stochastic error term

μ_i=estimate of technical inefficiency

The technical efficiency lies between 0 and 1. If it is equal to zero, it shows the farmer is not efficient at all, if it is one, it means the farmer is efficient or is on the frontier. However, if it is greater than zero but less than one ($0<TE<1$), it implies the presence of inefficiency.

To know the possible factors causing the inefficiency, the technical inefficiency model is used.

In this study, the presence of the four CSDP infrastructures namely Electricity, Boreholes, Education and health care centres were incorporated as dummy variable into the inefficiency model in addition other socioeconomic characteristics that may be responsible for the inefficiency.

Hence we state as follows the technical inefficiency of cassava farmers in CSDP benefitting communities.

$\mu_i = \alpha_0+\alpha_1Z_1+\alpha_2Z_2+\alpha_3Z_3+\alpha_4Z_4+\alpha_5Z_5+\alpha_6Z_6+\alpha_7Z_7+\alpha_8Z_8+\alpha_9Z_9+\alpha_{10}Z_{10}$...................... (9)

Where;

μ = Technical inefficiency

Z_1 =Sex of Respondents (dummy .1=male.2=female)

Z_2 =Age

Z_3 =Household Size

Z_4 =Years Of schooling

Z_5 =Marital Status (dummy 1=single, 2=Married,3=separated,4=divorced,5=Widowed)

Z_6 =Farming experience (years)

Z_7 =Electricity (dummy Available=1, Non-available=2)

Z_8 =Borehole (dummy Available=1, Non-available=2)

Z_9 =Education facilities (dummy Available=1, Non-available=2)

Z_{10} =Health Facilities (dummy Available=1.Non-available=2)

$\alpha_0, \alpha_1 \ldots \alpha_{10}$ are unknown parameters to be estimated. We equally estimate the Technical Inefficiency model of farmers in non-benefitting communities as follows

$\mu_i = \alpha_1 Z_1 + \alpha_2 Z_2 + \alpha_3 Z_3 + \alpha_4 Z_4 + \alpha_5 Z_5 + \alpha_6 Z_6$.. (10)

Where;

μ = Technical inefficiency

Z_1 =Sex of Respondents (dummy .1=male.2=female)

Z_2 =Age

Z_3 =Household Size

Z_4 =Years Of schooling

Z_5 =Marital Status (dummy 1=single, 2=Married,3=separated,4=divorced,5=Widowed)

Z_6 =Farming experience (years)

Results and Discussion

Table 1: Summary of the Costs and Returns Structure of Cassava production in the Communities

	Average per Farmer		Average per Farmer per Ha	
	Non-beneficiary Mean	**Beneficiary Mean**	**Non-beneficiary Mean**	**Beneficiary Mean**
Farm size (ha)	**0.78**	**0.85**	**0.78**	**0.85**
Labour(man-days)	**27.85**	**26.91**	**27.85**	**26.91**
INCOME				
Cassava output (kg)	6,996.58	7,656.47	8,969.97	9,007.61
Cassava (price / Kg)	90.17	92.42	90.17	92.42
Total sales (₦)	**630,881.62**	**707,610.96**	**808,822.59**	**832,483.48**
VARIABLE COSTS				
Cassava cuttings(₦)	44,851.28	50,789.39	57,501.64	59,752.22
Fertilizer(₦)	43,452.99	45,551.02	55,708.96	53,589.44

Chemicals(₦)	20,547.01	22,125.71	26,342.32	26,030.25
Labour(₦)	67,504.29	69,026.53	86,543.96	81,207.68
Land cost(₦)	31,841.88	36,455.10	40,822.92	42,888.35
TVC	**208,197.45**	**223,947.75**	**266,919.80**	**263,467.94**
FIXED COSTS				
Depreciation(₦)	6,594.44	6,571.02	8,454.41	7,730.61
TFC	**6,594.44**	**6,571.02**	**8,454.41**	**7,730.61**
TC	214,791.89	230,518.77	275,374.22	271,198.55
GM	422,684.17	483,663.21	541,902.79	569,015.54
NFI	**416,089.73**	**477,092.19**	**533,448.37**	**561,284.93**
ROI	**1.94**	**2.07**	**1.94**	**2.07**

**T-test result: Mean difference =N61,002.42;*
T value = 1.83; df = 477; prob. Level = 0.07 (NOTE: Not significant at 5% but significant at 10%)

Analysis of gross margin and profitability

The gross margin and profitability ratios are presented in Table 1. The gross margin value of ₦422,684.17 and net farm income (NFI) of ₦416,089.73 per farmer were estimated for non-beneficiary communities while the beneficial communities had a gross margin of ₦483,663.21 and NFI of ₦477,092.19 per farmer. These values clearly shows that farmers from beneficiary communities had ₦61,002.42 in revenue more than their counterpart in non-beneficiary communities. The mean difference was significant at 10% probability level.

This implies that farmers in beneficiary communities earned more income from cassava production than their counterpart in non-beneficiary communities and that extra income improved on their poverty status.

The profitability ratio showed return on investment of 1.94 and 2.07 for non-beneficiary and beneficiary communities respectively. The profitability ratios also showed a mean difference of $\bar{x}$ = 0.13, which is significant at 10% probability level.

Table 2: Land and Labour productivity of Cassava Farmers in CSDP beneficiary and Non-beneficiary communities

	Non-beneficiary(n=234)		**Beneficiary(n=245)**	
	Mean	**SD**	**Mean**	**SD**
Farm Size(hectares)	0.78		0.85	

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Labour(man-days)	27.85		26.91	
Cassava output(kg)	6996.58		7656.47	
Land productivity(kg/ha)	**8969.97**	909.4	**9007.62**	1074.3
Labour Productivity(kg/man-days)	**251.22**	54.6	**284.52**	71.7

Source: Field data, 2021

Table2 shows that with an average of 0.78 hectares of farm size and cassava output of 6996.58kg the mean land productivities for non-beneficiary farming communities was 8969.97kg/ha with standard deviation of 909.4 while that of the beneficiary farming communities was 9007.61kg/ha with SD of 1094.3 with an average farm size of 0.85 hectares and cassava output of 7656.47kg.

Similarly, with an average of 26.91(man-days) of labour and cassava output of 7656.47kg the mean labour productivity for the beneficiary farming communities was 284.52kg/man-day as against 251.22kg/man-day recorded by the non-beneficiary farming communities with cassava output of 6996.58kg and 27.85 man-days of labour. The result showed remarkable difference.

Table 3: Test of Difference of Land and Labour productivities between Cassava Farmers in CSDP and non-CSDP communities

	Non-beneficiary mean	**Beneficiary mean**	**Difference**	**T-value**	**Prob. level**	**Remark**
Land productivity	8969.97	9007.61	38.61	6.07***	P<0.05	Significant
Labour productivity	251.22	284.52	33.34	6.05***	P<0.05	Significant

Source: Field survey data 2021

The values from Table 3 shows a mean labour productivity of ($\bar{x}$ = 251.22 ± 54.6) for non-beneficiary farming communities and ($\bar{x}$ = 284.52 ± 71.7) for beneficiary farming communities. Likewise the mean land productivity of ($\bar{x}$ = 8969 ±909.4) for non-beneficiary communities and ($\bar{x}$ =9007±1094.3). The mean differences were all significant at 5% probability level. This implies that farmers in the beneficiary communities had greater land and labour productivity. Improvement in labour productivity was attributed to presence of the CSDP project in the communities, *ceteris paribus*.

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Table 4: The OLS and MLE of the beneficiary communities

	OLS				**MLE**			
Variables	**Parameter**	**Coefficient**	**S.E**	**t-ratio**	**Parameter**	**Coefficient**	**S.E**	**t-ratio**
Constant	b_0	6.261***	0.26	23.72	b_0	6.552***	0.29	22.87
LNFarm size (ha)	b_1	1.129***	0.28	4.05	b_1	1.436***	0.29	4.91
LNLabour (mandays)	b_2	0.094	0.06	1.54	b_2	0.143**	0.06	2.32
LNChemicals (lts)	b_3	-0.069	0.04	-1.60	b_3	-0.084**	0.04	-2.19
LNCassava cuttings (bundles)	b_4	0.449***	0.10	4.46	b_4	0.301**	0.12	2.61
LNFertilizer (kg)	b_5	0.001	0.01	0.11	b_5	0.003	0.01	0.46
sigma-squared		0.018				0.029	0.01	0.46
Gamma						0.451	0.31	1.46
log likelihood		150.94				156.2		
Mean Efficiency						**0.965**		
Minimum Technical Efficiency						**0.740**		
Max Technical Efficiency						**0.989**		

Source: Output from program frontier (4.c) ***, ** and * represent 1%, 5%, 10% significant level respectively

The estimated results of the ordinary least square (OLS) and maximum likelihood estimator (MLE) for cassava farmers in the beneficiary communities of Edo State is presented in Table 4. The results showed that farm size (β = 1.436), labour (β = 0.143) chemicals (β = 0.084), cassava cuttings (β = 0.301) were significant at 5% level. Farm size, labour and cassava cuttings all had positive coefficients, implying that they had positive relationship with output. Thus an increase in the use of these variables could lead to an increase in the output of cassava production. However, chemical was significant at level but negatively signed which implies an inverse relationship. A possible explanation for this is that the use of chemical herbicides by smallholder farmers is commonly limited to pre-planting operations, which is clearing of the farm.

Table 5: Distribution of Technical Efficiency range of Farmers in the Beneficiary Communities'

		Beneficiary	
Technical Efficiency (range)		**Frequency**	**%**
	<700	0	0.01
	0.701 - .800	3	1.22
	0.801 - .900	4	1.63
	0.901 - .950	31	12.65
	0.951 - 1.000	207	84.49
	Total	245	100.00

Source: Computed from field data , 2021

The distribution of the technical efficiency range of cassava farmers in the beneficiary communities as in Table 5 showed that 84.49% of the farmers had a technical efficiency of between 0.951-1.000 while 12.65% operated within the range of 0.901-0.950. At the same time, the distribution of individual technical efficiency indices showed a large variation in the level of efficiency in the sample with individual index estimates ranging from a minimum of 0.740 to a maximum 0.989.The results also indicated the mean technical efficiency at 0.965, implying that production on average is about 3.5% below the frontier (or maximum feasible output). This also means that a proportion of production is lost due to farm – specific technical inefficiency. The variation in the level of technical efficiency suggest the importance of farm specific characteristics such as the nature of technology and other exogenous environmental factors such as provision of rural infrastructure in attaining higher level of productive efficiency.

Table 6: Technical Inefficiency Estimates of the Beneficiary Communities

Variables	Parameter	Coefficient	S.E	t-ratio
Constant	δ_0	0.082	0.65	0.13
Sex	δ_1	-0.032	0.05	-0.69
Age Years	δ_2	-0.096	0.24	-0.40
Family size No	δ_3	-0.274***	0.07	-4.01
Educational level	δ_4	0.139	0.10	1.35
Marital status	δ_5	-0.564	0.45	-1.26
Experience (years)	δ_6	0.138	0.08	1.74
Electrification project	δ_7	0.003	0.12	0.02
Healthcare centre	δ_8	-0.181	0.14	-1.28
School building	δ_9	0.001	0.07	0.01
Borehole project	δ_{10}	-0.009	0.11	-0.08

Source: Output from program frontier (4.1c) ***, **,* represent 1%,5% and 10% level of significant

The estimates for z-variables are displayed in the inefficiency model that is shown in Table 6. Technical inefficiency is either increasing or decreasing, depending on whether the estimates are positive or negative. A positive impact on technical efficiency is indicated by a negative estimate. A structured questionnaire was used to help collect primary data for this investigation.

Age of Farmers

The age of the household head has a negative estimated coefficient (δ= -0.096), suggesting that it positively contributes to technical efficiency and that older farmers are more efficient than younger ones. This is a result of their increased experience and connections to extension agents among older farmers. Numerous studies in the agricultural literature have reported the finding that age significantly positively affects technical efficiency (Abate et al., 2019; Asefa, 2011, Ayele et al., 2019; Dessale, 2019; Tian et al., 2019). It appears that older farmers are less willing than younger ones to adopt new techniques and modern inputs. Other authors have also documented cases where farmer age may also have a negative impact on technical efficiency.

Family size of Farmers

The results shows (δ= -0.274) is negative and significant in this study. The family size was also an important factor that increased the efficiency of the cassava farmers in the study areas. Asafa, 2011 reported similar results.

Marital status of cassava farmers

(δ=-0.564) is negative and significant. It has a positive relationship with technical inefficiency. This implies marital status has got significant effect on efficiency. This means that married couples were more efficient in the use of resources and had higher output. Same finding was reported by (Mukwalikuli, 2018). .

Healthcare Centre

(δ= -0.181) is another dummy variable that equals 1 if this available in the farming communities and 0 otherwise. Healthcare centres have a negative coefficient. This implies that healthcare centres have a positive impact on the technical efficiency of the farmers in the community. This expected because the availability and accessibility of farmers to healthcare facilities increases their labour productivity. This finding is in tune with (Ulimwengu, 2009) that concluded that in rural communities, poor health reduces farmers' income and efficiency and suggested that investing in the health sector will increase not only efficiency and income but also return on investment.

Borehole project

(δ= -009) has a negative coefficient effect on technical inefficiency. This implies that provision of boreholes in these communities increase their technical efficiency. A plausible reason for this could be that citing of borehole in the communities made access to water easier, as less time will be required to fetch water from the borehole compared to the longer distance trekked to get water from the stream or river. Emokaro and Oyoboh (2016) reported 61 percent reduction in cases of water borne diseases, 65 percent access to portable water. This improvement will translate to increase labour productivity which invariably will translate increased agriculture production which in turn will increase technical efficiency.

Recommendations

The finding of the study showed that social infrastructure is a veritable tool to fight poverty and increase the livelihood of the rural farmers. The following recommendations are made.

1. Healthcare centres and boreholes should be extended to more farming communities as these increases the efficiency of the farmers.
2. Cassava farming should be encouraged in the state because of the profitability and ability to alleviate poverty among the rural populace.
3. The Community Driven Development (CDD) approach adopted by the CSDP should also be adopted by the State and Local Government in project execution in the State. This bottom – up approach of the CDD gives better access to projects. In CDD programs, communities determine their own development, agenda and implement externally funded development projects by themselves.

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