Gendered technical efficiency differentials among crop farmers in Oyo State Nigeria

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Abstract: In Nigeria and other developing countries, crop production and distribution could have been improved upon, if more attention is paid to the area of separation in the roles played by men women. This study, on gender basis, critically examined the technical efficiency and the determinants of technical efficiency among crop farmers in Oyo State, Nigeria. A structured questionnaire was used to collect data from 120 randomly selected respondents. The data were subjected to descriptive statistics and stochastic frontier production analysis. The results reveal that the mean ages for male and female farmers were 49.4 and 43.2 years respectively. Men (92.9%) are more educated than women (78.6%) respondents. The mean farming experience for men was 28 years while that of women was 16 years. On the average, male respondents were more visited by the extension agents than their female counterparts. The mean farm sizes for male and female respondents were 4 and 2 hectares respectively. The use of modern implement is not common in the study area. The results further reveal that there was a return to scale of -0.567 for male and -0.260 for female respondents. This shows that both categories of farmers are experiencing decreasing negative returns to scale. The determinants of technical efficiency among the male respondents were farmers age, educational level, access to extension services, access to credit and farmers association membership while that of female respondents were farmers age, educational level, access to credit and farmers association membership. The results again reveal that men crop farmers are more technically efficient than their women counterparts with mean technical efficient indices of 0.89 and 0.75 respectively. It was recommended that the crop farmers should re-organize the use of their variable and fixed resources in order to produce in the region where profit is maximized.
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Introduction

Agriculture is regarded as the mainstay of 70 percent of African's 1 billion population, employing 65 percent of its labour force and contributing to about 50 percent of the total export value and 30 percent of the GDP (IPCC, 2007; Toulmin, 2009; World Bank, 2009). Agriculture is the only source of food for both direct consumption and as raw material for refined foods. Agricultural production at any level determines food availability (FAO, 2011b). Agriculture is characterized by gendered. In the developing countries, women comprise 20 to 50 percent of the agricultural labour (FAO, 2011b). Agriculture could have been an important engine of growth and development in the developing economy like that of Nigeria, but little attention is paid to the area of separation in the roles played by men and women in the production and distribution of agricultural products.

Economic activity of the humans is directed towards the provision of basic necessities of life. Ajayi and Laogun (2004) argued that food as one of the basic necessities is scarce and its provision is of importance to both men and women. It was observed that women play an important role in the three components of food security (food production, food distribution, and food utilization) and also involve in a range of community-level activities, such as afforestation, crop domestication, soil and water conservation, that boost agricultural development. (World Bank, 2009).

Most of the times, at the small scale farm level of production, once the family harvest is done women are charged with the responsibilities of distribution and allocation of the food stock until the next harvest. Often, women manage the cultivation of subsistence crops, make available food for the entire household members and spend much of the income they make (compared to men) on clothing, health and education for their children (UNDP, 2012). In Nigeria, the problem facing the crop production is not expected going by the interventions of Federal and State Governments. According to Walabi (2005), the problem Nigeria as a country is facing is the gender inequality which characterized her agricultural climates given the gender roles which are culture specific. Ezedinma et al., (2006) observed with the feminization of agriculture, increase migration of the youth to the urban areas, ageing of the rural populace,

rural farm labour is expected to be expensive for agricultural purposes.

Gender has often been misunderstood by some people as being about the promotion of women interest alone. But this concept explains the relationship between men and women and how their potentials could be unlocked in order to make this world a better place for all. In many developing countries (Nigeria inclusive), the policy makers have not adequately considered gender responsibilities and differences. This study would genderly proffer solution to the following questions: What are the socio-economic characteristic of the crop farmers? How efficient are they technically in the use of resources? What are the factors responsible for their technical efficiency? In line with the questions raised, the objectives of the study are to, genderly: examine the socio-economic characteristics of respondents; determine their technical efficiency; and identify the factors determining their technical efficiency.

Methods And Materials

The Study Area

The research was conducted in Oyo State, Nigeria. This State is one of the three (3) States carved out of the former Western State of Nigeria in 1976. Oyo State covers approximately an area of 28,454 square kilometers and is ranked 14th by size among the States in Nigeria. The landscape consists of domed shaped hills and old hard rocks, which rise gently from about 500 Meters in the southern part and reaching a height of about 1,219 Meter above sea level in the northern part of the State.

The State is well drained with rivers flowing from the upland in the north – south direction. Oyo State enjoys an equatorial climate, high relative humidity, dry and wet seasons. The dry season starts and ends in November and March respectively while the wet season is between April and October. Average daily temperature ranges between 25^{o}C and 35^{o}C almost throughout the year. The vegetation pattern of Oyo State is that of guinea savannah in the north and rain forest in the south. The climate conditions of the State allow the cultivation of crops like beans, yam, cocoa, palm oil, maize, soya beans, etc.

Method of Data Collection

Primary data were used for the study. These were collected through the use of a well structured questionnaire. Trained enumerators under the supervision of supervisors were paid to administer the questionnaire. The questionnaire helped to retrieve information pertaining to the respondents demographic and socio – economic characteristics. Information were retrieved on the following characteristics, age, sex, level of education, household size, marital status, farm size, labour used, planting materials, capital, output, etc.

Sampling Technique

A multistage simple random sampling technique was used to select 120 respondents from the study area. At the first stage, three (3) Local Governments Areas were selected randomly from the State while in the second stage, five (5) villages were randomly selected from each of the Local Government Areas chosen. At the third stage, randomly, 8 (4 males and 4 females) respondents from each of the selected villages were picked to make a total of 120 respondents.

Analytical Techniques

The data collected were subjected to both descriptive statistics (mean, frequency distribution and percentage) and stochastic frontier production function analysis.

Coelli and Battese (1996) proposed stochastic frontier production function (SFPF) which captured the efficiency of farm production was used in the analysis. As a specialized econometric technique, SFPF is used to estimate the parameters of the regression model of the production function. In this technique, the error term of an ordinary regression model is assumed to have two component parts V and U. In the production, The V covers the random effects which are outside the control of decision unit while the technical inefficiency effects which are behavioural factors are measured by U.

The stochastic frontier production function model could be generally stated in the following format:

$$Y_i = f(X_i\beta) + (V_i - U_i) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where

Y_i is the output of the i-th farmer;

X_i is the vector of input quantities of the i-th farmer;

β is the vector of unknown parameters;

V_i are random variables which assumed to be $iid.N(0, \sigma_{V^2})$

U_i are non-negative random variables which accounted for technical inefficiency in production and are assumed to be $iid.|N(0, \sigma_{u^2})|$.

The Technical Efficiency (TE) of an individual farmer is defined in terms of the observed output (Y_i) to the corresponding frontier output (Y_i^*). The frontier output is the maximum achievable output and it is shown as;

$$Y_i = f(X_i\beta) + V_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

The following relationships about the parameter estimators and variance parameters which were

obtained by the maximum likelihood estimation method are worth nothing:

$$\sigma^2 = \sigma_u^2 + \sigma_v^2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

$$\gamma = \frac{\sigma_u^2}{\sigma^2} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

$$\lambda = \frac{\sigma_u}{\sigma_v} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Where: γ is the total variation of output from the frontier and this is caused by technical efficiency (Gamma) $(0 \leq \gamma \leq 1)$. σ_u^2 and σ_v^2 are variance of parameters U_i and V_i respectively. σ^2 is the overall model variance.

The coefficients of γ and σ^2 show the importance of the stochastic production frontier function and the correctness of the assumptions of the error term. The statistical significance of γ indicates that the specified model has a one-sided error component and hence the normal traditional OLS function cannot be used to analyse the data. The appropriate function is the stochastic production frontier function estimated by the maximum likelihood estimation method.

TE is denoted as;

$$TE = \frac{f(X_i\beta) + (V_i - U_i)}{f(X_i\beta) + V_i} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Where; TE is the Technical efficiency which is between 0 and 1. Other variables are as earlier defined.

The stochastic frontier production for farmers in the study area was specified by Cobb-Douglas functional form shown below.

$$lnY_i = \beta_0 + \beta_1 lnX_1 + \beta_2 lnX_2 + \beta_3 lnX_3 + \beta_4 lnX_4 + V_i - U_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

Where:

ln is the natural logarithm and β_0 to β_4 are the parameters to be estimated.

Y_i= Value of output (₦)

X_1= Labour Cost (₦)

X_2= Capital used (₦)

X_3= Farm size (hectare)

X_4= Farming Experience (year)

According to Yao and Liu (1998) it was assumed that the technical inefficiency measured by the mode of truncated normal distribution is a function of socio-economic characteristics

The inefficiency model is represented as follows:

$$U_i = \varphi_0 + \varphi_1 FAA + \varphi_2 EDL + \varphi_3 HOS + \varphi_4 ACE + \varphi_5 ACC + \varphi_6 MAS + \varphi_7 FAM \ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

Where:

U_i = Technical inefficiency of the i[th] farmer

FAA = Farmers Age (year)

EDL = Educational level (year)

HOS = Household Size (number)

ACE = Access to Extension Services (yes=1; no=0)

ACC = Access to Credit (yes=1; no=0)

MAS = Marital Status (married=1; single=0)

FAM = Farmers Association Membership (member=1; non-member=0)

The φ_s are unknown parameters to be estimated

The φ_s and β_s are coefficients of unknown parameters to be estimated by Maximum Likelihood Estimation Method using a computer programme, FRONTIER version 4.1, written by Coelli Tim(1994) for Stochastic Frontier Production and Cost Function Estimation.

Results and Discussion

Socio-economic characteristics of respondents

Table 1 reveals that 8.6 percent of the male crop farmers were below 31 years of age while 5.7 percent of the female crop farmers belonged to this category. Those in the age bracket of 31 to 40 years were 17.1 and 37.1 percents for male and female farmers respectively. Also, 32.9 and 35.7 percents of the male and female farmers respectively belonged to the age group of 41 to 50 years. In the age category of 51 to 60, 24.3 percent of the male farmers and 14.3 percent of the female farmers belonged to this group while 17.1 percent of the male farmers and 7.2 percent of the female farmers were found in the age bracket of 60 years and above. The mean ages for male and female farmers were 49.4 and 43.2 years respectively. This shows that male farmers are older than their female counterparts in the study area. This may be so because women retire earlier from farming activities in order to take good care of their grandchildren. The result also indicates that the majority of the farmers in the area are still in their useful and active working age.

When the marital status of respondents was considered, 4.3 percent of the male farmers and 5.7 percent of the female farmers were single while 88.6 percent (majority) of men and 82.9 percent (majority) of women were married. 2.8 percents of the male respondents had divorced while 5.7 percent of the female farmers were divorcees. Just, 4.3 percent and 5.7 percent of male and female farmers respectively lost their spouses. This is an indication that, in the study area, male respondents are more engaged in family affairs than their female counterparts because marriage allows farmers to have more responsibilities.

Distribution of respondents by educational level revealed that, just 7.1 percent of the male farmers did not go to school while 21.4 percent of the female farmers did not attend any school. Those that had primary education were 38.6 and 34.3 percents for male and female farmers respectively while those that attended secondary schools were 35.7 and 35.7 percents for male and female farmers respectively.

Also, 18.6 percent of the men and just 8.6 percent of the women attained tertiary education. The result implies that in the study area, men are more educated than their female counterparts. The importance of education in farming enterprise cannot be overemphasized. Educated farmers are better off in terms of management of limited farm resources. Also education allows farmers to keep proper farm records that are needed to assess farm performance.

Table1: Distribution of respondents by socio-economic characteristics

	Male		**Female**	
Variable	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Age (year)				
≤ 30	6	8.6	4	5.7
31- 40	12	17.1	26	37.1
41-50	23	32.9	25	35.7
51- 60	17	24.3	10	14.3
>60	12	17.1	5	7.2
Marital status				
Single	3	4.3	4	5.7
Married	62	88.6	58	82.9
Divorced	2	2.8	4	5.7
Widowed	3	4.3	4	5.7
Education				
No education	5	7.1	15	21.4
Primary	27	38.6	24	34.3
Secondary	25	35.7	25	35.7
Tertiary	13	18.6	6	8.6
Household size(Number)				
≤ 5	8	11.4	10	14.3
6-10	55	78.6	56	80
>10	7	10	4	5.7
Primary occupation				
Farming	60	85.7	60	85.7
Trading	7	10	4	5.7
Artisanship	3	4.3	6	8.6
Farming experience(Yr)				
≤10	2	2.9	4	5.7
11-20	20	28.6	36	51.4
21-30	29	41.4	24	34.3
>30	19	27.1	6	8.6
Extension visit(Number)				
≤10	4	5.7	2	2.8
11-20	52	74.3	55	78.6
>20	14	20	13	18.6
Farm size(Ha)				
<3	20	28.6	50	71.4
3-6	35	50	15	21.4
>6	15	21.4	5	7.2
Access to credit				
No	30	42.9	41	58.6
Yes	40	57.1	29	41.4
Modern implement usage				
No	47	67.1	49	70
Yes	23	32.9	21	30

More also, the result in Table 1 indicated that 11.4 percent of men and 14.3 percent of women farmers had less than or equal to 5 persons as household members while 78.6 percent and 80 percent of men and women respectively had between 6 and 10 members. Also, those that had household size of above 10 members were 10 percent and 4 percent for male and female respondents respectively. The mean household size was 6 persons for male headed households, while that of female headed households was 8. This shows that female headed households have larger family size than their male counterparts in the study area. Large household size may be useful in a situation where farmer makes use of family labour. This implies that more labour would be available on the farm for the female farmers than their male counterparts. But, a times, where family labour is used mainly, the money that is expected to be used for production may be channeled to consumption.

More also, table 1 revealed that the same percentage (85.7%) took farming as primary occupation, while 10 percent and 5.7 percent for male and female respondents respectively mentioned trading as their primary occupation. Those that were artisans primarily among male and female respondents were 4.3 percent and 8.6 percent respectively. It implies that in the study area the majority are into farming primarily. This will boost their technical efficiency because more attention would be paid to farming.

In addition, according to table 1, results on farming experience showed that about 3 percent and 6 percent of male and female respondents respectively had less than or equal to 10 years of experience in farming business, while those that had between 11 and 20 years of experience were about 29 percent for male and 51 percent for female respondents. Those that had over 20 years of farming experience were about 69 percent and 43 percent for male and female respondents respectively. The average farming experience for men and women were 28 and 16 years respectively. This shows that men are more experienced in farming than women in the study area. Ceteris paribus, experience aids efficiency.

Table 1 indicated that those that were visited 10 times or less in the last one year by the extension agents were about 6 percent among the male respondents and 3 percents among the female respondents. About 74 percent and 79 percent of male and female respondents respectively had the opportunity to be visited between 11 and 20 times, while 20 percent of the male respondents and about 19 percent of the female respondents received over 20 visitations from the extension agents. On the average male and female farmers were visited 20 times and 10 times respectively. This is an indication that, in the study area, farmers that are men have more access to extension services than their women counterparts. Extension agents are carriers of new innovations to farmers and over the years their services have been of assistance to agricultural production.

Moreover, in table 1, 28.6 percent of the male respondents and the majority (71.4%) of the female respondents used less than 3 hectares of land for their farming activities while the majority (50%) and 21.4 percent of the male and female respondents respectively cultivated between 3 and 6 hectares of land. Those that carried out their farming activities on over 6 hectares of land for male and female respondents were 21.4 percent and 7.2 percent respectively. The mean farm size for male respondents was 4 hectares while that of the female respondents was 2 hectares. This implies that the majority of the respondents in the study area operates on small scale. Also, the result shows that men have more access to land when compared with their female counterparts. This may be so because in the study area the land tenure system favours men than their women counterparts.

Table 1 showed that 42.9 percent and 58.6 percent (majority) of the male and female respondents respectively had access to credit facilities while 57.1 percent (majority)of the male and 41.4 percent of the female respondents had no access to credit. This implies that in the study area, women are better than their male counterparts when it comes to the issue of credit accessibility.

Distribution of respondents by the use of modern implement in table 1 showed that 67.1 percent (majority) and 70 percent (majority) of the male and female respondents respectively did not use modern implement on their farms, while 32.9 percent of the male respondents and 30 percent of the female respondents did. This result shows that the use of modern implement is not embraced in the study area. This may be due to the fact that majority of the crop farmers operate on small scale.

Maximum Likelihood Estimates of Stochastic Frontier for crop farmers

Table 2 shows the results of the Maximum Likelihood Estimates (MLE) of the parameters of the stochastic frontiers of the crop farmers. The estimated sigma squared (σ^2) of 0.382 for male respondents and 0.131 for female respondents were significantly different from zero at 1 percent. This indicates a good fit of the models and the correctness of the specified distributional assumptions. Also, the estimated values of gamma (γ), 0.418 and 0.817 for male and female crop farmers respectively were significant at 10 percent level of significance. This implies that about 42 percent and 82 percent of variations in the value of the outputs of the male and female farmers

respectively were due to differences in their technical inefficiencies.

Table 2 revealed that the coefficient of labour cost(X_1), one of the factors of production, for both male and female respondents had negative sign, that is, less than zero. This implies that the crop farmers (male and female) in the study area are using this resource in the third stage of production (supra-optimal stage) where production is experiencing decreasing negative returns. This is an irrational stage of production. It may be due to the fact that farmers do not pay for farmily labour. This corroborates the work of Oladeebo and Fajuyigbe (2007). The negative sign shows that as labour cost increases (decreases) the value of output decreases (increases). Also, the coefficient of the variable X_1 was not significant for male respondents but significant at 1 percent level of significance for female respondents. This implies that labour cost is an important input for female farmers in crop production.

In addition, according to table 2, the coefficient of capital used(X_2) was negative for male respondents but positive for female respondents. This implies that for male crop farmers in the study area, output increases (decreases) as capital used decreases (increases) while the reverse is the case for the female crop farmers. It shows that male crop farmers used the capital to the supra-optima stage where there is decreasing negative returns while the female crop farmers used the input X_2 to rational (optimal) stage of production where there is decreasing positive returns. The coefficient of X_2 was significant for male and female respondents at 1 percent and 10 percent respectively. This indicates that the capital used as an input is an important factor of production to both male and female farmers in the study area.

More also, farm size (X_3) was positively related to the value of output (Y_i) for both male and female respondents. This shows that as farm size increases the value of output increases and vice versa. The estimated elasticity of this variable (X_3) for both group of respondents was less than one but greater than zero. This is an indication that, in the study area crop farmers do use the resource, land, in the optimal (rational) stage of production (stage II) where there is always decreasing positive returns. In both cases the coefficient of the variable was significantly different from zero at 5 percent level of significance. This makes farm size an important variable in crop production in the study area.

Moreover, the coefficient of variable, farming experience (X_4) had negative sign in both cases. This implies that, this resource, farming experience, is being used in the irrational stage of production (supra-optimal stage). It indicates that increase in farming experience leads to decrease in the value of respondents' outputs and vice versa. Also the sign on the coefficient shows that the resource is being over utilized in the study area. The variable was significantly different from zero at 5 percent level in the case of male farmers while with the female respondents it was not significant.

Table 2: Maximum Likelihood Estimate and the inefficiency function of the Male and Female Farmers.

Variables	**Parameters**	**Male**	**Female**
Efficiency model			
Constant (X_0)	β_0	0.821***(0.287)	0.661*(0.376)
Labour cost (X_1)	β_1	- 0.562(0.375)	- 0.870***(0.143)
Capital used (X_2)	β_2	- 0.099***(0.025)	0.343*(0.202)
Farm size (X_3)	β_3	0.451**(0.181)	0.511**(0.269)
Farming exp.(X_4)	β_4	- 0.357**(0.179)	- 0.244(0.194)
Inefficiency model			
Constant	φ_0	0.735**(0.286)	0.249***(0.062)
Farmers age (FAA)	φ_1	0.843**(0.424)	0.398*(0.223)
Educ. level (EDL)	φ_2	- 0.159**(0.080)	0.547**(0.215)
Household size (HOS)	φ_3	0.205(0.171)	- 0.866(0.6383)
Acc. to ext. ser. (ACE)	φ_4	- 0.235*(0.134)	0.256(0.176)
Access to credit (ACC)	φ_5	- 0.196***(0.049)	- 0.358***(0.039)
Marital status (MAS)	φ_6	0.632(0.503)	- 0.111(0.069)
Far. ass. Membership(FAM)	φ_7	- 0.197**(0.077)	- 0.163*(0.089)
Sigma squared	σ^2	0.382***(0.046)	0.131***(0.045)
Gamma	γ	0.418*(0.238)	0.817*(0.435)
LH	LH	6.421	6.839

*,** and ***means significant at 10%, 5% and 1% respectively. Figures in parentheses are standard errors

According to table 2, there was a return to scale (RST) of – 0.567 for male and – 0.260 for female respondents. The two categories of farmers experienced decreasing negative returns to scale. This is an indication that crop farmers in the study area operate and use resources in the irrational (supra-optimal) stage of production where the technical efficiency of variable resource keeps on declining.

More also, when inefficiency model is considered, table 2 shows that the coefficient of variable farmers age (FAA) among the male and female respondents had positive sign and significant at 5 percent and 10 percent levels of significance respectively. It implies that as age of respondent increases the technical inefficiency increases and this leads to reduction in the technical efficiency and productivity. This may be due to the fact that at old age, farmers are not ready to accept new innovations in the course of production.

According to table 2, the coefficient of educational level (EDL) was negative for the male crop farmers while it was positive in the case of female crop farmers. In both cases, the variable was significant at 5 percent level of significance. This result shows that as the level of education increases, male respondent's level of inefficiency decreases and hence the levels of efficiency and productivity increase. But with their female counterparts, as the level of education increases, efficiency and productivity decrease.

Table 2 reveals that, the coefficient of variable, household size (HOS) had positive sign in the case of male respondents but negative with the female respondents. The variable was not significant in both cases at the levels of significance considered. The results indicates that, with the male crop farmers, the more the household size the less the efficiency while the reverse is the case with their female counterparts.

Also, access to extension services (ACE) was negative and significant at 10 percent for male crop farmers but had positive sign and not significant in the case of female farmers. This implies that in the study area, access to extension services enhances the male respondents' efficiency while it encourages inefficiency among the female crop farmers.

Table 2 indicates that, the coefficient for access to credit (ACC) was negative and highly significant at 1 percent level of significance for the male and female respondents. This shows that access to credit for agricultural production promotes efficiency and productivity among the two categories of farmers. This again shows the importance of credit to farming business.

The coefficient of marital status (MAS) was positively signed for male respondents but negative in the case of the female crop farmers. In both cases the variable was not significant. The result implies that marriage among the male respondents encourages inefficiency while among the female respondents it encourages efficiency and productivity.

In addition, the coefficient of farmers association membership (FAM) was negatively signed in both cases and significant at 5 percent and 10 percent for male and female respondents respectively. This implies that, in the study area, membership of farmers association promotes efficiency and productivity among the two categories of farmers.

Hence, the main determinants of technical efficiency among the male respondents were; farmers age, educational level, access to extension services, access to credit and farmers association membership. Among the female respondents the main determinants of technical efficiency were; farmers age, educational level, access to credit and farmers association membership.

Table 3 shows the distribution of respondents' technical efficiency by gender. This was obtained from the estimated stochastic frontier.

Table 3: Gender distribution of respondents technical efficiency

	MALE		**FEMALE**	
Efficiency	frequency	Percentage	frequency	Percentage
≤0.50	4	5.7	10	14.3
0.51-0.60	2	3.0	12	17.1
0.61-0.70	5	7.1	12	17.1
0.71-0.80	5	7.1	13	18.6
Above 0.80	54	77.1	23	32.9
Total	**70**	**100**	**70**	**100.0**
Mean	0.89	0.75		
Minimum	0.47	0.39		
Maximum	0.92	0.96		

According to table 3, the predicted farm technical efficiencies ranged between 0.47 and 0.92 with a mean of 0.89 for men and between 0.39 and 0.96 with a mean of 0.75 for women crop farmers. The result shows that there are potential of about 11 percent and 25 percent to improve the outputs of male and female farmers respectively. The majority (77.1%) of the male respondents had their technical efficiencies greater than 80 percent while the majority (67.1%) of the female respondents had theirs less than 80 percent. The implication of the results in table 3 is that, given the production inputs at the disposal of both categories of crop farmers, one could conclude that in the study area, the male farmers are more efficient in the use of production resources than their female counterparts.

Conclusion and Recommendations

This empirical research work, with the help of stochastic frontier production function, genderly examines the technical efficiency and its determinants among the crop farmers in Oyo State Nigeria. The maximum likelihood estimate results show that technical efficiency of both male and female crop farmers varied due to the presence of technical inefficiency effects in crop production. Capital used, farm size and farming experience were found among the male respondents to be the significant production factors while among their female counterparts, labour cost, capital used and farm size were significant production factors. The study reveals that both categories of crop farmers operate in the region (stage III) where decreasing negative returns to scale is experienced. Male respondents were found to be more technically efficient. The main determinants of technical efficient among men were; farmers age, educational level, access to extension services, access to credit and farmers association membership while among the women respondents the main determinants of technical efficiency were; farmers age, educational level, access to credit and farmers association membership. Based on the findings of this study, the following recommendations if embraced would lead to improvement in the technical efficiency of the crop farmers in the study area;

- More extension services should be extended to the female crop farmers.
- In order to promote large scale production of crops among female farmers, the land tenure system in the study area should be revisited and reviewed to also favour women.
- The crop farmers in the study area should be sensitized on the importance of using modern implement. Government should provide the implement at affordable prices.
- Since access to credit promotes technical efficiency, government should make loan at one digit interest rate available to farmers.
- Also, in order to have access to more information on farming activities, farmers should be encouraged to join at least one farmers association.
- Since the crop farmers are operating in the region of decreasing negative returns to scale, as a matter of urgency, the farmer should re-organize the use of their variable and fixed resources in order to produce in the region where profit is maximized.
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