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Gender Differentials in Technical Efficiency among Small-Scale Cassava Farmers in Abia State, Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. Authors ESY and MIN designed the study, performed the statistical analyses, wrote the protocol and wrote the first draft of the manuscript. Authors AAAC and FDI managed the analyses of the study and literature searches. Author AA participated in data analyses and edited the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

This study examined gender differentials in technical efficiency among small scale cassava farmers in Abia State, Nigeria. The profitability of cassava production, technical efficiency as well as the factors influencing inefficiency among the farmers in the study area were determined. Well structured questionnaire and interview schedule were employed to obtain primary data from the 133 male and 147 female cassava farmers sampled from two agricultural zones in Abia State. Data were analyzed using descriptive statistics, farm budgeting technique and stochastic frontier production function. A total of 73.68% of males and 81.63% of females were married, with an average household size of 6 and 5 persons, mean farming experience of 18 years for males and 16 years for females, and cultivated less than 2ha of land. Cassava production was profitable with a gross margin of ₦140,978.28 per hectare for males and ₦131,070.27 per hectare for females. The maximum likelihood estimates showed male farmers were more technically efficient with mean efficiency score of 0.82 compared to 0.78 for female farmers. Factors affecting the technical efficiency of male farmers included farm size, educational level, extension contact, credit amount

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while that of the female farmers were age, farm size, cooperative membership, land ownership and off-farm income. High cost of acquiring credit facilities and farm inputs, poor road network, inadequate extension services, limited farmland were the major constraints faced by farmers in the study area. It was concluded that male farmers were more technically efficient and also had higher gross income per hectare than their female counterpart. Policies aimed at improving the female farmers' access to land and other farm inputs should be established and implemented by the government in order to increase efficiency was recommended.

Keywords: Gender differentials; technical efficiency; cassava and small scale farmers.

1. INTRODUCTION

Gender related issues dominate every aspect of the human society. Ranging from the family to the community, rural to the urban areas, manufacturing to consumption sites, education, political and religious systems, there are persistent arguments on what should be and what roles and responsibilities should be carried out by either men or women. Inferably, even the agricultural sector is not exempted [1]. In the early seventies, matters on gender were first raised and projects such as Women in Development (WID), Women and Development (WAD), Gender and Development (GAD) were birthed specifically to address the problem of gender inequality, provide resources and create activities for women [2]. Subsequently, efforts were made to place both men and women on equal grounds in all project activities. At present, there is a keen attempt to eliminate gender bias from project activities (mainstreaming) by making both the concerns and experiences of women and men, an integral dimension of all agricultural and rural development efforts.

Crop production is a gender activity [3]. This implies that both men and women are involved in crop production activities. However, the roles played are task specific, with the women carrying out menial activities such as planting, weeding, harvesting, processing, storage and marketing of crops while the men are more involved in strenuous tasks such as bush clearing, land preparation, tree felling, stumping among others [4,5,6]. Cassava is a major staple crop and is widely cultivated in Abia State [7]. In recent times, men are going into cassava production and processing, even though their level of involvement and contributions along side with their female counterparts are not equal. For instance, a research carried out in Abia State by Ezeibe et al. [8] revealed that women dominated in minor activities like planting, weeding and fertilizer application while the men participated actively in pre-planting activities and harvesting of cassava which were tedious for the female counterparts. Because of these differences, their views, needs and priorities to increase their productive potentials also differ.

Research studies on gender issues have focused on time used by members of a household and their responsibility for decision-making in the allocation and use of household resources. In matters of household food security, some work has also been done on food and nutrition security at the household level as well as on male and female production efficiency. Most researchers in the study area [9,10,11,12] have concentrated on cultivation and farmer adoption prospects while the gender related issues as it affects production efficiency have not been fully addressed. It is fascinating to know that little or no study has empirically addressed both male and female cassava farmers' technical efficiency jointly in the study area. An earlier study conducted by Ezeibe et al. [13] skewed their findings towards constraints affecting cassava production.

In Abia State like most South Eastern States in Nigeria, women face gender-specific constraints that reduce their productivity and limit their contributions to agricultural production, economic growth and well-being of their families. This current situation of women needs to be considered comprehensively in the formulation and implementation of policies if the goal of transforming agriculture is to be fully realised. Anything less will not be in the interest of inclusive growth. It thus leaves one with the fact that the level of gender involvement in the production of cassava, the economic gains and gender associated constraints in the study area needs to be examined as this has not been properly addressed in the study area. Therefore, for a substantial impact to be made in cassava production in Abia State there is need to analyze the situation more in details considering the small-scale male and female farmers' technical efficiencies in cassava production. It is on the aforementioned premise that this study aimed to

analyze gender differentials in technical efficiency among small scale cassava farmers in Abia State, Nigeria.

2. METHODOLOGY

2.1 Study Area

This study was carried out in Abia State. It is located within the South eastern Nigeria and lies between Latitudes 07°00' to 08°10' North of the equator and Longitudes 04°45' and 06°07' East of the Greenwich Meridian. The State occupies a total land area of about 5,834 km^2. The estimated population of the State in 2006 was 2,845,380 comprising of 1,430,298 males and 1,451,082 females [14]. With a growth rate of 2.7 percent, the 2016 projected population was estimated to be 3,814,303 comprising of 1,917,350 males and 1,896,953 females. The State has distinct wet and dry seasons, which characterize its humid tropical climate, with the dry season extending from November to March. It has an annual mean temperature of about 27°C to 30°C and a relative humidity ranging from 70% to 80%, with January to March as the hottest months. Agriculture is one of the major occupations of the people especially in the rural areas involving over 70 percent of the population. The State has much arable land that produces crops like cassava, yam, maize, potato, rice and cash crops like oil palm, cashew and plantain. According to National Bureau of Statistics (NBS) [15] report, the State has a total of 335,000 male and 693,000 female crop farmers. The map Nigeria showing the study area is presented in Fig. 1.

2.2 Sampling Technique

Given the large population and several cluster levels of farmers in the area and cost implications, a multi-stage sampling procedure was adopted to select representative respondents for the study. In the first stage, two out of the three agricultural zones in the State namely; Ohafia and Umuahia zones was purposively selected based on the preponderance of small scale cassava farmers. The second stage involved a random selection of two (2) Local Government Areas (LGAs) from each agricultural zone. The third stage involved a random selection of two (2) communities from each selected LGA, giving a total of eight (8) communities. One hundred percent (100%) sampling was adopted to derive a sample size of 147 female and 133 male cassava farmers in the study area.

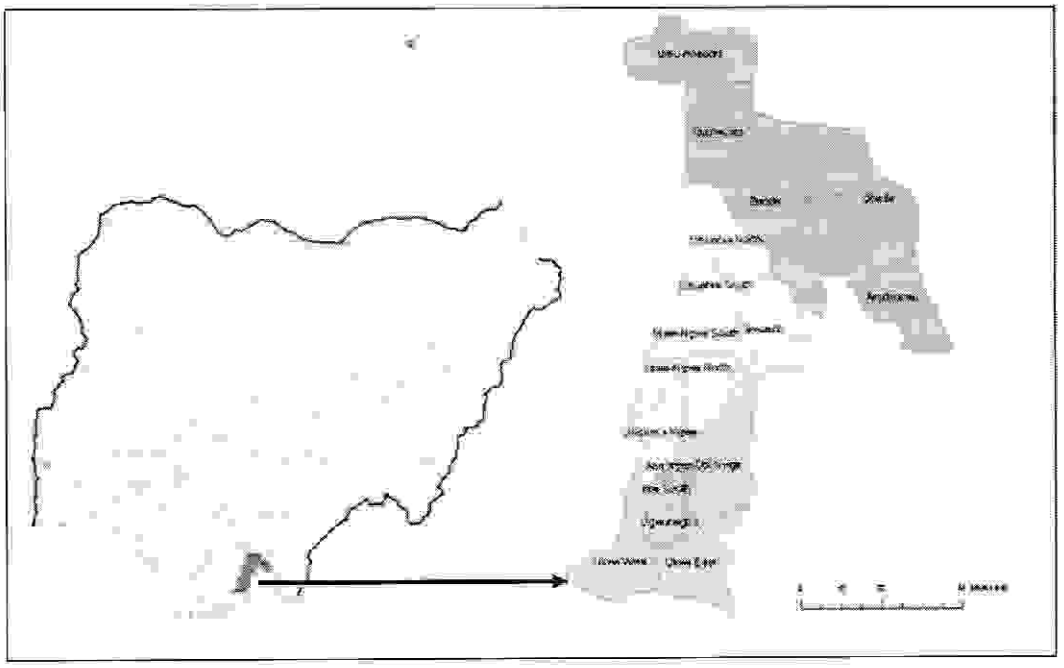

Fig. 1. Map of Nigeria showing the study area

2.3 Method of Data Collection

This study used primary data. The primary data were obtained by the use of a structured questionnaire which was administered to the selected small scale cassava farmers. The questionnaire used was adopted from Uteh [16] and modified by the researchers. Resident enumerators who were familiar with the farmers and the native language spoken in the area were recruited and trained to assist with data collection which lasted a period of 9 weeks.

2.4 Analytical Techniques

Analytical tools such as Descriptive Statistics, Farm Budgeting Technique and Stochastic Frontier Production Function were used for data analysis. Following Umunakwe et al. [17], a five (5) point Likert scale was used to measure the severity of constraints affecting cassava production in the study area.

2.4.1 Farm budgeting technique

Farm budgeting technique was used to estimate the cost and returns in cassava production in the area. The farm budgeting technique was adopted from Mohammed [18] and the formula was specified in equation (1).

$$NFI = GFI - TVC - TFC \quad (1)$$

Where;

NFI = Net Farm Income (₦)
GFI = Gross Farm Income (₦)
TVC = Total Variable Cost (₦)
TFC = Total Fixed Cost (₦)

2.4.2 Technical efficiency (TE) analysis

The Cobb-Douglas stochastic production function was used to determine the technical efficiency of both male and female small-scale cassava farmers in the study area. 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 inputs used by the farm [19]. The technical efficiency of farm is as specified in equation (2):

$$\text{Technical efficiency} = \frac{Y_i}{Y_i^*} = \frac{f(Xi, \beta)+(Vi-Ui)}{f(Xi; \beta)+Vi} \quad (2)$$

Where;

Y_i = Observed output
Y^* = Frontier output
$V_i - U_i$ = composite error term
β = Vector of unknown parameters
X_i = Vector of input quantities of the i^{th} farmer

The function is explicitly expressed in equation (3) as:

$$\ln Y_i = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 \ln X_6 + \beta_7 \ln X_7 + V_i - U_i \quad (3)$$

Where,

Y_i = Output of cassava (kg/ha)
X_1 = Farm size (ha)
X_2 = Hired labour (man-days)
X_3 = Family Labour (man-days)
X_4 = Amount of Fertilizer (kg)
X_5 = Quantity of cassava cuttings used (kg/ha)
X_6 = Quantity of agro-chemical used (litres/ha)
X_7 = Capital inputs (depreciation on farming equipment, buildings, interest payment, rents on storage facilities) (₦)
ln = Natural logarithm
$\beta_1 - \beta_7$ = coefficients of the production factors to be estimated
V_i = represents independently and identically random errors as $N\sim (0, \delta^2 V)$. These are factors outside the control of the farmer and
U_i = represents non-negative random variables which are independently and identically distributed as $N\sim (0, \delta^2 U)$, that is the distribution of U_i is half – normal. If $|U_i| \geq 0$, it implies that the farm's production lies below the frontier and $|U_i| = 0$ for a farm whose production lies on the frontier.

Factors contributing to observed technical efficiency of both male and female cassava farmers were analyzed jointly with the stochastic frontier production model in a single stage maximum likelihood estimation procedure using the computer software Frontier Version 4.1.

The technical inefficiency model is specified in equation (4) as;

$$-U_i = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5 + \delta_6 Z_6 + \delta_7 Z_7 + \delta_8 Z_8 + \delta_9 Z_9 \quad (4)$$

Where;

$-U_i$ = Technical inefficiency score
Z_1 = Marital status (married = 1, single = 0)

Z_2 = Age of the farmer (years)
Z_3 = Household size (number of family members)
Z_4 = Educational level (number of years spent in school)
Z_5 = Farming experience (years)
Z_6 = Extension contact (number of visits per month)
Z_7 = Off-farm income (₦)
Z_8 = Amount of credit received (₦)
Z_9 = Membership of farmer association (member = 1; non-member = 0)
δ_0 = *Intercept*
$\delta_1 - \delta_9$ = Coefficients to be estimated

3. RESULTS AND DISCUSSION

3.1 Socio-economic Characteristics of the Respondents

The distribution of the socio-economic characteristics of the male and female small scale cassava farmers which includes age, marital status, household size, educational level, farm size, years of farming experience, number of extension visits and amount of monthly off-farm income were presented in Table 1.

Table 1 showed that the mean age of both male and female respondents was 45 years. This implied that majority of the respondents were in their middle and active age of life and can utilize available resources efficiently. This result is in consonance with the findings of Alamba and Odoemelam [20]. Obinna [21] who reported that cassava farmers in Abia State were in their economically productive and active age. More so, the result in Table 1 showed that majority of the male (73.68%) and female (81.63%) were married. A possible reason for the dominance of married farmers could be for household sustenance from the income gotten from the proceeds of cassava. This is in conformity with a report by Ezeibe et al. [22] who revealed that 70% and 84% of males and females farmers respectively in Abia State were married. Result on educational level presented in Table 1 showed that only 10.53% and 13.61% of the male and female respondents respectively had no formal education. This result contradicts with that of Ezeibe et al. [23] who found out that majority (36%) of the female cassava farmers in Abia State had no formal education while 76% of the male cassava farmers had both primary and secondary education. This could be as a result of the female farmers embracing the new programme (Education for Employment) introduced by the present administration to enlighten them and be able to read and write appropriately. Their average household sizes were 6 persons for males and 5 persons for females depicting that the males had a larger household size than the females. This is relatively low when compared to the traditional African setting and could be as a result of the trending urban lifestyle and the urge for independency by the growing youth. This partly confirms the findings of Badmus et al. [24] who *reported an average household size of 5 persons* for female farmers in Oyo State.

The mean farm sizes were 1.22 for males and 1.24 for females. This is a clear indication that majority of the cassava producers in the study area are small scale farmers and the implication is small farm production results to low output. This finding conforms to the report of Oluwemimo [25] that small scale farmers are the dominant food crop producers in Nigeria. Furthermore, the average years of farming experience were 18 for male and 16 for the female respondents. This depicts that the male respondents in the study area are more entrenched in cassava production earlier in their lives than their female counterparts. Previous experience in cassava production enables farmers to set realistic time and cost targets, allocate, combine and utilize resources adequately as well as identify production and marketing risks [26].

The result on the monthly off-farm income of the respondents as shown in Table 1 revealed that average off-farm income of the male respondents was ₦5,940.21 higher than the female respondents indicating that the male farmers earn slightly higher as they are more involved in other business ventures apart from farming in the study area. This result corroborates the findings of Onumadu and Onuoha [27] who reported that the mean annual off-farm income of male cassava farmers at ₦293,461 was greater than the mean annual off-farm income of female cassava farmers at ₦181,271.80 in Abia State. The result also showed that only about 50% of the male and female farmers respectively had access to extension services in the area. This insinuates that farmers in the study area are liable to have insufficient awareness and adoption of new technologies that will enhance cassava production. Extension contact is a relevant and viable factor which determines adoption of new farming strategies among small scale farmers.

Table 1. Distribution of respondents according to their socio-economic characteristics

Variables	Male (n=133)			Female (n=147)		
	Frequency	Percentage	Mean	Frequency	Percentage	Mean
Age (years)			45.00			45.00
21 – 30	19	14.29		17	11.56	
31 – 40	28	21.05		35	23.81	
41 – 50	43	32.33		52	35.37	
51 – 60	34	25.56		32	21.77	
Above 60	9	6.77		11	7.48	
Marital status						
Single	1	0.75		18	12.24	
Married	98	73.68		120	81.63	
Divorced	25	18.80		3	2.04	
Widowed	9	6.77		6	4.08	
Educational level						
No formal education	14	10.53		20	13.61	
Primary education	38	28.57		29	19.73	
Adult education	3	2.26		18	12.24	
Secondary education	42	31.58		48	32.65	
Tertiary education	36	27.07		32	21.77	
Household size (number)			6.00			5.00
1 – 5	54	40.60		84	57.14	
6 – 10	65	48.87		52	35.37	
11 – 15	14	10.53		11	7.48	
Farm size (ha)			1.22			1.24
0.01 – 1.00	80	60.15		90	61.22	
1.01 – 2.00	40	30.08		38	25.85	
2.01 – 3.00	10	7.52		16	10.88	
Above 3.00	3	2.26		3	2.04	
Farming experience (years)			18.00			16.00
1 – 10	38	28.57		51	34.69	
11 – 20	54	40.60		57	38.78	
20 – 30	23	17.29		27	18.37	
Above 30	18	13.53		12	8.16	
Monthly off-farm income (₦)			27,443.61			21,503.40
1 – 10,000	53	39.85		58	39.46	
10,001 – 20,000	34	25.56		48	32.65	
20,001 – 30,000	22	16.54		23	15.65	
30,001 – 40,000	13	9.77		13	8.84	
40,001 – 50,000	5	3.76		2	1 36	
Above 50,000	6	4.51		3	3	
Access to extension services						
No	67	50.38		71	48.30	
Yes	66	49.62		76	51.70	

3.2 Costs and Returns Analyses of Respondents in the Study Area

The results of the cost and returns analysis in cassava production in the area are presented tin Table 2. It showed that the total variable cost per hectare for male farmers was ₦76,640.02 which constitutes 93.96% of the production cost, in which the cost incurred on labour, fertilizer and cassava stem took 44.55%, 21.96% and 8 36%.. The fixed cost per hectare was estimated to be ₦4,926.87 which represents 6.04% of the total cost. The gross margin was ₦140,978.28 per hectare while the net farm income was ₦136,051 41 per hectare.

Furthermore, the total variable cost per hectare for female farmers was ₦78,354.33 which constitutes 93 60% of the production cost, in which the cost incurred on labour, fertilizer and cassava stem took 51.63%, 18.16% and 7.46%. The fixed cost per hectare was estimated to be ₦5,359.48 which represents 6.40% of the total cost The gross margin was ₦131,070.27 per hectare while the net farm income was ₦125,710.79 per hectare.

From the findings, the male farmers earned more profit than their female counterparts which was as a result of inadequate access to production resources faced by women farmers in the study area. A typical reference is from the findings of Ayoola et al. [28], Odoh et al. [29] in the role of gender inequalities in agricultural production. The result further indicated that cassava production is viable in Abia State with a benefit cost ratio of 2.67 for males and 2.50 for females. This implies that for every one naira invested in cassava production, additional ₦1.67 and ₦1.50 was realised by the male and female farmers respectively. This is in agreement with the result of Nwafor et al. [30] who ascertained that cassava farming in the study area is lucrative and should be encouraged to enhance food supply and alleviate poverty

3.3 Technical Efficiency of Small Scale Cassava Farmers in the Study Area

3.3.1 Stochastic frontier production function estimates for cassava production

The result presented in Table 3 showed that the minimum and maximum efficiency scores for male respondents were 0.4738 and 0.9553 while their mean efficiency estimate was 0.8214. For the females, their efficiency scores ranged from a minimum of 0.5270 to a maximum of 0.9996 while their mean efficiency estimate was 0.7812. This is an indication that on the average, the male farmers were more technically efficient than their female counterparts in the study area but contradicts the findings of Simonyan et al. [31], Nwaru [32] who reported that female farmers were more technically efficient in Akwa Ibom and Abia States respectively. This could be as a result of the female farmers having issues presently with production resources such as less access to land to improve their productivity and income in the study area

3.3.2 Maximum likelihood estimates of stochastic production function of the respondents

The result in Table 4 showed the Maximum Likelihood Estimates (MLE) of the stochastic production frontier for male and female small scale cassava farmers in the study area. As indicated in the table, the estimated variance (δ^2) was significant at percent level of probability for both male and female farmers indicating goodness of fit and correctness of the specified distribution assumption of the composite error terms. The estimated gamma parameter of the model was 0.9854 for males and 0.6699 for females and was also significant at 1% level of probability. This implies that 98.54% and 66.99% variation in cassava output among the male and female farmers respectively could be attributed to the differences in their technical inefficiencies.

The coefficients of farm size (0.9104), hired labour (0.0086) and cassava cuttings (0.0069) for male respondents were all positive and significant at 1% level of probability while agrochemicals (0.0223) and family labour (0.0100) were positively significant at 5% and 10% levels of probability. Similarly, the coefficients of farm size (0.8519), hired labour (0.0179) and cassava cuttings (0.0886) for female respondents were all positive and significant at 1% level of probability while family labour (0.0013) and fertilizer (0.0130) were positively significant at 5% level of probability. The implication of this is that the likelihood of the cassava farmers to be technically efficient increases with an increase in these variables holding others constant. This finding is similar to those of Akinbode et al. [33], Aminu et al. [34] who reported that farm size, labour and fertilizer significantly and positively influence the technical efficiency of small-scale farmers in North-Central and Lagos State Nigeria respectively.

The results of the determinants of technical inefficiency of the small-scale cassava farmers were presented in Table 4. The coefficients of age (0.0385) was positive and significant at 10% while household size (-0.0279) was negatively significant at 10%. Farming experience (-0.0963), number of extension visits (-0.1990), off-farm income (-0.0000), co-operative membership (-2.2181) were also negatively significant at 5% for male respondents. The coefficient of age was positive which implies that as the small-scale male cassava farmers advance in age, their capacity to manage technical challenges in their farm reduces thus making them technically inefficient. This may be as a result of the fact that older farmers are very conservative and are not receptive to new innovations for adoption and also, leaves them still farming in their own crude ways as argued by Adekunle et al. [35], Akinbode et al. [36]. Household size (10%), farming experience (5%), off-farm income per month (5%), co-operative membership (5%) and number of extension visits (5%) were negative implying that an increase in these variables will reduce their technical inefficiency holding other factors constant. This is in line with the *a priori* expectation that being a member of an

agricultural cooperative, experienced number of years in farming, having a secondary source of income and having access to beneficial information enable farmers to enhance their level of efficiency in their individual farms.

The coefficients of marital status (-1.6816) and number of extension visits (-0.1584) were negatively significant at 10% while the coefficients of household size (0.1898) was positive at 5%. Co-operative membership (-0.0181) was negatively significant at 5% for female small-scale cassava farmers. This indicates that an increase in the positive variables will lead to an increase in the technical inefficiency of female small-scale cassava farmers holding other factors constant. Also, a decrease in the negative variables will lead to a decrease in technical inefficiency while other factors are held constant. It therefore means that the age, marital status, household size, farming experience, membership of farmers' association, number of extension visits and amount of off-farm income are the major determinants of male and female small-scale cassava farmers' technical inefficiency in the study. This findings all corroborates those of Amos [37], Nmadu et al. [38], Aminu et al. [39] for socio-economic variables that affects the efficiency of farmers in Nigeria.

Table 2. Estimated costs and returns for male and female small scale cassava farmers in the study area

Items	Male		Female	
	Amount (₦/ha)	Percentage (%)	Amount (₦/ha)	Percentage (%)
Variable Cost (VC)				
Labour	36,337.44	44.55	43,219.54	51.63
Cassava stem	6,818.35	8.36	6,246.87	7.46
Fertilizer	17,911.95	21.96	15,202.80	18.16
Agrochemical	6,076.66	7.45	4,654.12	5.56
Manure	249.08	0.31	367.45	0.44
Processing	4,129.00	5.06	2,949.12	3.52
Storage	911.51	1.12	951.04	1.14
Transportation	4,206.03	5.16	4,763.39	5.69
Total Variable Cost (TVC)	76,640.02	93.96	78,354.33	93.60
Fixed Cost (FC)				
Depreciation on farm tools	1,122.07	1.36	1,033.19	1.23
Interest on credit	996.92	1.22	495.33	0.59
Rent on land	2,807.88	3.44	3,830.96	4.58
Total Fixed Cost (TFC)	4,926.87	6.04	5,359.48	6.40
Total Cost (TC)	81,566.89	100.00	83,713.81	100.00
Total Revenue (TR)	217,618.30		209,424.60	
Gross Margin (GM)	140,978.28		131,070.27	
Net Farm Income (NFI)	136,051.41		125,710.79	
Benefit-Cost Ratio (BCR)	2.67		2.50	

Table 3. Technical efficiency estimates of male and female small scale cassava farmers

Efficiency score range	Male		Female	
	Frequency	Percentage	Frequency	Percentage
0.41 – 0.50	6	4.51	-	-
0.51 – 0.60	6	4.51	6	4.08
0.61 – 0.70	5	3.76	20	13.61
0.71 – 0.80	19	14.28	63	42.86
0.81 – 0.90	62	46.62	43	29.25
0.91 – 1.00	35	26.32	15	10.20
Total	133	100	147	100
Mean efficiency	0.8214		0.7812	
Minimum efficiency	0.4738		0.5270	
Maximum efficiency	0.9553		0.9996	

Table 4. Estimates of stochastic production frontier of cassava production in Abia State

Variables	Male		Female	
	Coefficient	t-ratio	Coefficient	t-ratio
Efficiency model				
Constant	9.5649	10.5475***	9.3073	9.3954***
Farm size	0.9104	3.9327***	0.8519	2.9097***
Hired labour	0.0086	0.6711	0.0179	1.6816*
Family labour	0.0100	1.6991*	0.0013	0.2058
Fertilizer	0.0017	1.9857**	0.0130	2.4885**
Cassava stem	0.0067	2.8360***	0.0088	2.6842***
Agrochemical	0.0222	2.4513**	-0.0183	-1.5788
Capital	0.0330	1.3310	0.0044	0.1320
Inefficiency model				
Constant	-4.6309	-0.7116	-0.2711	-0.3379
Marital status	0.7581	0.6909	-0.1307	-1.6816*
Age	0.0385	1.7572*	-0.0078	0.4899
Household size	-0.0278	-1.8736*	0.1897	2.4769**
Educational level	0.0477	0.9345	0.0592	1.4896
Farming experience	-0.0963	-2.2035**	-0.0070	-0.9501
Number of extension visit	-0.1990	-1.9876**	-0.1584	-1.6920*
Off-farm income/month	0.0001	1.9964**	0.0010	0.3469
Credit amount	-0.0101	-0.7865	-0.0001	-0.9112
Cooperative membership	-0.0250	-2.2181**	-0.0181	-2.0871**
Sigma-squared	0.7135	6.8190***	0.5190	4.6152***
Gamma	0.9853	8.2381***	0.6699	5.8546***
Log likelihood function	12.7035		-10.3907	
LR test	46.6274		20.7552	

****, ** and * implies significance at 1%, 5% and 10% probability levels respectively*

Table 5. Constraints faced by small-scale cassava farmers in the study area

Constraints	Weighted sum	Weighted mean score	Remark
High cost of acquiring credit facilities	1021	3.65	Severe
High cost of farm inputs	1016	3.63	Severe
Poor road access and transport facilities	1008	3.60	Severe
Inadequate extension and farm advisory services	972	3.47	Severe
Limited farm land	946	3.38	Severe
Pilfering/theft	833	2.90	Not severe
High incidence of pests and diseases	807	2.88	Not severe
No co-operative or farm association	756	2.70	Not severe
Inadequate storage facilities	747	2.67	Not severe
Inadequate market information	528	1.89	Not severe

3.4 Constraints Faced by Small-scale Cassava Farmers in the Study Area

The result of analysis on the constraints faced by the cassava based crop farmers in Abia State is presented in Table 5. The result showed that high cost of acquiring credit facilities, high cost of farm inputs, poor road access and transport facilities, inadequate extension and farm advisory services and limited farm land in a descending order had mean scores of 3.65, 3.63, 3.6, 3.47 and 3.38 which are above the 3.00 benchmark. The implication of this is that these are the major constraints faced by the small-scale cassava farmers in the study area. The result further revealed that the respondents however also have other minor constraints which include high incidence of pests and diseases, inadequate storage facilities, absence of cooperative or farm association, inadequate market information and pilfering/theft. This is in agreement with the findings of Ezeh et al. [40], Varathan et al. [41] who reported that farmers are faced with several constraints which include inadequate market

information, inadequate storage facilities among others. The inference that can be drawn from this finding is that the small-scale cassava farmers are faced with several challenges in the study area, which require attention for efficient production.

4. CONCLUSION

Based on the findings of this study, it was concluded that cassava production was profitable in the study but resources were not fully utilized among male and female respondents. The male farmers were more technically efficient than their female counterpart and thus, had higher gross income per hectare. Therefore, there is need for improvement for female small-scale cassava farmers in their levels of efficiency to increase cassava production. The following recommendations were thus made:

i. Production inputs such as fertilizer, agrochemicals, and improved cassava cuttings should be subsidized by the government and made affordable to small-scale farmers coupled with proximity to financial institutions for easy access to soft loans with single digit interest rates.
ii. Policies aimed at improving the female farmers' access to land and other farm inputs should be established and implemented by relevant government authorities in order to increase efficiency which in turn will increase the level of food sufficiency among Nigerians.
iii. Agricultural agencies should be strengthened by the government to promote and provide adequate and relevant extension services to farmers on cassava production. This should be inculcated in activities, workshops and various programs geared towards an increase in agricultural productivity among small-scale farmers.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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