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Effects of Land Acquisition for Large Scale Farming on the Performance of Small Scale Farming in Nigeria

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ABSTRACT The study examined the effects of land acquisition for large scale farming on the performance; productivity and technical efficiency of small-scale farming in Nigeria. The primary data for the study were collected from 200 small-scale farmers selected using the multistage sampling technique, from three local government areas in Ondo State, Nigeria. The farmers were grouped into Group A: farmers whose families donated land for large scale oil palm project and Group B: farmers whose families did not donate land for the large scale oil palm project in the study area. Data collected were analyzed using descriptive statistics, gross margin and stochastic frontier production function analyses. The study revealed that farmers in group A had long distant farms that were in small highly fragmented holdings and produced mainly arable crops that yielded smaller revenue compared with the farmers in group B. It was further revealed that group B farms were more productive in the allocation of resources and over all production as measured by the decreasing positive elasticity of production of most of the variables involved in the production function analysis. The group B farms were also more technically efficient than the group A farms. The study therefore recommends that government should open up the lands on the highways that are not owned by any family for prospective large scale agricultural producers.

INTRODUCTION

In Nigeria the mere presence of land to cultivate has never been a serious problem of agricultural development. Nigeria has a total land area of about 98.3 million hectares out of which about 71.2 million hectares are cultivable but only about one third is presently in cultivation (Daramola, 2004). The main problem with respect to land for cultivation is land availability. Land availability for agricultural production in Nigeria involves a complexity of interacting variables such as population, land tenure system, level of technology and the stage of the country's development (Ojo and Afolabi, 2003). These variables, especially land tenure systems put serious limitations on the amount of land that is available for both small and large scale agricultural productions because land is communally owned in the various communities and no single person has exclusive right over the piece of land he is using for agricultural purposes. The community leadership determines what crops (arable or perennial) to cultivate. The plight of the farmers is even worsened if he is not an indigene of the community. Apart from giving him the less fertile portion to farm, he must not cultivate perennial crops.

The governments of Nigeria made several efforts to solve the problem of land availability for agricultural production. Among such efforts was the establishment of the land use decree of 1978 which vested ownership of all lands in the country on the government and its agencies, such that, land acquisition by prospective farmers especially for large scale production would no longer be a problem because the general impression is that large scale farming is the solution to the problem of Nigerian agriculture and thus national policies tend towards it, as in the cases of the river basin development authority, and the acquisition of about 73640 ha by government for large scale production of oil palm between 1975 and 1985 in the oil palm belt states of the country(FDA, 1985).The large scale farming policy and programmes have always been taken a large proportion of the readily accessible arable land from the traditional owners without any significant positive increase in agricultural production and productivity while the small scale farmers(land owners) have always been on the receiving end. The best of their lands are taken from them by government for large scale farming and the population increase is putting its own pressure on the fertile land within the vicinity of the towns for building projects.

This study is relevant in that the rights of the small scale farmers to the use of land is adversely affected with the government large scale farming

policy and programmes. Should this trend continue? The contribution of this category of farmers who account for over 90 percent of the agricultural production in Nigeria would be adversely affected with its implications on food security and poverty. Therefore it is necessary to know the effects of large scale acquisition of land for farming on small scale farming to inform policy decision. This paper, therefore examines the effects of land acquisition for large scale farming on the performance (profitability, production and productivity and technical efficiency) of small scale farming in Nigeria.

METHODOLOGY

Study Area: The study was based on data collected from small scale farmers in three local government areas of Ondo State, Nigeria, where the Ondo State government acquired about 12743ha from 15 communities for large scale oil palm production since 1968. The study area is in the South Western part of Nigeria. It is in the rainforest belt with annual rainfall of over 2000mm and daily temperature of between 23^0C - 30^0C (Ojo and Afolabi, 2003). The area has well formed fertile sandy loam soil that is well suited for oil palm production and other perennial and arable crops such as cocoa, rubber, yam, cassava, vegetables and so on.

The large scale oil palm farm known as Okitipupa Oil Palm PLC was established in 1968. It is now a public liability company. It processes oil palm fruits into palm oil, palm kernel and brown soap. The company has oil palm plantations in eight locations in three LGAs (Okitipupa, Irele and Ese-Odo LGAs) of the state. The main palm oil mill and the headquarters of the company are sited at Okitipupa because of its central location to the oil palm plantations. The establishment of the company in the area brought about some mixed feelings. While it was hoped that it would generate employment and improve the socio-economic conditions of the area, the question of land availability for small scale farming in the area after the government acquisition of the large chunk of land for the oil palm farms continues to generate mixed reactions in the minds of those whose families gave out their lands to government for the oil palm farms.

Data Collection and Sampling Technique: Primary data, collected using questionnaire administration, were mainly used in the study. The data were collected from 200 small-scale farmers selected using the multistage sampling technique. The first stage was the purposive selection of the three local government areas (Okitipupa, Irele, and Ese-odo) where the Okitipupa Oil-palm Company has its eight oil palm plantations. The second stage of the sampling technique was the use of stratified sampling method where the population of small scale farmers was stratified into two groups namely; Group A: farmers whose families donated land for large scale oil palm farms of the Okitipupa Oil Palm PLC, and Group B: farmers whose families did not give out their lands for the company's oil palm farms. The third stage of the sampling technique was the random selection of 100 small scale farmers from each group. The sample was selected from the 15 communities where the company got land donation for its large oil palm farms. Information was collected on the farm output in monetary value(Naira), input data such as age and level of education of farmers, farm size in ha, number of farm locations, annual cost of implements (depreciation value), labour in man-days, farm distance in kilometer and operating expenses.

Method of Data Analysis: The analytical technique includes: descriptive statistics (mean, standard deviation and percentage) to analyze the socio-economic characteristics of the respondents, gross margin analysis to analyze the profitability of farm operations, and the stochastic frontier production function (SFPF) to examine the productivity of resources of production function and predict the technical efficiency of the farmers.

The use of the SFPF has some conceptual advantage in that it allows for the decomposition of the error term into random error and inefficiency effects rather than attributing all the errors to random effects (Xu and Jeffrey, 1998). The SFPF is specified thus:

$Y=f(X_a, \beta)+V-U$…… (Battese et al., 1993)

Where Y is output,

X_a denotes the actual input vector; β is the vector of production function parameters,

V is a random error term having zero mean, constant variance, normally distributed and independent of the U. It covers random effects on production outside the control of the decision unit. The U is a non-negative error term having zero mean and constant variance (Xu and Jeffrey 1998). It measures technical inefficiency effects that fall within, (because the errors could be controlled with effective and adequate managerial control of the firm), the control of the decision unit (Apezteguia and Garate, 1997).

Table 1: Summary of socio-economic characteristics of groups a & b farmers

Variable	*Details*	*Group A Farmers*	*Group B Farmers*
Age (years)	≥ 50	70%	47%
Farm distance (km)	< 4	10.64%	63.82%
Mode of land acquisition	Owned	57.2%	93.6%%
Ease of getting land	Difficult	100%	34%%
Farm size	Mean farm size (ha)	1.86	4.25
	< 3	63.83%	21.28%
Type of farming	Subsistence	60%%	10.6%
	Commercial	40%	89.4%
Enterprise combination	Only arable	38.3%	14.9%
	Only permanent crops	19.1%	40.4%
	Both	42.6%	44.7%
Farm location	One	87.2%	15%
Education	≤ Primary Education	63.8%	72.3%

The estimated SFPF parameters are used in the productivity and technical efficiency analysis. The technical efficiency (TE) is measured in terms of the observed output (Y_i) to the corresponding frontier output (Y_i*), that is,

$TE = Y_i / Y_i^* = f(X_a, \beta) + V - U$

$f(X_a, \beta) + V$

So that 0d"TEd"1.

For this study, the production function of the farmers was assumed to be specified by the Cobb-Douglas function. *(The literatures support that stochastic frontier models are better estimated using either cobb-douglas or translog functional forms).*

The Cobb Douglas function is of the form:

$$LnY_{ik} = \beta_0 + \beta_1 lnX_1 + \beta_2 lnX_2 + \beta_3 lnX_3 + \beta_4 lnX_4 + \beta_5 lnX_5 + \beta_6 lnX_6 + \beta_7 lnX_7 + \beta_8 lnX_8 + V - U$$

where, Y = Output of the i^{th} farmer in k^{th} group

k = Groups A and B farmers, i = 1…100 farmers in each group, ln = natural log

X_1 = Age of farmers, X_2 = Level of education of farmers (years of schooling), X_3 = Farm size (hectares), X_4 = Number of farm locations, X_5 = Annual cost of farm implements, X_6 = Labour cost, X_7 = Farm distance (kilometers), X_8 = Operating expenses (cost of planting materials, transportation cost, cost of non-durable farm implements etc), V and U as previously explained, β and the variance parameters are unknown scalar parameters to be estimated.

(Note that variables X_5, X_6 and X_8 are in monetary units. Even, where all the variables are expressed in monetary units for the stochastic frontier production function model, the efficiency estimates would still be technical efficiency unless it is expressly stated at the software analysis of the data that cost efficiency is to be estimated from where the allocative efficiency would be computed. The output is best expressed in monetary term because multiple outputs were involved due to the small scale nature of the farm holdings.)

The OLS and maximum likelihood estimates for the parameters of the SFPF are obtained using the program *FRONTIER VERSION 4.1c* (Coelli, 1994). Two different models were estimated for each group of farmers. Model 1, in which the inefficiency effects U were not present. This is a special case of the SFPF model in which gamma (γ); the ratio of the variance of farm technical inefficiency (σ_u^2) to the total of variance of output (γ^2) was assumed to be zero, that is, $\gamma = 0$. Gamma measures the total variation of output from the frontier which can be attributed to technical efficiency. Model 2 is the general frontier model in which gamma is not zero, that is, $\gamma \neq 0$.

The generalized likelihood ratio test was used to test the null hypothesis that there was absence of technical inefficiency effects in the production technology of the farmers, that is,

H_0: γ=0.The test statistics is defined by chi-square(χ^2) distribution: $\chi^2 = -2[L(H_0) / L(H_a)]$

Where, H_0 and H_a are the log likelihood functions evaluated at the restricted and unrestricted frontier models. The test statistics has a mixed chi-square distribution with the degree of freedom equal to the number of parameters excluded in the restricted model 1 (Ajibefun 1998).

RESULTS AND DISCUSSION

***Analysis of Socio-economic Characteristics of the Farmers*:** The analysis of the socio-economic characteristics of the farmers in groups

Age: Farmers in group A were relatively older than those in group B. About 70 percent of farmers in group A were older than 50 years while only 47 percent of farmers in group B were in that age bracket. That young and energetic people were not into farming in group A might have been as a

result of their inability to get land at the appropriate locations for farming, and this has led them to drift into going to the big towns to learn Artisanal jobs, like tailoring, barbing and so on.

Farm Distance: About 10.64 percent of farmers in group A had farms in less than 4km from their settlements; about 63.82 percent of farmers in group B were in that category. Therefore, farmers in group A covered more distances before getting to their farms and this is expected to influence the productivity and production performance of farmers in each group as corroborated by Ojo and Afolabi (2003) in their study on 'Effects of farm distance on productivity of farms in Nigeria'.

Mode of Land Acquisition: About 57.2 percent of group A farmers owned their farmlands either through inheritance or purchase while about 93.6 percent of farmers in group B owned their farmlands through mainly communal inheritance. Therefore, while 100 percent of farmers in group A expressed difficulty in getting land to farm only 28 percent in group B experienced some mild difficulty in getting land to farm. In other words, members of families that released their lands for government programmes always find it difficult to get land for farming.

Farm Size: The mean farm-size of farmers in group A was 1.86ha and that of group B was 4.25ha. Also, about 63.83 percent of farmers in group A farmed less than 3ha per farmer while only 21.28 percent of farmers in group B farmed less than 3ha per farmer. The small farm size per farmer in group A was due to the difficulty in getting land through inheritance, purchase and even leasing. The size of the farmland invariably influenced the type of farming (subsistence or commercial) and enterprise combination (crop combination planted) opened to the farmers. While about 60 percent farmers in group A were mainly into subsistence farming, only 10.6 percent of group B farmers were into subsistence. Also, only 19.1 percent of group A farmers were involved in the production of only permanent crops and 38.3 percent in only arable crops. For the group B farmers, about 40.4 percent produced mainly permanent crops, and 14.9 percent produced mainly arable crops. The study showed that more group B farmers planted oil palm trees with arable crops which ensured a regular stream of income throughout the year, they were able to generate higher revenue from their farming operations than those in group A, whereas, majority of farmers in group A were not allowed to plant permanent crops on the rented or leased pieces of land they were farming on.

Farm Location: About 87.2 percent of group A farmers had their farms in more than one locations, while only 15 percent of group B farmers had more than one farm locations. Having farms in scattered holdings though one of the major characteristics of Nigerian agriculture (Upton 1997), is equally responsible for low production and productivity in small-scale farming in Nigeria (Ajibefun, 1998)

Education: The level of education was low in both groups A and B. About 63.8 percent of group A farmers and 72.3 percent of group B farmers had primary education or no-formal education. This low educational level invariably adversely influenced the overall production in both groups of farmers.

Profitability Analysis: The profitability analysis of farms in groups A and B is presented in Table 2

Table 2: Profitability analysis of groups A & B farms

Variable	*Group A Farms*	*Group B Farms*
Farm size (ha)	1.86	4.25
Labour cost	53605.46	16333.75
Operating cost	11146.96	3497.72
Total Variable Cost	64853.42	39811.47
Total Revenue	58612.47	80317.87
Gross Margin	-16240.95	40506.40
Gross Margin per ha	-8731.69	9530.92

The study showed that labour cost was the highest single cost item in each of the groups and it was higher for group A farms where it was ₦53605.46 per farmer and ₦16333.75 per farmer for group B farms. The high labour cost in group A was due to the long distance workers had to cover before getting to the farms. In essence workers would only be willing to work on such long distant farms on assurance of higher wage rate. Also, labour productivity in long distant farms was expected to be lower since the workers whose means of transportation most of the time was trekking would be expected to be tired before getting to such distant farms and thus unable to accomplish as much as workers in short distant farms.

The Total Revenue in group B was higher than that of group A for reasons due to lower labour cost, lower operating cost and most importantly the type of farming and enterprise

combination of the group B farms. The group farms were mainly commercially oriented, growing mainly permanent crops as against the subsistence and arable crop production of the group A farms.

The gross margin analysis showed that farming business was not profitable in group A as the value of the gross margin was negative, whereas, farming business was profitable in group B with a gross margin value of ₦ 9530.92 per ha.

Production Function Analysis: The estimates of the stochastic frontier production function for farms in groups A and B are presented in Table 3. These estimates were used for the productivity and technical efficiency analyses.

Table 3: Estimates of production function of groups a and b farms

Variables	*Group A Farms*	*Group B Farms*
Constant	*4.586 (0.589)	*5.955 (0.474)
Age of farmers	-1.166 (0.123)	-0.177 (0.244)
Educational level	-0.019 (0.047)	-0.023 (0.034)
Farm size	*0.667 (0.065)	*1.046 (0.099)
Number of farm locations	-0.022 (0.076)	0.028 (0.081)
Cost of farm implements	0.079 (0.119)	*0.132 (0.077)
Labour cost	-*0.468 (0.067)	0.084 (0.059)
Farm distance	-*0.317 (0.117)	0.049 (0.051)
Operating expenses	0.083 (0.094)	0.043 (0.064)
Sigma squared	*0.009 (0.002)	*0.035 (0.006)
Gamma	*0.574 (0.193)	*0.829 (0.323)
Log likelihood function	43.583	65.329

Figures in parentheses are standard errors

* Estimate is significant at 5% level of significance.

Productivity Analysis: The estimated coefficients (elasticity of production) of variables of group A farms showed decreasing positive returns to farm-size, annual cost of implements, and operating expenses, implying efficient allocation of the variables in the production process. The elasticity of production of labour, farm location, age of farmers and educational level of farmers showed negative returns, implying inefficient allocation.

For the group B farms, the elasticity of production of farm size, labour, farm location, annual cost of implements, operating expenses and farm distance showed positive decreasing returns except farm size whose elasticity of production was greater than unity and indicating its allocation was in the irrational stage of resource allocation. The elasticity of production of age of farmers and educational level of farmers showed negative returns.

The study further confirmed that farmers in Nigeria are ageing and this phenomenon spells serious problem for increase in agricultural development in general and food production in particular. Group B farms were more efficient in the utilization of farm location, farm distance, operating expenses, labour and annual cost of implements but group A farms were more efficient in the allocation of farm size.

The return to scale (RTS) analysis of groups A and B farms was presented in Table 4

Table 4: Elasticity of production and return to scale (RTS)

Variables	*Group A Farms*	*Group B Farms*
Age of farmers	-1.166	-0.177
Educational level	-0.019	-0.023
Farm size	0.667	1.046
Number of farm locations	-0.022	0.028
Cost of farm implements	0.079	0.132
Labour cost	-0.468	0.084
Farm distance	-0.317	0.049
Operating expenses	0.083	0.043
RTS	-0.163	1.182

The RTS of group A farms was negative,(RTS_A = -163), indicating that farming operations in the group was in the inefficient stage of the production surface, while it was positive and greater than unity for group B farms, (RTS_B = 1.182) indicating that production was in stage 1, the stage of irrational production where production should be expanded by employing more of the resources with positive elasticity of production, especially farm size whose allocation was in the irrational stage of the production surface. This finding corroborated the works of Ojo and Afolabi (2003), Ogundari *et al* (2006) and a host of other empirical works on Nigerian small-scale farming that production is either in the irrational stage or inefficient stage of the production surface.

Technical Efficiency Analysis: The technical efficiency analysis of farms in groups A and B is presented in Table 5.

Table 5: Technical efficiency analysis of groups A and B farms

Variable	*Group A Farms*	*Group B Farms*
Mean TE	0.751	0.861
Minimum TE	0.602	0.579
Maximum TE	0.916	0.999
TE > 70	72%	85%

The TE of farmers in groups A and B varied significantly as confirmed by the significant value of their estimated gamma coefficients (γ). The gamma for group A farms was 0.574. It was significant at 5 percent level of significance as confirmed by the t-ratio value of 2.974 which was greater than the tabulated t-ratio at the stated level of significance. This indicates that about 57.4 percent variation in the output of group A farms was due to differences in the farmers' technical inefficiency. The gamma for group B farms was 0.829. It was significant at 5 percent level of significance as confirmed by the t-ratio value of 2.566 which was greater than the tabulated t-ratio at the stated level of significance. This indicates that about 82.9 percent variation in the output of group B farms was due to differences in the farmers' technical inefficiency.

The TE values for group A farms ranged between 0.602 and 0.916 with a mean TE of 0.751. The decile range of the frequency distribution of the TE showed that about 72 percent of farmers in group A had TE >0.70. The TE for group B farms ranged between 0.579 and 0.999, with mean TE of 0.861 and about 85 percent of farmers in the group having TE > 0.70. The results of the technical efficiency analysis showed that farmers in group B were relatively more technically efficient than farmers in group A.

CONCLUSION AND RECOMMENDATION

The study revealed that acquisition of land for large scale farming in the study area had adverse effects on small-scale farming. This could further worsen the food security crisis in Nigeria, because about 80 percent of farmers in Nigeria practice small-scale farming (Olayide, 1980) and produce over 90 percent food and agricultural production in the country (Ojo 1991). The study therefore recommends that government in its drive to encourage large scale agricultural production should not acquire land near the towns and people's settlements, rather, land on the highways/ expressways should be opened up and allocated to prospective large scale farmers.

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