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PROFITABILITY AND EFFICIENCY ANALYSIS OF MAIZE-BASED FARMERS UNDER GROWTH ENHANCEMENT SCHEME IN NIGERIA: A CASE STUDY OF OGUN STATE.

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ABSTRACT
This study examines the profitability and efficiency of Ogun State maize-based farmers under Growth Enhancement Scheme in Nigeria. A two-stage sampling procedure was used to select 120 farmers and interviewed for the study. A well-structured questionnaire and scheduled interviews were used to obtain information from the farmers. The data collected were analyzed using descriptive statistics, budgetary analysis and stochastic frontier analysis. The results revealed that majority of the respondents were male, educated and in their active years. The budgetary analysis showed that the maize-based farmers under the Growth Enhancement Scheme were profitable as indicated by their gross margin (₦530708.08). Efficiency analysis identified seed ($p<0.01$), fertilizer $p<0.1$), herbicides ($p<0.01$), farm size ($p<0.1$) and labour($p<0.01$) as the major factors contributing significantly to output. While the inefficiency model identified age ($p<0.01$), household size ($p<0.01$) and farming experience ($p<0.01$) as having a negative but significant relationship with inefficiency. Technical inefficiency decreases with age, number of persons in the house and years of experience. The minimum and maximum technical efficiency scores were 0.3112 and 0.9714 respectively. The maize-based farmers had a mean efficiency of 0.86, indicating that for them to efficiently maintain the production frontier they have to overcome 14 percent inefficiency.

Keywords: *Profitability, Efficiency, Growth Enhancement Scheme, Farmers.*

INTRODUCTION

According to Patachu, (2012) agriculture as the mainstay of the economy, is contributing significantly to Nigeria's Gross Domestic Product (GDP). National Bureau of Statistics (NBS, 2012), further supported this claim by saying that agriculture contributes about 40% of the country' GDP. The potentials of agriculture are vast ranging from employment generation, to food security and poverty reduction in Nigeria. Rural farmers in Nigeria are known to be the major practitioners of agriculture. Most of the farms are however, fragmented, have low input and low output, the usages of farm machines, fertilizer and improved seeds have been very low. World Bank (2013), in comparison with Indonesia, stated that only ten tractors are available per 100 hectares of farmland in Nigeria against 241 tractors per hectare in Indonesia. It was also reported by International Fertilizer Distribution Centre (IFDC, 2013) that the average usage of fertilizer in Nigeria is 13kg/hectare while the mean of the world average annual usage is 100kg/hectare compared to the average usage in Asia which reached up to 150kg/hectare. Nigeria crop yields have the lowest growth rate of 0.2% from 1968 to 2008 as against 1.2% for China, 2.3% for Indonesia and 3% for Malaysia. As a result of this, farmers find it difficult to feed their families and hence, there is dependence on imported foods (World Bank, 2013). An attempt to overcome these challenges led to the introduction of the Growth Enhancement Support scheme (GES) through the use of Electronic Wallet (e-wallet) approach. Adesina, (2013), defined e-wallet as an efficient and transparent electronic device system that makes use of vouchers for the purchase and distribution of agricultural inputs.

According to Signal Alliance (2014), Growth Enhancement Scheme is part of the Agricultural Transformation Agenda (ATA) which involves the distribution of agricultural inputs at subsidized rates to registered farmers. Several indices are used for participation; these include, farmers must be above 18 years of age, must have participated in a survey authorized by the government to capture farmers personal detailed information, must own a cell phone and a registered SIM card and must have at least sixty naira credit on the cell phone. The fulfillment of these conditions guarantees the issuance of an e-wallet voucher to the farmers.

Hunger continues to persist in Nigeria even with the continued production of various food crops. There has been difficulty matching the demand for food viz-a-viz supply from the farm. Ogundari and Ojo, (2007) supported this claim when they stated that despite various efforts geared towards agricultural development, an estimate of 65% of Nigerians are living with hunger as a result of low growth of agricultural production. Farmers have continued to complain about the high cost of

production inputs, and have stated this as their reason for declined production of food crops

Olajide *et al.*, (2012) also reported that only less than 50% of the Nigerian arable land is under cultivation. According to Central Bank of Nigeria (CBN, 2003), the share of the agricultural sector to GDP has been less than 45% since 1986, because production has been left under the control of peasant farmers who rely on traditional and unimproved method of farming. Hence, the problems of stagnation in productivity and growth continue to linger in Nigeria's agricultural sector. The major stride for the implementation of ATA is the Growth Enhancement Support scheme (GES) among others. GES was designed to enhance agricultural productivity through timely, efficient and effective delivery of yield increasing farm inputs. With emphasis on maize-based farmers, this study assessed the effect of the GES on efficiency of production by proffering answers to the following research questions: what are the socio-economic characteristics of farmers in the study area? What is the perception of farmers GES?, do farmers make profit under this scheme? Are the farmers technically efficient?

The broad objective of this study was to examine the profitability and efficiency of GES practicing maize-based farmers in Ewekoro and Obafemi-Owode Local Government Areas of Ogun State, Nigeria. In order to achieve this, the following specific objectives were analyzed: describe the socio-economic characteristics of the farmers in the study area, assess the perception of farmers on the GES scheme, estimate the profitability of farmers under the GES project, compute the technical efficiency of the GES participants.

METHODOLOGY

Study Area

Ogun is a state in Southwestern Nigeria, which was created in February 1976. It has boundaries with Lagos state to the south, Oyo and Osun states to the north, Ondo state to the east and republic of Benin to the west. The capital city is Abeokuta. The state consists of twenty (20) Local Government Areas. These are; Abeokuta North, Abeokuta South, Ado-Odo/Ota, Ewekoro, Ifo, Ijebu East, Ijebu North, Ijebu North East, Ijebu Ode and Ikenne. others are: Imeko Afon, Ipokia, Obafemi Owode, Odogbolu, Odeda, Ogun Waterside, Remo North, Sagamu, Yewa North and Yewa South. Ewekoro is one of the sites of West African Portland Cement Company (WAPCO) blessed with large deposit of limestone- the major raw material in the production of cement. The Ewekoro plant of WAPCO is located in Ewekoro local government area of Ogun State in the south west Nigeria. The local government area is bounded in the North by Abeokuta, in the East by Obafemi-Owode, in the West by Yewa South and in the South by Ado-Odo Ota. Ewekoro is on latitude $5^0 50' N$ and longitude $3^0 17' E$. Also it is approximately 64 kilometers north of Lagos and 42 kilometers south of Abeokuta. Ewekoro has a land area of 631.5km^2 and 1,410km^2 respectively and population of 55,156 and 228,851 people based on 2006 population census. Majority of the inhabitants are predominantly engaged in farming, trading, livestock and fisheries business including various forms of self-employment. Obafemi Owode is a Local Government Area in Ogun State, Nigeria. It's headquarters are in the town of Owode at 6°57′N 3°30′E6.95°N 3.5°E. It has an area of 1,410km^2 and a population of 228,851 at the 2006 census.

The Local Government is inhabited by the Yoruba of Egba linage. There are however settlers of Igbo and Hausa origin. The people of Obafemi- Owode are predominantly farmers of arable crops such as cassava, rice, maize, cocoyam, plantain and vegetables. Cash crop such as palm produce and cocoa are also cultivated in the council area. Some of the people also engage in livestock and fisheries. In recent times, people also engage in quarry business, artisans work, and hand craft like tie and dye and poultry.

Sampling Techniques

Two-stage sampling procedure was used to select the respondents. The first stage was purposive selection of two local government area (Ewekoro and Obafemi-Owode). The second stage was random selection of 60 and 80 farmers from each local government respectively, giving a total of 140 respondents. Only 120 of the questionnaire contained useful information and were used. Data were collected using structured questionnaire and interview method. Information were collected on socio-economic characteristics of the respondents, their perception on GES project, the quantity and price of input used, area of land cultivated, quantity and price of their output.

Analytical Techniques

Descriptive statistics such as, frequency, percentages, mean were used to analyze objective one and two.

Gross margin Analysis

This was used to determine the profitability of the maize-based farmers in the study area.

GM = TR – TVC…….. (i)

Where TR= Total revenue (₦) given by Y. P_y

Where Y= output of maize

P_y = price per kg of maize

TVC= Total variable cost (₦)

Stochastic Frontier Model

Stochastic Frontier model was used to measure the technical efficiency between the dependent variable and independent variables. The parameters of the stochastic frontier function were estimated by the method of maximum likelihood. The model is presented as follows:

$LnQ = b_0 + b_1LnX_1 + b_2LnX_2 + b_3LnX_3 + b_4LnX_4 + b_5LnX_5 + b_6LnX_6 + (V–U)$…… (ii)

TE= esp(–u) where

TE= Technical efficiency index

Q= Output (kg)

X_1= Seeds (kg)

X_2= Labour (mandays)

X_3= Quantity of fertilizer (kg)

X_4= Herbicide (liters)

X_5= Land (hectare)

X_6= Insecticides (liters)

V= Stochastic residual form.

U= One sided error term associated with TE.

X_1 to X_7 are the independent variable.

$b_1$to b_6= corresponding estimated coefficient.

In this study, the technical inefficiency was measured by the mode of the truncated normal distribution (i.e. U_i) as a function of socio-economic factors (Yao and Liu, 1998). Thus, the technical inefficiency was simultaneously estimated. The determinants of the technical inefficiency were defined by:

$U_1 = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5 + \delta_6 Z_6 + \delta_7 Z_7$ ..... (iii)

Where: U_i = technical inefficiency of the farmer
Z_1 = Age of farmer (years)
Z_2 = Family Size (number)
Z_3 = Year of farming experience (years)
Z_4 = Education (years)
Z_5 = Gender (male =1, 0 otherwise)
Z_6 = Marital Status (1= married, 0= Otherwise)
Z_7 = Years of Participation in GES

RESULTS AND DISCUSSIONS **Socio-economic Characteristics of respondents**

This section provides information on the socio-economic characteristics of maize-based farmers in Ewekoro and Obafemi-Owode Local Government Areas of Ogun state. Table 1 shows that 45.8% of the farmers were between the ages of 45 and 54 years with the mean of 49 years. This implies that most of the farmers are still within their productive years, hence their ability to participate or produce to earn some revenue. Godson-Ibeji et.al (2016) discovered that the average age of the farmers that participated in e-wallet scheme in Imo State was 48 years. Tables 1 also revealed that majority of the respondents were male (71.7%). This implies that majority of the respondents are men who are mainly involved in pre-planting and planting stages of crop production and not post-planting activities which are mostly carried out by women. This is in line with the findings of Odebode (2007). Majority of the respondents (91.7%) are married while 0.8% are single. This implies that the farmers would likely have access to family labour which would in the long run reduce the cost of hiring labour and boost their profitability. With respect to their educational status, most (92.5%) of the respondents did not go beyond secondary school. The more educated a farmer is, the easier it becomes to adopt new technologies. Oyediran *et. al* (2015) also assert that most farmers had secondary education. The table further revealed that 30% of the farmers had primary education while 7.5% had tertiary education. The table also revealed that the mean household size is 6. The implication of this result is that respondents with large household size may likely enhance family labour supply on the farm hence, supporting the favorable, productive capacities of the farmers already enhanced by their age. This finding is supported by Omoare *et. al* (2014) and Oyediran *et. al* (2015) The result further revealed that 34.17% of the farmers had household size that was less than 5 while 14.17% had household size that was greater than 9. More than half (51.17%) of the farmers has household size of the range 5-9. The mean farming experience was 19 years. This implies that the experience of the respondents will possibly have effect on production. The result also shows that 34.2% had farming experience of between 9 and 15 years Only 5.8% had farming experience that was less than9 years while 18.3% had farming experience of between 30-37 years. The result further revealed that 22.5% and 19.2 were the farming experience range of 16 to 22years and 29 to 23 years respectively.

Table 1: Socioeconomic Characteristics of the Respondents

Variable	Frequency	%	Mean
Age			
25-34	2	1.7	
35-44	31	25.8	
45-54	55	45.8	
55-64	29	24.2	49
65-74	3	2.5	
Marital Status			
Single	1	0.8	
Married	110	91.7	
Divorced	2	1.7	
Widow/widower	7	5.8	
Sex			
Male	86	71.7	
Female	34	28.3	
Educational level			
Primary	36	30	
Secondary	75	62.5	
Tertiary	9	7.5	
Household Size			
< 5	41	34.2	

5-9	62	51.7	6
>9	17	14.2	
Experience			
<9	7	5.8	
9-15	41	34.2	
16-22	27	22.5	
23-29	23	19.2	**19**
30-37	22	18.3	
Total	**120**	**100**	

Farmers' perception of Growth enhancement support scheme

Table 2 revealed the perceptions of farmers to the growth enhancement support scheme. The table shows that 43.3% of the farmer perceived that the input delivery was poor while only 15% agreed that the delivery of input was excellent. Meanwhile, when considering input availability, 60% of the farmer agreed that the timely delivery of input was fair while. 53.3% said that input delivery was good. The input supplied to the farmers was fairly sufficient (59.2%). Majority (58.3%) of the farmers also indicated that they were fairly satisfied with the scheme.

Table 2: Farmers' perception of Growth enhancement support scheme

Perception	Excellent Freq (%)	Good Freq (%)	Fair Freq (%)	Poor Freq (%)
GESS delivers input to farmers directly	18 (15)	22 (18.3)	28 (23.3)	52 (43.3)
GESS makes inputs available	15 (12.5)	64 (53.3)	39 (32.5)	2 (1.7)
GESS inputs are delivered on time	13 (10.8)	35 (29.2)	72 (60)	-
GESS inputs are sufficient for farm operations	1 (0.8)	25 (20.8)	71 (59.2)	23 (19.2)
Reduction in inputs procurement	35 (29.2)	50 (41.7)	35 (29.2)	-
GESS scheme is effective	10 (8.3)	52 (43.3)	58 (48.3)	-
Preferential treatment	8 (6.7)	16 (13.3)	44 (36.7)	52 (43.3)

***percentages in brackets**

Profitability level of GES Farmers

Gross margin analysis was carried out using data collected from input and output prices. The analysis was used to determine the profitability of the farming enterprises of GES participants in the study. The table 3 shows that the total variable cost was ₦87,438.64. The total revenue from the proceeds of the farm per hectare was ₦140,509.45. The result showed that the farmers had a gross margin per hectare of ₦53,070.81. This implies that GES participants spend less on their inputs procurement which makes them to have more profit from their production.

Table 3: Gross Margin Analysis

Items	**Amount** (₦)/ha
Seed	3,472.98
Labour	14,415.14
Fertilizer	63,700.59
Herbicide	3,572.97
Insecticide	2,276.96

Total Variable Cost (TVC)	**87,438.64**
Total Revenue (TR)	**140,509.45**
Gross Margin (GM)	**53,070.81**

Distribution of Technical Efficiency among Respondents Based on their Socio-Economic Characteristics

Table 4 presents the efficiency distribution across socioeconomic characteristics **of** the respondents. Table 4 revealed that male farmers were more technically efficient than the females. The T-test shows that there is no significate difference between the mean efficiency score of male and female. The males had an efficiency of 0.9259 and standard deviation of 0.0956, indicating that they were only 7.41% inefficient. The females had an efficiency score of 0.8399 and standard deviation of 0.1645. It implies that the females were 16.01% inefficiency. The higher efficiency score of the male farmers is an indication that farming business is fraught with several strenuous practices and males are more adaptable to strenuous activities compared with the female. The table also showed the distribution of efficiency of the respondents with respect to their marital status. The F-statistic was 11.11 ($p<0.01$). This implies that the mean efficiency score across the marital status was significantly diferent. Those who were single had an efficiency score, while those who were married had a higher efficiency score of 0.9680 and standard deviation of 0.1105. The higher level of efficiency of the married respondents could be attributed to the availability of additional labour in terms of household size. There was a significant difference between the mean efficiency across the educational status, the f-statistic was 29.21 ($p<0.01$). On the basis of their educational status, the results presented indicated that efficiency increased with level of education, hence, farmers who had primary level of education were least efficient (0.8341) with standard deviation of 0.1644 compared to those with tertiary education (0.8804) who were the most efficient. This could translate into better exposure to and adoption of improved technology. The table also revealed the efficiency distribution across age of respondents. From the table, it was shown that efficiency increased as the age of the respondents increased up to the active years of the respondents (45-54 years) were it was highest (0.9556) and declined afterwards as they got older.

Table4: Efficiency Distribution across Socioeconomic Characteristics of the respondents

Variable	Efficiency	Standard Deviation
Age (years)		
25-34	0.7944	0.0225
35-44	0.9362	0.0293
45-54	0.9556	0.1712
55-64	0.8607	0.0329
65-74	0.8014	0.0211
Education		
Primary	0.8341	0.1644
Secondary	0.8509	0.0350
Tertiary	0.8804	0.2036
Marital Status		
Single	0.9341	
Married	0.8806	0.1105
Divorced	0.5515	0.1018
Widow	0.2050	0.7749

Sex		
Male	0.9259	0.0956
Female	0.8399	0.1645
Total	**0.8643**	0.1313

Determinants of Technical Efficiency of GES Farmers

This section presents the result of the analysis of the factors influencing technical efficiency of the farmers in the GES scheme. The estimated results of the Maximum Likelihood Estimates (MLE) of the parameters of the Cobb Douglas Stochastic Frontier Production Function (SFPF) and the inefficiency model are presented in Table 5. The table shows that sigma squared was statistically significant ($p<0.01$), which indicates the correctness of the specified assumption of the distribution of the composite error term. Also, the major factors that influenced the output of the farmers in the study areas were; seeds, herbicides, fertilizer, farm size and labour. These also contributed significantly to the technical efficiency of the respondents. The co-efficient of seed was significant ($p< 0.01$) and positive, which implies that increase in output of crop farmers, can be achieved by increasing the quantity of seeds planted. Similarly, the co-efficient of herbicide usage was positive and significant ($p<0.01$), which indicates the relevance of weed control to output as it is important for the farmer to ensure that weeds are completely eradicated from the farm as they compete with the crops for available growth resources and hence hinders the growth of crops. Fertilizer was also significant ($p< 0.1$) implying that, with an increase in the use of fertilizer technical efficiency increased. Also, Farm Size was statistically significant and positive ($p< 0.1$) indicating that the larger the farm size, the more efficient the farmers. Therefore, as farm size increases, quantity of seeds required for cultivation increases, the need to control the presence of weeds also increases, which eventually result into increased output. This finding of Esham (2014) which suggested that an increase in area of land cultivated would lead to increased productivity and efficiency.Labour use also contributed significantly to technical efficiency ($p<0.01$). Human capital is key to any production process, hence in order to increase the efficiency of production, there has to be efficiency of labour use. This corroborates the findings of Ajibefun and Daramola, (2003) that agricultural production activities are labour intensive and large household can provide family labour at reduced or no cost.

From the result of the inefficiency model, the major factors which influenced the inefficiency of the respondents were; age, farming experience, household size. Farming experience was found to have a negative and significant co-efficient ($p< 0.01$). The implication of this is that as the respondents' farming experience increases, their inefficiency declines. This result is consistent with *apriori* expectation that, the more time a person spends doing a particular thing, the better he gets at it; this does not exclude the practice of farming. Experience and age were both found to be statistically significant with a negative coefficient ($p< 0.01$). The older the farmer is, the more experienced he is and consequently, the less inefficient he becomes. Household size was also found to be statistically significant ($p< 0.01$) and negative, indicating that, the larger the household size, the less inefficient the farmer is. This could arise from the fact that the large household size translates to ready supply of labour. Years of involvement in the scheme, marital status, education and sex did not have any significant influence on inefficiency.

Table 5: Determinants of Technical Efficiency among the Respondents

Variables	Coefficient	t-value
Constant	4.8244	4.9356***
Seed	0.3369	4.4904***
Fertilizer	0.4261	1.8154*
Herbicides	0.6639	4.6555***
Insecticides	0.0408	1.3106
Farm size	0.2209	1.9472*
Labour	0.9466	5.3466***

Inefficiency		
Constant	-1.7501	-2.004
Sex	-0.017	-1.1037
Age	-0.8937	-3.8909***
Marital Status	0.2795	1.8309
Education	-0.1	-0.9094
Household Size	0.1414	3.1813***
Farming Experience	0.091	4.6553***
Programme years	0.0519	0.0362
Sigma-Squared	0.3203	8.6393***
Gamma	0.22	0.00000174

Log likelihood Function = -86.74
***** significant at 1% and * significant at 10%**

Distribution of Technical Efficiency among GES Farmers

The table 6 shows the distribution of technical efficiencies among farmers. The efficiency of the farmers ranges from 0.3112 to 0.9714 Most of the farmers (55%) had technical efficiencies greater than 0.90. The mean technical efficiency was 0.8643, indicating that they had an inefficiency level of 13.57%.

Table 6: Distribution of Technical Efficiency among GES Farmers

Range	Frequency	Percentage
0.30-0.49	4	3.3
0.50-0.69	10	8.3
0.70-0.90	40	33.3
Above 0.90	66	55.0
Minimum	**0.3112**	
Maximum	**0.9714**	
Mean	**0.8643**	

CONCLUSION AND RECOMMENDATIONS

The study revealed that most of the farmers that participated in the scheme were in their middle age, mostly males and married with large household size. Most of them had secondary level of education. Farmers indicated that e-wallet approaches have fairly increased their output and also fairly effective. The farmers had a gross margin of ₦53,070.81 indicating that maize production under the GES is profitable. Maximum likelihood estimation (MLE) shows that seed, herbicides and labour were statistically significant at 1 percent level of significance, while fertilizer and farm size were significant at 10 percent level of significance. Results of the inefficiency analysis showed age, household size and farming experience have negative coefficients that were statistically significant at 1 percent level of significance. The mean efficiency for the farmers implied that although, they were efficient, they still had room to increase their efficiency in their farming by 14.8 percent through better

use of available resources provided by the current state of technology.

Attempts should be made by the government to ensure that most farmers, through extension agents, have knowledge of the benefit of GES and hence, they should be encouraged to participate. Also, the GES scheme should be extended to other areas of crop production as well as animal production; as this would in the long run, boost the contribution of agriculture to the nation's economy.

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