International Journal of
Agricultural Research

ISSN 1816-4897

Academic
Journals Inc.

www.academicjournals.com

International Journal of Agricultural Research 9 (6): 294-303, 2014
ISSN 1816-4897 / DOI: 10.3923/ijar.2014.294.303

Resource Use Efficiency among Beneficiaries and Non-beneficiaries of Fadama Rice Project in Niger State, Nigeria

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ABSTRACT

The study compared the resource use efficiency among beneficiary and non-beneficiary rice farmers of Fadama Project in Niger State, Nigeria. Data used for the study was obtained using structured questionnaire administered on 120 randomly selected rice farmers from both the beneficiary (60) and non-beneficiary (60) groups of Fadama Rice Project in the state. Technical and allocative efficiency estimates were obtained using stochastic frontier production function and marginal product approach, respectively. The study found that the technical efficiency of the Fadama group ranged between 0.41 and 1.00 with a mean value of 0.79 while that of the non-Fadama group ranged between 0.44 and on 0.98 with a mean value of 0.81 on the scale of one. The result of t-test showed that the difference between the mean scores of the two groups was not statistically significant. Allocative efficiency analysis also showed that the two groups under-utilized available resource inputs. Elite capture of the Fadama project as well as equal access to inputs except for Fadama Advisory Service and input supports may have explained the lack of significant difference in the mean scores of the two groups on technical and allocative efficiencies. The study recommends that the project implementation strategy should tackle the challenge of elite capture, inputs diversion, intensify advisory services/training and ensure the usage of high yielding seeds, labour saving technology and agro-chemicals for rice farmers.

Key words: Resource use, technical efficiency, allocative efficiency, Fadama

INTRODUCTION

The food sub-sector of Nigerian agriculture has a large array of staple crops but rice occupies an eminent position. At independence in 1960, rice was merely a festival food consumed mostly in affluent homes during the Christmas and other religious festivals (UNEP, 2002). However, as shown in the report of Akpokodje *et al.* (2001), since the mid-1970s, rice consumption in Nigeria has risen tremendously (+10.3% per annum) as a result of accelerating population growth rate and changing consumer preferences. Urbanization appears to be the main cause of the shift in consumer preferences towards rice in Nigeria. Rice is easy to prepare compared to other traditional cereals, thereby reducing the chore of food preparation and fitting more easily the urban lifestyles of rich and poor alike. The poorest third of urban households obtain 33% of their cereal-based calories from rice and rice purchases represent a major component of cash expenditures on cereals (World Bank, 1995). According to CARD (2009), Nigeria's estimated annual rice demand is about 5 M tons while the country produces about 2.21 M tons milled product, leaving a supply demand gap of 2.79 M tons which is abridged by importation.

Ogundele and Okoruwa (2006) noted that in an apparent move to respond to the increased per capita consumption of rice in Nigeria, local production boomed, averaging 9.3% per annum. These increases have been traced to vast expansion of cropped rice area at an annual average of 7.9% and to a lesser extent to an increase in rice yield of 1.49% per annum. Inspite of this, the production increase has not been sufficient to match the increase in consumption.

In order to address the demand/supply gap, governments have at various times come up with policies and programmes. These include the Federal Rice Research Station (1970), National Accelerated Food Production Programme (1972), Agricultural Development Project (1975), Operation Feed the Nation (1975), River Basin Development Authority (1978), the Green Revolution Programme (1980), the Directorate of Food, Road and Rural Infrastructure (1985), National Land Development Authority (1988) and the National Fadama Development Programme (1992).

Fadama, a Hausa word adopted by World Bank refers to the low lying swampy areas consisting of alluvial deposits and containing extensive exploitable aquifers. Fadama lands are among the world's most productive ecosystems, rich in biodiversity of forest wildlife, fisheries, crops, livestock and water resources (Kutigi, 2005). Qureshi (1989) defined it as alluvial lowlands formed by erosional and depositional actions of rivers and streams possessing fine texture and less acid which makes it a rich agricultural soil. In Nigeria, they are visible along the flood plains of Niger, Sokoto-Rima, Benue-Jemaari and Yobe rivers. They vary in width from a few hundred meters to as much as 20 ha stretch and encompasses land and water resources that could be developed for irrigated agriculture (World Bank, 1993).

The first National Fadama Development Project (NFDP) designed to promote irrigation facilities especially in the Fadama plains became effective from February 1993. Small scale irrigation in the Fadama was found to be hampered by several constraints which included poor infrastructure, low investment in technology development and extension for irrigated agriculture, weak financial intermediation, poorly organized Fadama farms and limited access to foreign exchange for importation of irrigation equipment. The first phase of the project (Fadama I) was designed to tackle these constraints (World Bank, 2003).

The second and the third phases of the project (Fadama II and Fadama III) which started in May 2004 and March 2009, respectively, were aimed at sustainably increasing the income of all users of Fadama resources including crop farmers, gatherers of edible and non edible fruits, fisher folks, hunters, pastoralists and service providers. In Niger State the Fadama III project was implemented in the entire 25 Local Governments (LGAs) of the state. The project development followed the Community Driven Development (CDD) approach which is a bottom up approach that empowers communities/associations to develop social and all inclusive local development plans whereby communities take responsibility for designing, implementing, operating and maintaining as well as monitoring and evaluating the sub projects as prioritized in their local development plans (NSFDO, 2005).The intervention of the project in the form of capacity building, advisory services, community driven pilot asset acquisition, economic and rural infrastructure and input supports was intended to affect farmers behavior in their decision making process.

Having expended much resources in the Fadama project, it has become very necessary to determine the resource use efficiency among rice farmers who are one of the major beneficiaries of Fadama project in Niger State. The broad objective of the study was therefore to compare resource use efficiency among beneficiary and non-beneficiary rice farmers in the state. The specific objectives were to determine and compare the technical efficiencies of the two categories of rice farmers, estimate returns to scale of the two groups and determine and compare their allocative efficiencies.

Conceptual framework: Community Driven Development (CDD) is a development approach that gives control over planning decision and investment of resources to community groups and local governments. Community Driven Development (CDD) programmes operate on the principles of local government, participatory governance, demand responsiveness, administrative autonomy, greater downward accountability and enhanced local capacity (World Bank, 2010). Mansuri and Rao (2004) viewed CDD as a mechanism which among other things enhance sustainability, improve efficiency and effectiveness and complement market and public sector activities. According to IFAD (2010), CDD may be a way to correct failures by government, markets and civil society or a self help approach to accelerate access for communities and rural areas to public goods and services. In an effort to promote greater livelihood security by strengthening activities that stabilize income streams, many CDD operations have promoted local producer organizations and microfinance systems and have actively participated in building occupational skills for income generation activities and jobs (World Bank, 2009).

The national Fadama development project is expected to empower communities/associations through the CDD approach to develop all inclusive Local Development Plans (LDPs) whereby communities take responsibility for designing, implementing, operating and maintaining as well as monitoring and evaluating the sub-projects prioritized in their LDPs (Kutigi, 2005). Fadama beneficiary rice farmers are those rice farmers that have benefited from the Fadama intervention as members of Fadama Users Group while non-Fadama beneficiary rice farmers refer to those farmers that have not directly benefited from the Fadama intervention even though some of them might have purchased inputs from beneficiaries who directly benefited from the intervention.

World Bank (2009) noted that result of the evaluation of the three CDD objectives of service delivery, governance and economic livelihoods of the Fadama project were lacking on outcomes in terms of improvement to the lives and incomes of the poorest people themselves. This underpins the purpose of this study which sought to evaluate the resource use efficiency of Fadama project beneficiary rice farmers as against non-Fadama project beneficiary rice farmers in Niger State, Nigeria.

Farrell (1957) first proposed an approach for estimating productive or Economic Efficiency (EE) of observed units and decomposed productive efficiency into two elements: Technical Efficiency (TE) and Allocative Efficiency (AE). Technical Efficiency is the ability of a firm to produce a given level of output with minimum quantity of inputs under a given technology. Allocative efficiency on the other hand is a measure of the degree of success in achieving the best combination of different inputs in producing a specific level of output considering the relative prices of these inputs. In one sense, the efficiency of a firm is its success in producing as large an amount of output as possible from given sets of inputs. Maximum efficiency of firm is attained when it becomes impossible to reshuffle a given resource combination without decreasing total output (Umoh, 2006). The stochastic frontier production function as specified by Battese and Coelli (1995) was used in this study for the analysis of technical efficiency.

MATERIALS AND METHODS

Study area: The study was carried out in Niger State which is one of the 36 states that make up the Federal Republic of Nigeria. The state lies between latitudes 8°20′N and 11°30′N and longitudes 3°3′E and 7°20′E. It is bordered to the north by Zamfara state to the south by Kogi; while Kaduna State and the Federal Capital Territory (FCT) border the state to the northeast and southeast, respectively. It shares a common international boundary with the Republic of Benin. There are two main seasons in the state, dry and wet seasons. The wet season decreases in length and amount of rain from south to north. The mean annual rainfall varies from around 11,000 mm in the north to more than 11,600 mm in the south and the duration of wet season varies from 187 to 220 days. The growing season for crops extends beyond the end of the rains due to residual soil moisture. The state is in the savannah vegetation zone with the northern part falling within the Sudan Savannah zone while the southern part is in the Guinea Savannah zone. The predominant crops are rice, sorghum, millet, yam, groundnut and cotton.

Methodology: Both purposive and multi-stage samplings were used in the study. Sampling covered all the three agricultural zones in the state, namely: Bida, Kuta and Kontagora. One Local Government Area (LGA) with highest rice production in each agricultural zone was purposively selected giving a total of three LGAs. From each of these LGAs one Fadama beneficiary rice producing community and one non-beneficiary community were selected. Lists of rice farmers in the selected communities were obtained from Fadama facilitators and extension agents of the Niger State Agricultural Development Programme (ADP). This formed the sample frame for the study. From the sample frame 40 rice farmers were randomly selected from each of the three communities, giving a sample size of 120 respondents (i.e., 60 for Fadama and 60 for non-Fadama rice farmers). Data was obtained from primary sources. Questionnaire/interview schedule that elicited responses from the farmers on input-output data such as output of rice in kg, farm size in hectares, labour (family/non family) used in man-days, fertilizer used in kg, agrochemicals used (herbicides and pesticides) in liters and some farmer specific variables like family size, educational status, farming experience in years, extension agent contact, information and support from the Fadama project.

Data was analyzed using techniques including Cobb Douglas Stochastic Frontier Production Function through maximum likelihood estimate approach to determine the technical efficiencies of the rice farmers. Summation of input elasticities of production was done to estimate return to scale of rice farmers in the two groups. Variables with positive coefficients from the OLS estimates of the function were used to estimate allocative efficiencies.

The stochastic frontier production function for the rice farmers was specified as follows:

$$\ln Y = \beta_0+\beta_1\ln X_1ij+\beta_2\ln X_2ij+\beta_3\ln X_3ij+\beta_4\ln X_4ij+\beta_5\ln X_5ij+Vij = Uij$$

where, In represents logarithm to base e, subscript ij refers to the jth observation of the ith farmer.

Y	=	Total farm output of rice (kg ha^{-1})
X_1	=	Farm size (ha)
X_2	=	Quantity of rice seed planted (kg ha^{-1})
X_3	=	Quantity of fertilizer used (kg ha^{-1})
X_4	=	Quantity of labour (family and non family used in man-days)
X_5	=	Quantity of herbicide (L ha^{-1})
X_6	=	Quantity of patricides (L ha^{-1})
Vij	=	Asymmetric error component that accounts for random effects and exogenous shock.
$\mu ij \leq 0$	=	A one sided error component that measures technical inefficiency of production of farmers, as used to be truncated at zero (0)
$\beta_0 \_ \beta_1$	=	Parameters to be estimated

The inefficiency model is represented by μij which is defined as:

$$\mu ij = \delta oj+\delta_1\ln Z_1ij+\delta_2\ln Z_2ij+\delta_3\ln Z_3ij+\delta_4\ln Z_4ij+\delta_5\ln Z_5ij+\delta_6\ln Z_6ij+\delta_7\ln Z_7ij+\delta_8\ln\delta_8$$

μij = Technical inefficiency
Z_1 = Age of the farmer
Z_2 = Household size
Z_3 = Educational level
Z_4 = Farming experience (in years)
Z_5 = Sex (1 for male, 0 for female)
Z_6 = No. of access to extension services
Z_7 = No. of access to Fadama Project Advisory Services
Z_8 = Access to Fadama input (1 for access, 0 otherwise)

RESULTS AND DISCUSSION

Maximum Likelihood Estimates (MLE) for parameters of cobb-douglas model: The results of the maximum likelihood estimates for the Fadama beneficiary rice farmers showed that farm size, seed, labour, herbicides and pesticides gave positive coefficients of 0.23, 0.48, 0.45, 0.09 and 0.19, respectively (Table 1). Thereby conforming to a priori expectation, from these results, seeds appear to be the most important factor of production with an elasticity of 0.48 suggesting that a unit increase in seed results in 0.48 increase in output given the existing technology. The second most important factor input was labour followed by farm size, pesticide and herbicide in that order.

Table 1: Maximum likelihood estimates of parameters of the cobb-douglas frontier function for fadama and non-fadama beneficiary rice farmers in Niger state

	Fadama beneficiaries			Non-Fadama beneficiaries	
Variables	Parameters	Coefficients	t-ratio	Coefficients	t-ratio
Production factor					
Intercept	β_0	-2.679	-4.185	-1.899	-0.724
Farm size	β_1	0.231	1.541	0.596	1.124
Seed	β_2	0.479	4.007**	0.229	0.891
Fertilizer	β_3	-0.063	-1.282	0.069	3.090**
Labour	β_4	0.445	3.795**	0.258	0.388
Herbicides	β_5	0.093	2.905**	0.025	0.248
pesticides	β_6	0.185	1.003	-0.009	-0.006
Inefficiency factors					
Constant	Z_0	1.083	3.896	-0.613	-0.098
Age	Z_1	-0.029	-6.108**	-0.005	-0.059
Household size	Z_2	-0.002	-0.089	-0.035	-0.080
Educational level	Z_3	-0.019	-2.191*	0.005	0.608
Farming experience	Z_4	0.009	1.787	0.032	0.779
Sex	Z_5	0.361	2.426	0.691	0.211
Extension contact	Z_6	-0.002	-0.037	-0.254	-2.128*
Fadama advisory service	Z_7	-0.071	-0.141	0.000	0.000
Fadama input supports	Z_8	0.187	1.578	-0.257	-0.054
Diagnostic statistics					
Sigma-squared	δ	0.478	4.137	0.327	0.815
Gamma	γ	0.657	5.414	0.456	0.283
Log likelihood ratio		3.610	4.136		
LR test		21.870	3.764		

Source: Field survey, 2011, **, *Significantly at 1, 5%, respectively

From the t-ratio, seed, labour and herbicides contributed significantly to the technical efficiency of the Fadama beneficiary rice farmers. This implied that seeds, labour and herbicides were significant factors influencing changes in output of rice among beneficiaries. The significance of seeds may imply that the group used the right seed and the right spacing; the significance of labour could be that rice farming in the group was labour intensive and so its availability affected output the significance of herbicides could also be as a result of the group's increased use of better weed control methods. Fertilizer was found to be curiously inversely related to output but not significant for the beneficiaries. For the non-beneficiaries except for pesticide with a negative coefficient of - 0.01, all the remaining inputs of farm size, seeds, fertilizer, labour and herbicides gave positive coefficients of 0.60, 0.23, 0.01, 0.26 and 0.03, respectively. From the results, the most important factor of production for the non beneficiaries was farm size with a coefficient of 0.60 followed by labour (0.26) seed (0.23) fertilizer (0.07) and herbicides (0.03) in that order. From the t-ratio, fertilizer is the only input contributing significantly to the output of the non beneficiaries.

The findings conformed to earlier findings of Mba (2006); Umeh and Attarboh (2007) and Aye and Oboh (2006) which listed labour and herbicides among inputs contributing significantly to output. However, points of divergence exist between these findings and those of Mba (2006) and Umeh and Attarboh (2007) who included farm size and fertilizer as factors contributing significantly to technical efficiency of rice farmers. In this study, fertilizer contributed significantly only to the technical efficiency of the non-beneficiary group while farm size which had a positive correlation with output in the two groups was not significant. However, Ogundele and Okoruwa (2006) found that contribution of fertilizer to rice output was not significant while Ojo *et al*. (2009) also found an inverse relationship between fertilizer used and yam output.

The result of the inefficiency model (Table 1) provided some explanations for the relative efficiency levels among the farmers. For beneficiaries: age, household size, educational level, extension contact and Fadama advisory services were correctly signed, conforming to a priori expectations but only age and educational level were significant at 5% level. For the non beneficiaries age, household size, extension contact and input support were correctly signed conforming also to a priori expectation except extension contact which was significant at 5% level. The negative coefficients of age, household size, educational level, extension contact and Fadama advisory services/training among beneficiaries implied that as farmers got older and as their household sizes increased their technical efficiency increased probably due to acquisition of more skills and availability of more hands to till the land in the labour intensive rice farming in the state. The findings on age and household size agreed with that of Umeh and Attarboh (2007). The negative and significant coefficient of educational level, extension contact and Fadama advisory services showed that farmers with greater years of formal schooling and longer extension contact tended to be more technically efficient. This agrees with the findings of Seyoum *et al*. (1998), Amaza and Tashikalma (2003), Amos *et al*. (2004), Amaza and Maurice (2005) and Shehu *et al*. (2007). The findings on advisory services and training conform to the previous findings. It is puzzling that input supports which contributed though not significantly to the technical inefficiency of beneficiaries significantly added to the technical efficiencies of the non-beneficiaries. The targeting mechanism of the project which gave priority to the poorest of the poor, could be the explanation for the scenario since some beneficiaries might have sold off the input supports received from the project to non-beneficiaries.

Technical efficiency of beneficiaries and non-beneficiaries: The frequency distribution of technical efficiencies of the two categories of rice farmers (Table 2) shows that 45% of beneficiaries

Table 2: Technical efficiency of fadama and non-fadama rice farmers in Niger State

Fadama	Beneficiaries		Non-beneficiaries	
0.00-030	0	0.0	0	0.0
0.31-0.40	0	0.0	0	0.0
0.41-0.50	5	8.3	4	6.7
0.51-0.60	8	13.3	4	6.7
0.61-0.70	11	81.4	9	15.0
0.71-0.80	8	13.3	9	15.0
0.81-0.90	1	1.7	10	16.6
0.91-01.0	27	45.0	24	40.0
Total	60	100.0	60	100.0
Mean	0.79		0.81	
Maximum	1.0		0.98	
Minimum	0.41		0.43	

Source: Field survey, 2011

Table 3: Elasticity of factor inputs and returns of scale of fadama and non-fadama beneficiary rice farmers in Nigeria State

	Coefficient (Elasticity or production)	
Variables	Fadama beneficiaries	Non-fadama beneficiaries
Farm size	0.230	0.596
Seed	0.479	0.229
Inorganic fertilizer	-0.063	0.069
Labour	0.445	0.258
Herbicides	0.093	0.025
Pesticides	0.185	-0.009
Return to Scale	1.432	1.168

Source: Field survey, 2011

had technical efficiency of 0.81-1.0 while 43.4% of the non-beneficiaries had technical efficiency of 0.41-0.81. The farmer specific indices of technical efficiency varied widely between the two groups ranging between 0.41 and 1.00 for the beneficiaries and 0.44 and 0.99 for the non beneficiaries. The mean technical efficiency of 0.79 for the beneficiaries means that their technical efficiency could be increased by 21% while the mean technical efficiency score of 0.81 for the non-beneficiaries suggests that this group could increase their efficiency by 19% suggesting that non-beneficiaries were more technically efficient in the study. This could be explained by farmer specific factors like age, household size, education and access to extension services. The elasticity of production for the two categories of rice farmers (Table 3) indicated total elasticities of 1.43 and 1.17, respectively for the beneficiary and non-beneficiaries indicating increasing return to scale in each case. This means that rice production by the two groups can still be expanded or increased by increasing their levels of input use. This agrees with Umeh and Attarboh (2007) who recorded an increasing return to scale of 1.82 for rice farmers in Kogi State.

Allocative efficiency of beneficiaries and non-beneficiaries: The allocative efficiency of beneficiaries and non-beneficiaries was derived using the OLS estimates of the Cobb-Douglas frontier production function (Table 4). The estimated OLS results showed that only the coefficients of farm size, labour and herbicides were significant for the beneficiaries while all coefficients except that of pesticides were significant at either 1 or 5% level for non-beneficiaries.

Table 4: OLS Estimates of Parameters of the cobb-douglas frontier function for fadama and non-fadama beneficiary rice farmers in Niger state

	Fadama beneficiaries			Non-fadama beneficiaries	
Variables	Parameters	Coefficients	t-ratio	Coefficients	t-ratio
Production factor					
Intercept	β_0	-3.020	-0.464	-2.821	-7.660**
Farm size	β_1	0.360	2.261*	0.606	4.061**
Seed	β_2	0.198	1.671	0.184	2.399*
Fertilizer	β_3	-0.376	-0.674	0.192	4.197**
Labour	β_4	0.677	6.210**	0.332	3.97
Herbicides	β_5	0.149	4.35**	0.013	0.259*
pesticides	β_6	-0.116	-0.688	0.079	1.247
Sigma-squared	δ	0.65		0.77	

Source: Field survey, 2011, **, *Significant at 1, 5% significant level, respectively

Table 5: Allocative efficiency of fadama beneficiary rice farmers

Variable	MFC_i	B_i	P_y	MVP ($MPP.P_y$)	Ki (MVP_I/MFC_i)	Deviation from optimality ($1-K_i$)
Farm size	8,500	0.360	50,000	18,000	2.12	-1.12
Seed	4,800	0.198	50,000	9,900	2.06	-1.06
Labour	2,000	0.677	50,000	3,385	1.69	-0.69
Herbicides	1,200	0.149	50,000	7,450	6.20	-5.20

Source: Field survey, 2011, Only variables with positive coefficients from the OLS estimates were considered

Table 6: Allocative efficiency of non fadama beneficiary rice farmers

Variables	MFC_i	B_i	P_y	MVP ($MPP.P_y$)	Ki (MVP_I/MFC_i)	Deviation from optimality ($1-K_i$)
Farm size	8,500	0.606	50,000	30,000	3.56	-2.56
Seed	4,800	0.184	50,000	9,200	1.96	-0.96
Labour	4,000	0.192	50,000	9,600	2.40	-1.40
Fertilizer	2,000	0.332	50,000	16,600	8.30	-7.30
Herbicides	1,200	0.126	50,000	6,300	5.25	-4.20
Pesticide	1,100	0.791	50,000	39,550	35.95	-34.95

Source: Field survey, 2011, Only variables with positive coefficients from the OLS estimates were considered

In terms of allocative efficiency factor, inputs of farm size, seed, labour and herbicides gave an MVP/MFC ratios of 2.12, 2.06, 1.69 and 6.20, respectively (Table 5) indicating that these inputs were underutilized. For the non-beneficiaries the result showed that factor, inputs of farm size, seed, fertilizer, labour, herbicides and pesticides gave MVP/MFC ratios of 3.56, 1.96, 2.4, 8.3, 5.25 and 35.95, respectively (Table 6) indicating also input underutilization.

CONCLUSION

The study examined the resource use efficiency of beneficiaries and non-beneficiaries of Fadama project rice farmers in Niger State and found that the difference in the technical efficiencies of the two groups was statistically insignificant. The findings showed that seeds, labour and herbicides contributed significantly to changes in the output of rice among beneficiaries while fertilizer was the only input that contributed significantly to the technical efficiency of non-beneficiaries. The estimated co-efficient of the inefficiency model showed that age, household size, educational level, extension contact and Fadama advisory services positively affected the technical efficiency of beneficiaries while only age, household size and extension contact positively affected non-beneficiarie's technical efficiency although, only extension contact was significant. The return to scale values of 1.432 and 1.168 for the beneficiaries and non beneficiaries, respectively indicated increasing returns to scale. Also allocative efficiency analysis result showed that rice farmers in the two groups did not make optimal use of resources available to them as all resource input was underutilized. These results point to the fact that the two categories of rice farmers have potentials for expansion of their rice output.

The results agree with earlier findings that no matter the level of success of an agricultural development intervention, the effects of farmer specific characteristics like age, years of farming experience, educational background and level of income on the final outcomes should not be ignored (Ogundele and Okoruwa, 2006). It was also observed that apart from Fadama Advisory Services and input support that were restricted to Fadama farmers only, farmers in both groups had equal access to extension contacts and all necessary input from the market in the state. This might also have explained no significant difference in the levels of their technical efficiency. One other reason that might explain the lack of outstanding performance by the Fadama group may be the issue of elite capture found prevalent in most government sponsored agricultural development programme. Such elite without prior and fundamental experience in rice production may have performed below expectation thereby influencing the result of the study.

The overall outcome of this study suggests that adequate strategy should be put in place to prevent elite capture of the Fadama project in the state. The positive correlation between farm size and rice output for both groups in the study suggests that there is need for policies that will make more land available to these farmers. Use of high yielding seeds, timely provision of fertilizers and labour saving technologies will surely increase rice output in Niger State because they all contributed positively to the efficiencies of farmers in both groups.

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