

TECHNICAL EFFICIENCY OF YOUTH PARTICIPATION IN AGRICULTURE: A CASE STUDY OF THE YOUTH - IN - AGRICULTURE PROGRAMME IN ONDO STATE, SOUTH WESTERN NIGERIA

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ABSTRACT

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This study analysed the technical efficiency of the Youth-in-Agriculture Programme in Ondo State. Random sampling technique was used in selecting 110 respondents distributed across 23 farm locations for the programme in the state. Stochastic frontier model was employed in the study. The study shows that efficiency differentials exist among the youths in the programme. Furthermore, land, labour, herbicide and number of cassava cutting are the major factors that affect output of the youths' production in the programme. The technical efficiency of the youth ranges from 33% to 96% with a mean of 85%. The study also shows that household size, years of participation in youth-in-agriculture programme, usage of extension information and level of education are the significant factors ($p < 0.10$) that account for the observed variation in efficiency among the participants. To achieve increased efficiency of production by the participants, this study recommends the need for farm expansion, increased access to herbicides and improved cassava cuttings as well as effective training for the participants.

Keywords: Technical Efficiency, Youth- in- Agriculture, Ondo State, Nigeria

INTRODUCTION

Nigeria is a nation blessed with good climatic conditions that favour agricultural production. Agriculture is an important sector in the economic development and poverty alleviation drive of many countries. The importance of this sector is more pronounced in the developing countries including Nigeria where it is the main thrust of national survival, employment, food and foreign exchange earning (Abdullahi, 1986; Adebayo and Okuneye, 2005). The role agriculture has played in the industrial growth and development of most of the industrialized countries in the world can not be over emphasized (Adeyemi and Adekunmi, 2005). Youth-in-Agriculture programme has been described as a very important structure for land and agrarian reform which will go a long way towards promoting the interest of youth in the agricultural sector of the economy (Gwanya, 2008). Since agricultural development is the basic tool for economic development, there is the need for more emphasis to be placed on the role youth can play in agriculture (Fatula, 1996). In Nigeria, agricultural production is still carried out using physical strength, which declines with age. This has therefore been observed as one of the major constraints to agricultural production in Nigeria (Okeowo et. al., 1999). Though youths have desirable qualities that can promote agriculture, most of them have strong apathy toward it (Jibowo, 1998; Adedoyin, 2005; Adewale et al., 2005). This has resulted in mass unemployment and lack of sustainable livelihood activities among the youths (Breitenbach, 2006). This has further led most youths into cultism, prostitution and street begging, among others (Sodique, 2006). With fewer youths into agriculture, the long-term future of the agricultural sector is in question. The development of the agricultural sector of the Nigerian economy therefore depends on the young people, more especially the rural youths. This is because a larger population of youths represents the link between the present and the future as well as a reservoir of labour (Okeowo et. al., 1999).

The successive regimes at the Federal Government level have introduced various agricultural development schemes with the aim of encouraging the youth and boosting food production and farmers' income through provision of agricultural infrastructure, inputs and effective extension work (Jibowo, 2005). The state and local governments also introduced some agricultural programmes aimed at boosting food production and youths' participation. One of such programmes is the Youth-In-Agriculture Programme (YIAP) introduced in 2004 by the Ondo State Government. The programme is designed to create rapid employment for the youth through active participation in modern agricultural practices by raising the production efficiency and productivity of the beneficiaries. Since the inception of the programme in 2004, few attempts have been made to study the impact of the programme on productivity of the participants. This study, therefore, intends to provide answers to the following research questions:

- (i) What are the socioeconomic characteristics of youths participating in the programme?
- (ii) Are the beneficiaries technically efficient in their production?

(iii) What are the determinants of technical inefficiency in their production?

Objectives of the Study

The broad objective of this study is to assess the efficiency of the Ondo State Youth-In-Agriculture Programmes (YIAP). The specific objectives are to:

1. describe the socio-economic characteristics of the participants in the youth – in- agriculture programme,
2. estimate the technical efficiency of the participants in the programme,
3. analyze the determinants of technical inefficiency of the participants and
4. proffer some policy recommendations based on the findings of this study.

CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

Efficiency improvement is an important source of production growth in any economy. It can however be decomposed into technical and allocative efficiency. The concept of technical efficiency is based on input and output relationships. Technical inefficiency arises when actual or observed output from a given input mix is less than the maximum possible. Allocative inefficiency arises when the input mix is not consistent with cost minimization. Allocative inefficiency occurs when farmers do not equalize marginal returns with true factor market prices (Fan, 1999). The level of technical efficiency of a particular firm is characterized by the relationship between observed production and some ideal or potential production. The measurement of firm specific technical efficiency is based upon deviations of observed output from the best production or efficient production frontier. If a firm's actual production point lies on the frontier it is perfectly efficient. If it lies below the frontier then it is technically inefficient, with the ratio of the actual to the potential production defining the level of efficiency of the individual farmer (Okoruwa and Ogundele, 2008). Efficiency of a firm consists of three components: technical, allocative and economic efficiencies. Technical efficiency is defined as the ability to produce a given level of output with a minimum quantity of inputs under certain technology. Allocative efficiency refers to the ability to choose optimum input levels for given factor prices. Economic or total efficiency is the product of technical and allocative efficiencies. An economically efficient input-output combination would be on both the frontier function and the expansion path (Ogundari and Ojo, 2006). Early studies focused primarily on technical efficiency using a deterministic production function with parameters computed using mathematical programming techniques. However, with inadequate characteristics of the assumed error term, this approach has an inherent limitation on the statistical inference on the parameters and resulting efficiency estimates. Stochastic frontier production function was thereafter developed to overcome the deficiency (Ogundari and Ojo, 2006). The frontier production function model is estimated using maximum likelihood procedures. This is because it is considered to be asymptotically more efficient than the corrected ordinary least square estimators (Coelli, 1995). The maximum likelihood estimates for all the parameters of the stochastic frontier and inefficiency model, defined by equation (1) and (2) was simultaneously obtained by using the programme, FRONTIER VERSION 4.1, which estimates the variance parameters in terms of the parameterization as follows:

$$\delta^2 = \delta v^2 + \delta u^2$$

$$\text{and, } \gamma = \delta u^2 / (\delta v^2 + \delta u^2)$$

where, γ = total output attained on the frontier which is attributed to technical efficiency.

The technical efficiency of an individual farm is defined in terms of the ratio of the observed output (Y_i) to the corresponding frontier output (Y_i^*), given the available technology, conditional on the level of input used by the farm. Hence the technical efficiency of farm i is expressed as follows:

Technical efficiency = $Y_i/Y_i^* = f(X_i, \beta) \exp(V_i - U_i) / f(X_i, \beta) \exp(V_i) = \exp(-U_i)$. This is obtained from the result of the FRONTIER 4.1 (Coelli, 1995). Based on the individual farm's technical efficiency, the mean technical efficiency for the sample is obtained (Yao and Liu, 1998).

METHODOLOGY

Area of Study

The study was conducted in Ondo State, Nigeria. The state covers an area of 14,788.723sq.km. It lies in-between longitude 4°31' and 6°00' East and latitude 4°15' and 8°15' North. The state is bounded by Ekiti and Kogi States in the North; in the East by Edo State; in the West by Ogun and Osun States and in the South by the Atlantic Ocean. There are three distinct ecological zones within the state. These are the mangrove forest to the south, the rainforest to the middle belt and the derived savannah to the North. The state has an annual rainfall ranging from 2,000mm in the southern parts to 1200mm in the northern areas with the raining season running between March and October.

Sampling Procedure

This study was carried out in 2008. The study examined the activities of the participants in the Youth in Agriculture Programme in Ondo State for the 2007/2008 planting season. Since only 34 farm locations were

involved in the programme for the 2007/2008 planting season, a random sampling technique was employed for the selection of 23 farm locations. This was followed by administration of structured questionnaire to 5 beneficiaries at each location. A total of 110 responses were used for this study.

Analytical Techniques

The major tool of analysis used in this study was the stochastic frontier model by Battese and Coelli (1995). The stochastic frontier production function model is specified in the implicit form as follows:

$$Y_i = f(X_i, \beta) + (V_i - U_i)$$

Where: Y_i is the output of the i^{th} farm

X_i is a $k \times 1$ vector of input quantities of the i^{th} farm

β is a vector of unknown parameters to be estimated

V_i are random variables which are assumed to be normally distributed $N(0, \sigma_v^2)$ and independent of the U_i . It is assumed to account for measurement error and other factors not under the control of the farmer.

U_i are non-negative random variables, called technical inefficiency effects (Aigner et al., 1977).

A Cobb-Douglas Production form of the frontier used for this study is presented as follows:

$$\ln Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 \ln X_6 + \beta_7 \ln X_7 + V_i - U_i \dots \dots (1)$$

Where: Y = Crop Output. Since cassava and maize are the only crops produced, crops output of the respondents were measured in grain equivalent

X_1 = Farm size (ha)

X_2 = Labour (man-day)

Other inputs required in production whose monetary worth constitutes the capital considered in this study are:

X_3 = Fertilizer (kg)

X_4 = Herbicide (litre)

X_5 = Maize seeds (kg)

X_6 = Apron plus (kg)

X_7 = Cassava cuttings (bundles)

$\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7$ = Parameters to be estimated.

The inefficiency model is represented by U_i which is defined as follows:

$$U_i = d_0 + d_1 z_1 + d_2 z_2 + d_3 z_3 + d_4 z_4 + \dots + d_n z_n \dots \dots (2)$$

U_i = Technical inefficiency

z_1 = Age (years)

z_2 = Household size (number)

z_3 = Farming experience (years)

z_4 = Youth-In-Agriculture programme experience (years)

z_5 = Usage of extension information (Yes = 1, No = 0)

z_6 = Level of education (years)

z_7 = Membership of association (Yes = 1, No = 0)

$d_0, d_1, d_2, \dots, d_7$ = Parameters to be estimated.

Since the dependent variable of the inefficiency model represents the mode of inefficiency, a positive sign of an estimated parameter implies that the associated variable has a negative effect on efficiency but positive effect on inefficiency and vice versa (Yao and Liu, 1998; Rahji, 2005).

RESULTS AND DISCUSSION

Socio-economic Characteristics of Respondents

Some socio-economic characteristics may influence farmers' production decisions as well as their overall technical efficiency in production. The essence of this sub-section, therefore, is to discuss the findings of this research with reference to the socio-economic characteristics that affect the youths' production decisions. Table 1 presents the socio-economic characteristics of the respondents. As shown in Table 1, about 83% of the beneficiaries are males while about 17% are females. The sex of an individual can influence the type and quality of work carried out by the individual. The results obtained showed that there are more males involved in the Youth-In-Agriculture Programme than females. This is most likely to be due to the fact that men are capable of doing more tedious work which is usually associated with farming than the females.

In the traditional agricultural production, family labour plays a significant role in farm labour supply. The average farmer first exhausts all sources of labour in his family before hiring labour in order to reduce the cost of production. The amount of family labour available is usually closely related to the marital status of the farming household. As shown in Table 1, most of the participants in the Youth – in – agriculture programme in Ondo State are married. This suggests that they may have a reasonably large family size which may provide more family labour in production than other households with different marital status. Household composition of the participants interviewed

Table 1: Distribution of the Respondents According to their Socio-Economic Characteristics

Socio-Economic Characteristics	Frequency	Percentage (%)
Sex		
Male	91	82.73
Female	19	17.27
Total	110	100
Marital Status		
Single	41	37.27
Married	68	61.82
Divorced	1	0.91
Total	110	100
Households' Sizes		
1-3	41	37.27
4-6	48	43.64
Above 6	21	19.09
Total	110	100
Level of Education		
No formal education	7	6.36
Adult education	3	2.74
Primary education	22	20.00
Secondary education	61	55.45
Post-secondary education	17	15.45
Total	110	100
Age		
16 – 22	6	5.45
23 – 29	45	40.91
30 – 36	25	22.73
37 – 43	21	19.09
44 – 50	13	11.82
Total	110	100
Farming Experience (Years)		
1 – 10	61	55.45
11 – 20	34	30.91
21 – 30	13	11.82
>30	2	1.82
Total	110	100
Years of Participation in the YIAP		
1	46	41.82
2	38	34.55
3	16	14.55
4	10	9.09
Total	110	100

Source: Field Survey, 2008

includes wives,/husbands, children and other dependants. Family size of the respondents ranges from 1 to 9 persons. A range of 4 to 6 members constitute the modal household size. On the average, there are a total of five persons in a household. It must however be pointed out that most of the respondents are composed of members majority of whom are still in the primary level of education. A farmer’s level of education is expected to influence his ability to adopt agricultural innovations and make decisions on various aspects of farming. Education is therefore highly important for sustainable agricultural growth and development. Many of the respondents who did not have the opportunity of acquiring formal education have, for this reason, undergone informal education. As shown in Table 1, a greater percentage of the programme participants (93.64%) have some form of formal education. This implies that the participants are not likely to have much difficulty in understanding and adopting modern agricultural technologies and innovations. However, less than two-sixth of the respondents (15.45%) have tertiary education. This could be an indication of the lack of interest in agriculture by many young graduates. Farming experience generally correlates with acquisition of improved skills in agricultural production. The results of this study as presented in Table 1 shows that the modal farming experience of the beneficiaries is 1 – 10 years. On the average, a typical farmer participating in the programme has an experience of about 12 years in agricultural production in general. This could however be due to the nature of the programme which is meant specifically for the youths. With a mean age of 33years, the participants in the youth –in – agriculture programme have ages that range between 18 and 48 years. The modal age group for the beneficiaries range between 23 and 29

years. With respect to their length of participation in the programme, this study shows that most (41.82%) of the beneficiaries have 1year of participation in the scheme. This implies that most of the youth are new entrants into the programme. It is however important to observe that there was a decline in the number of participants based on their years of participation in the programme. This could be caused by the drift of youths from farming to less tedious and more lucrative jobs.

Summary of the Technical Efficiency of the Participants in the Ondo State Youth-in-Agriculture Programme

This sub section is aimed at presenting the variation in the technical efficiency of the participants in the Youth-in-Agriculture Programme. Table 2 presents the distribution of the respondents according to their technical efficiency in production.

Table 2: Distribution of Technical Efficiency Estimates for Ondo State Youth-in-Agriculture Programme’s Participants

Level of Efficiency	Sample	Percentage	Minimum	Maximum
30 – 59.99%	6	5.46	32.62	57.92
60 – 69.99%	3	2.73	68.61	69.99
70 – 79.99%	6	5.45	72.72	79.85
80 – 89.99%	53	48.18	80.06	89.99
90 – 99.99%	42	38.18	90.756	96.25
Sample	110	100	32.62	96.25

Source: Data Analysis from Field Survey, 2008.

Table2 shows that there was a minimum estimated efficiency of 32.62%, maximum efficiency of 96.25% and mean technical efficiency of 85.23%. Even though about 86% of the respondents are operating at about 80% level of technical efficiency, the mean value indicates that if the efficiency of input usage is increased by 14.77% (100 – 85.23), the youths will be operating on the production frontier. Thus, opportunity still exists for increasing participants’ productivity and income through increased efficiency in the use of existing farm technology.

Determinants of Technical Inefficiency

Identifying the factors that affect inefficiency is one major step that should be taken in raising the efficiency of production activities. The results of the Stochastic Frontier Model used in this study to identify the determinants of inefficiency among the participants in the youth – in – agriculture programme in Ondo State, South Western Nigeria are as presented in Table 3. As shown in Table 3, the estimated equation and for the stochastic production function and in consonance with apriori expectations, the coefficients for land, labour, herbicides and cassava cuttings are positive and statistically significant. These indicate that increase in the use of the inputs will increase output of production activities of the participants. Table 3 shows that gamma has a coefficient that is significant. This implies that there is the presence of technical inefficiency in agricultural production among the respondents. With an estimated gamma value of 0.874, this study shows that about 87% of the variation in the output of the respondents from the frontier is due to their technical inefficiency. The inefficiency model shows that the coefficients of household size, usage of extension services and education are positive and significant. The coefficient of the years of participation in the Youth-In-Agriculture Programme however, is significant but negative. The fact that household size is positively related to technical inefficiency implies that as the number of household members increases, technical efficiency decreases. This is in contrast with Onyenwweaku (2005) who observed that there was no significant relationship between household size and technical efficiency in pig production. This may be as a result of the fact that most of the households members who are still at very young age may not be able to contribute to labour supply since they are likely to be in school during the peak period of agricultural production activities. Years of participation in Youth-In-Agriculture (YIAP) is negatively related to technical inefficiency. This implies a decreased level of technical inefficiency as the youth spend more years in the programme. The likely reason for this is that the youth may develop more skill with time as long as they are in the scheme.

Usage of extension services is positively related to technical inefficiency. This is in line with Raphael (2008) who observed that extension contact has negative effect on the efficiency of farmers in cassava production. This implies that rather than increase the efficiency with which the youth carry out their production activities, extension contact actually reduced the efficiency of the youth participants. This may however be due to lack of trust among the participants on the potency of the information received from the extension agents. Besides, Raphael (2008) was of the opinion that this may be due to bureaucratic inefficiency and some generic weaknesses in information dissemination in the civil service.

Table 3: Maximum likelihood estimates of the stochastic frontier production function for Ondo State Youth-In-Agriculture Programme’s Beneficiaries

Variables	Coefficients	S.E.	t-value
Stochastic frontier			
Constant	5.282	0.545	9.691
Land	0.198*	0.104	1.899
Labour	0.256*	0.088	2.921
Fertilizer	0.015	0.094	0.159
Herbicide	0.397*	0.107	3.721
Maize seed	0.027	0.042	0.648
Apron Plus	0.006	0.032	0.198
Cassava cutting	0.372*	0.022	17.176
Inefficiency Model			
Constant	5.386	3.645	1.478
Age	-3.243	2.135	-1.519
Household size	1.252*	0.761	1.645
Farming experience	0.155	0.163	0.953
Years of Participation in YIAP	-0.630*	0.382	1.649
Usage of extension information	1.449*	0.878	1.650
Education	0.761*	0.462	1.647
Membership of association	0.045	0.261	0.171
Variance parameters			
Sigma-squared (δ^2)	0.338**	0.148	2.280
Gamma (γ)	0.874***	0.065	13.420

*Significant at 10% level of probability,
** Significant at 5% level of probability,
*** Significant at 1% level of probability
Source: Data Analysis, 2008.

Level of education is also positively related to technical inefficiency. This implies that there is increased level of technical inefficiency as level of education increases. This is in contrast with the findings of Ferenji and Heidhues (2007) and Raphael (2008) that education of the household has positive and significant influence on the technical efficiency of farmers. The reason for this is probably because of the orientation of most people in the country linking education with white collar job. As such, the more educated ones among the participants may develop inferiority complex which might be responsible for their inefficiency in agricultural production.

CONCLUSION

This study carried out an assessment of the technical efficiency of the Youth-in Agriculture Programme in Ondo State, Nigeria. The study also identified the determinants of the technical inefficiency of the participants. The findings of this study may therefore be of immense contribution to the growth and development of agriculture in Nigeria. More importantly, the study can be used by various agencies and organizations interested in youth empowerment through agriculture to identify the areas of concerns for effective participation in agriculture. Based on the findings of this research, the participants are about 85% technically efficient. Household size, usage of extension services, education level of the participants and the years of experience of the participants are the major factors affecting their level of technical inefficiency.

POLICY RECOMMENDATIONS

In order to improve on the efficiency of the youth participation in the Ondo State Youth-in-Agriculture programme, the following recommendations are suggested:

1. The youth should be assisted to have better access to the necessary inputs of production such as land, labour, herbicides and cassava cuttings.
2. Years of participation in the youth- in-agriculture programme was found to increase their output. In order to improve their skills and knowledge in agriculture, the participants should be assisted to acquire better and effective training through participation in training programmes and workshops.
3. Further more youth should realize that the era of acquiring education mainly for the sake of seeking white collar job in public and private corporate enterprises is over. As such they should be made to develop self esteem in agriculture as a viable income generating venture and not look down on it as it is currently the practice among the educated youth.
4. The households’ size of the participants should be controlled especially by the use of modern family planning technique. This however requires visiting the health centres around them for proper advice.
5. Finally, the extension services in the state should be overhauled. This is with the aim of enlisting the confidence of the participants on the usefulness of extension information.

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