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GENDER DIFFERENTIALS IN UTILIZATION OF IMPROVED CASSAVA TECHNOLOGIES IN SOUTHEAST, NIGERIA

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ABSTRACT

This study investigates gender differentials in the adoption of improved cassava technologies in Southeast Nigeria, specifically focusing on socioeconomic characteristics of male and female cassava farmers, level of utilization of improved cassava technologies among male and female cassava farmers and factors influencing utilization among male and female cassava farmers. Using a multi-stage sampling technique, two Local Government Areas (LGAs) each from Anambra and Abia states were selected based on farmer cooperative concentrations. The sample comprised 120 farmers from four cooperatives, with data collected through structured questionnaires in face-to-face interviews. Descriptive and inferential statistics, including ordinary least squares regression analysis, were employed for data analysis. The results indicated active utilization of improved cassava technologies by both genders, with factors such as education, marital status, and income significantly influencing adoption. While gender disparities were observed in some socioeconomic characteristics, there was no significant difference in technology utilization between male and female farmers. The findings underscore the need for targeted interventions to address gender disparities in resource access and empower women in agriculture. Recommendations include enhancing women's access to resources, providing gender-sensitive extension services, and promoting women's participation in decision-making. The positive findings suggest an opportunity to foster inclusive and sustainable agricultural development in Southeast Nigeria by empowering women in cassava production

Key words: Cassava Technologies, Gender Differentials; Utilization; Socioeconomic Factors

Introduction

Cassava is an important crop in Nigeria and Africa, renowned for its ability to thrive under extreme stress conditions, minimal input requirements, year-round availability, and efficient food energy production (Beeching, Niger and Tohme, 2000; Awa and Tumanth, 2001; Ekwe, Nwachukwu and Ekwe, 2008). It is considered the foremost crop for food security and poverty alleviation in Nigeria and Sub-Saharan Africa (Nweke et al., 2002). Cassava's adaptability to marginal lands, drought tolerance, and long storage capabilities make it a valuable resource for resource-poor farmers (Okunade, Olaniyi and Ogunnle, 2005). Nigeria is the world's largest cassava producer, with substantial production estimated at about 60 million metric tons (FAO, 2022). Also, global cassava production in terms of total area harvested has increased substantially in recent years. Nigeria led the world in this aspect with total harvested area of 7.7 million ha in 2020 (FAOSTAT, 2022). Harnessing the potential of cassava can bridge food security gaps and contribute to poverty reduction and environmental sustainability (Clair and Etukudo, 2000).

The significant gender gap in agricultural productivity, as highlighted by the World Bank (2014), stands as a key obstacle to agricultural

growth. Gender dynamics acknowledge that adult males and females engage with social and economic realities differently, shaped by their socio-economic status and cultural context. The efficacy of numerous policies, programs, and projects directed at rural farming households has been hindered by the oversight of gender roles and positions. Notably, the work performed by female farmers tends to be underestimated, unreported, or underreported in economic analyses, while the focus remains predominantly on the contributions of males (Oladosu et al., 2018). This imbalance has resulted in inequities in the formulation and implementation of agricultural strategies and policies in Nigeria.

These gender-based differences extend to economic capacities and incentives, thereby diminishing women's ability to contribute to and benefit from economic growth. This inequality further influences intra-household resource allocation, land productivity, and overall welfare levels. Importantly, the disparities in accessing agricultural inputs, technology, and extension services create discernible productivity gaps between men and women in low-income countries, as highlighted by Peterman, Behrman, and Quisumbing (2014). Recognizing and addressing these gender-specific challenges is

essential for fostering inclusive and effective agricultural development strategies.

Studies consistently demonstrate that men are more likely to adopt agricultural technologies and practices compared to women, leading to disparities in productivity (Peterman et al., 2014; Dongsop-Nguez et al., 2016; Gaya, Tegbaru, Bamire, Abdoulaye, and Kehinde, 2017). Factors such as labor shortages, limited access to productive resources, and gender norms contribute to lower agricultural productivity among women (World Bank, 2014). It is estimated that women's farm yields could increase by 20-30% if they had equal access to productive resources as men, potentially raising total agricultural output by 2.5-4% in low-income countries (FAO, 2011). However, even with equal access, women may still face challenges due to gender norms, institutional constraints, and market failures (World Bank, 2014). While modern technologies have the potential to improve livelihoods and increase productivity for both men and women in agriculture (RadovićMarković and Živanović, 2020; Kabir, RadovićMarković, and Radulović, 2019; Ogunniyi et al., 2017), evidence suggests that women's adoption rates of agricultural technologies remain low compared to men (Theis, Lefore, Meinzen-Dick, and Bryan, 2018; Ragasa, Sengupta, Osorio, OurabahHaddad, and Mathieson, 2014). Socio-economic constraints, limited information and knowledge, gender role beliefs, and time constraints are among the challenges faced by women in accessing and adopting agricultural technologies (Rola-Rubzen et al., 2020; Quisumbing and Pandolfelli, 2010). Additionally, variations in technology preferences based on different tasks and responsibilities further contribute to disparities in technology adoption (Huyer, 2016; Ahuja and Narayan, 2016).

Reducing the gender gap in agriculture is recognized as a priority to foster agricultural growth and development, particularly in developing countries (Huyer, 2016; FAO, 2011; Ahearn and Tempelman, 2010). Simultaneously, women's empowerment is considered a key factor in achieving gender equality, improving agricultural productivity, and advancing broader development outcomes (Seymour, 2017; Alkire et al., 2013). Empowering rural women and promoting the adoption of agricultural technologies can lead to enhanced productivity among female farmers (Seymour, 2017; Peterman et al., 2010).

Despite the importance of addressing gender differences in technology adoption, there is a dearth of research on this issue in different parts of the world (Alvi et al., 2021; Bezner, 2017; Huyer, 2016; Njuki et al., 2014) inclusive of South-east, Nigeria. This study aims to fill this research gap by providing empirical evidence on gender differences in the utilization of improved cassava technologies in Southeast Nigeria. Understanding these dynamics

will contribute to designing gender-responsive agricultural programs and initiatives that effectively address the challenges faced by women in adopting agricultural technologies (Kristjanson et al., 2017; Rola-Rubzen et al., 2020).

Against this backdrop, this paper sought to analyse the gender dimensions to the factors influencing adoption of improved cassava technologies in Abia and Anambra States of Nigeria. Specifically, the study described socioeconomic characteristics of the respondents by gender; assessed level of utilization of improved cassava technologies by gender; and examined factors influencing utilization of improved cassava technologies by gender.

Hypotheses:

1. There is no significant difference between selected socioeconomic characteristics of male and female cassava farmers.
2. There is no significant difference in utilization of cassava technologies between male and female farmers.

Methodology:

The study area was South East, Nigeria. South East, Nigeria is divided into five states which include Abia, Anambra, Ebonyi, Enugu and Imo. It is located within latitudes 5°N to 6°N of the equator and longitudes 6°E and 8°E of the Greenwich (prime) meridian (M.S Corporation, 2009). The climate of the zone has two main regimes; dry (November-February) and rainy or wet (March-October) seasons. Rainfall in Southeast is between 1800 and 2700 mm and temperature ranges are 28-35 °C and 19-24 °C for mean maximum and average, respectively. Southeast is a rainforest zone which comprises a belt of tall trees with dense undergrowth of shorter species dominated by climbing plants (Nwajiuba and Onyeneke, 2010). It allows the growth and survival of most tropical food crops like yam, cassava, maize, vegetables, rice, cocoyam, sweetpotato, as well as livestock production. As a result, about 60-70% of the inhabitants of this zone are engaged in agriculture, mainly crop farming and animal rearing (Okoye et al., 2010). Root and tuber crops like cassava, yam, cocoyam, sweetpotato are massively produced in the rural areas of the zone.

Multi-stage sampling technique was adopted in selecting the respondents for this study. The first stage involved the purposive selection of two out of the five States that make up the zone These states are Anambra and Abia states. In the second stage, two Local Government Areas (LGAs) each from Anambra and Abia states were purposively selected based on their large concentration of farmer cooperatives. The selected LGAs were Awka North and Ayamelum from Anambra state, and Isiala Ngwa South and Umuahia South from Abia state.

In the third stage, two cooperative societies were randomly chosen from each of the selected LGAs. In the fourth stage, 15 farmers were randomly selected

from a list of members of each of the selected cooperative societies, resulting in a total of 120 farmers as participants. Data was collected using a structured questionnaire. Descriptive and inferential statistics were used to analyze the collected data. Level of utilization of improved cassava technologies was achieved with a 4- point Likert type rating. The 4-point Likert type rating was weighed in this order: Never = 1, Rarely = 2, Often = 3, Always = 4. Mean score response equal to or above calculated mean score of 2.5 was regarded as significant. To determine the mean Likert level $=X_s = \frac{\sum X}{n}$. X_s of each item were computed by multiplying the frequency of each response pattern with its appropriate nominal value and dividing the sum with the number of respondent to the items. This can be summarized with the equation below: $X_s = \frac{\sum fn}{nr}$.

Where:

\bar{X} = Mean score; Σ = Summation; f = Frequency; n = Likert nominal; n_r = number of respondents

$$\bar{X} = \frac{0+1+2+3+4}{4} = \frac{10}{4} = 2.5$$

Ordinary least squares regression analysis was used to estimate the factors influencing utilization of improved cassava technologies by gender.

Model specification

The implicit form of regression model is specified as follows:

$$Y = F(X_1, X_2, X_3, X_4, X_5, e)$$

Y = Utilization of cassava technologies by gender (measured with mean scores)

The independent variables are:

X_1 = Age of respondents (No. of yrs of age); X_2 = Level of education (No. of years of schooling); X_3 = Extension contact (No. of extension visits received by farmers in a yr); X_4 = Marital status (Married = 1; Otherwise = 0); X_5 = Income from cassava (Annual earnings from cassava); e = error term.

Z- test was used to test the hypothesis of significant difference in cassava utilization between male and female farmers. This hypothesis was tested using Z- test at 10% level of significance as specified. The choice of Z-test to test the hypothesis is because $n > 30$.

Where; Z = calculated value, X_1 = Mean cassava utilization of males, X_2 = Mean cassava utilization of females, d^2X_1 = Sample variance of utilization for males, d^2X_2 = Sample variance of utilization for females, n = Sample size of males, n = Sample size of females

Decision: if $Z_{cal} > Z_{tab}$ at $(P \leq 0.10)$, we reject the null hypothesis.

Results and Discussion

Socioeconomic Characteristics of the Respondents

This section discussed the socio-economic characteristics of farmers which are known to influence adoption of agricultural technologies.

Table 1: Socioeconomic characteristics of the respondents

Variable	Male (N=70)			Female (N=50)		
	Frequency	%	Mean	Frequency	%	Mean
Age						
21 – 40	41	58.6		43	86.0	
41 – 60	23	32.9		5	10.0	
61 – 80	6	8.5		2	4.0	
Total	70	100	40.9	50	100	35.6
Marital Status						
Married	54	77.1		35	70.0	
Single	10	14.4		8	16.0	
Widowed	6	8.5		7	14.0	
Total	70	100			100	
Household size						
1 -5	36	51.4		36	72.0	
6 – 10	33	47.1		14	28.0	
11 – 15	1	1.5		0	0	
Total	70	100	5	50	100	5
Formal Education						
No formal Education	4	5.7		1	2.0	
Primary Education	17	24.3		8	16.0	
Secondary Education	32	45.7		26	52.0	
Tertiary Education	17	24.3		15	30.0	
Total	70	100	10.8		100	11.3
Years of farming						
1 – 5	2	2.8		5	10.0	
6 – 10	27	38.6		20	40.0	
11 – 15	17	24.3		15	30.0	
16 – 20	13	18.6		5	10.0	

Above 20 years	11	15.7		5	10.0	
Total	70	100	14.8	50		12.9
Extension contact						
Yes	25	35.7		22	44.0	
No	45	64.3		28	56.0	
Total	70	100		50	100	
Access to credit						
Yes	24	34.3		24	48.0	
No	46	65.7		26	52.0	
Total	70	100		50	100	

Source: Field Survey, 2023

The socioeconomic variables considered include age, level of education, household size, marital status, years of farming, extension contact and access to credit. The results in table 1 revealed that the mean ages of male and female respondents' were 40.6 and 35.6, respectively. The age distributions among the male respondents were as follows: while 58.6% of them fell in the age range of 21-40 years, 32.9%, and 8.5% fell in the range of 41-60 and 61-80 years, respectively. On the other hand, 86.0% of the female respondents fell in the age range of 21-40 years, 10.0% and 4% of the respondents fell in the age range of 41-60 and 61-80, respectively. The means of the ages of the respondents of both sexes revealed that they are still in their active ages.

The marital status of the respondents revealed that majority of both the male (77.1%) and female (70.0%) respondents were married while 14.4% and 16.0% of the male and female respondents respectively were single. The low proportion of the singles among respondents of both classes revealed that Nigerian youths are not so much interested in farming rather they seem to show preference for white collar job. The distribution of the household size revealed that 51.4 % and 47.1% of the male respondents had household size range of 1-5 and 6-10, respectively while 72.0% and 28.0% of the female respondents had household size range of 1-5 and 6-10, respectively. The mean household sizes between the male and female respondents were 5 persons

respectively. This corroborates the findings of Idumah et al. (2015).

Majority of both the male (94.3%) and female (98.0%) respondents had one form of formal education or another. The means of year of schooling among the male and female respondents were 10.8 years and 11.3 years. This implies that the respondents are educated.

The means of years of farming among the male and female respondents were 14.8 and 12.9 years, respectively. The distribution among the male respondents revealed that 2.8%, 38.6%, 24.3%, 18.6% and 15.7% of the respondents had farm experience ranging from 1-5 years, 6-10 years, 11-15 years, and 16-20 years and above 20 years, respectively. Among the female respondents, the distribution revealed that 10%, 40%, 30%, 10% and 10% of them had farm experience ranging from 1-5 years, 6-10 years, 11-15 years, 16-20 years and above 20 years, respectively. Majority of both the male (64.3%) and female (56.0%) respondents do not have access to extension contact. Similarly, majority of both male (65.7%) and female (52.0%) respondents do not have access to credit.

Level of Utilization of Improved Cassava Technologies by Gender

Technological Innovation if properly understood from the gender perspective can foster increase in agricultural productivity (Tavya et. al. 2013).

Table 2: Level of utilization of male and female cassava famers' utilization of improved cassava technologies

Technologies	Male			Female		
	Mean	SD	Decision	Mean	SD	Decision
Yellow root varieties	2.31	1.14	Not utilized	1.94	0.96	Not utilized
White root varieties	3.10	1.19	Utilized	3.38	1.09	Utilized
GAP in cassava	3.20	0.79	Utilized	3.36	0.72	Utilized
Value addition	2.63	1.05	Utilized	2.62	0.99	Utilized
Grand mean	2.81	0.72	Utilized	2.83	0.64	Utilized

Source: Field Survey, 2023; Bench mark mean score = 2.50.

Table 2 presents gender usage of cassava technologies in the study area. The result shows that male and female cassava farmers use white root varieties, good agronomic practices (GAPs) in cassava production and cassava value addition technologies. The implication is that innovations in

cassava have been effectively utilized in the study area. However, yellow root varieties, which have not been utilized in this context, may be attributed to undesirable characteristics such as the loss of yellow color during processing, as reported by Amadi et al. (2021).

Factors Influencing Utilization of Improved Cassava Technologies by Gender

Ordinary least squares regression analysis of factors influencing utilization of improved cassava technologies is presented in table 3.

Table 3: Ordinary Least Squares regression analysis of socioeconomic factors influencing utilization of improved cassava technologies by gender

Variable	Male		Female		Pooled	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Constant	-1.0742	-1.36	-1.7960	-1.74 *	-0.8188	-2.92**
Age	-0.0727	-0.61	-0.0194	-0.09	0.0515	1.12
Education	0.1331	2.80**	0.0263	0.35	0.0443	2.41**
Ext. Contact	0.0351	0.37	0.1128	1.10	0.0168	0.51
Marital Status	0.2612	2.49**	0.1558	1.27	0.0758	2.14**
Income from cassava	0.1519	3.59***	0.2125	3.41***	0.0704	4.56***
R²	0.4036		0.4893		0.5404	
Adjusted R²	0.3492		0.4198		0.5071	
F-Statistic	5.58		5.61		7.22	

Lead equation: Double log; *significant at 10%, **significant at 5%, *** significant at 1%

The double-log function with the highest R^2 (0.4036) for males, (0.4893) for females, and (0.5404) for pooled, the highest number of variable significance and in conformity with the *a priori* expectation was chosen as the lead equation. The coefficient of multiple determinant R^2 (0.4036) for males, (0.4893) for females and (0.5404) for pooled indicate that 40.36%, 48.93% and 54.04% respectively of the variations in the use of improved cassava technologies were explained by the joint action of the respondents' socioeconomic characteristics, while the F-statistics of 5.58***, 5.61*** and 7.22 indicated that the results were normally distributed.

The coefficient of level of education was positive and statistically significant at 5% level of probability for the males indicating that a unit increase in the level of farmer's education will lead to a significant increase in the use of improved cassava technologies and vice versa. However, it was not significant for the females. This result is consistent with *a priori* expectation as education improves the ability to obtain, process, and use information that is relevant for adoption and utilization of agricultural technologies. The coefficient of marital status was positive and statistically significant at 5% level of probability for males; this finding indicates that a change in marital status among male farmers will

significantly affect the level of use of improved cassava technologies in Southeast. On the other hand, the coefficient of marital status was not statistically significant for females. A large household which is largely synonymous with those who are married will have the advantage of labor availability (Effiong, 2005; Idiong, 2005).

The coefficient of Income was also positive and statistically significant at 1% level of probability indicating that one unit increase in the income of both male and female cassava farmers will increase to a greater extent the use of improved cassava technologies. As income increases, households have access to more resources to support various expenditures, including investments in agricultural production aimed at enhancing farm productivity. The result is similar to the findings of Udensi et al, (2011). Contrarily, the findings of the study carried out by Amadi (2018) revealed a negative relationship between income and adoption of cassava value addition technologies among male and female farmers in Imo state, Nigeria.

Test of Hypotheses

H_{01} : There is no significant difference between the socioeconomic characteristics of male and female cassava farmers.

Table 4: Z-test table showing the difference in socioeconomic characteristics of male and female cassava farmers

Variable	Male		Female		Z-statistic
	Mean	SD	Mean	SD	
Age (Yrs)	40.87	11.63	35.6	7.28	3.069**
Years spent in school	10.81	5.90	11.32	3.33	-0.596
Years of farming	14.8	8.14	12.9	7.44	1.340
Income (N/Annum)	328,571.4	202,250.3	384,000	187,246.4	1.546*
Yield (t/ha)	25.81	17.98	35.24	17.26	2.898**

Source: Field survey, 2022;

Z-test was used to compare the means of explanatory variables between male cassava farmers and female cassava farmers. Results on table 4 indicated a significant difference in the age of male and female cassava farmers in the study area at 5% level of probability. With regard to average income per annum, the income of female cassava farmers was significantly higher than the income of male cassava farmers at 10% level of probability. Similarly, the yield of female cassava farmers was significantly

higher than the yield of male cassava farmers at 5% level of probability. This implies that there were significant differences in selected socioeconomic characteristics of male and female cassava farmers. We thus, reject the null hypothesis and accept the alternative hypothesis.

H₀₂: There is no significant difference in utilization of improved cassava technologies between male and female cassava farmers.

Table 5: Z-test table showing the difference between utilization of improved cassava technologies among the male and female farmers

Variable	N	Mean	Std. Deviation	Std. Error	Z- Statistics	Df	Pr>t
Utilization Male	70	2.8101	0.7178	0.0858	-0.1144	118	0.5454
Utilization Female	50	2.8250	0.6414	0.0907			

Source: Field survey, 2022;

Results on table 5 show that the z-statistic was not significant which implies that there was no significant difference in utilization of improved cassava technologies between male and female cassava farmers. We therefore accept the null hypothesis (H₀₂). The study concludes that gender had no significant influence on the utilization of improved cassava technologies in South-East Nigeria.

Conclusion:

The study reveals that cassava farmers in Southeast Nigeria, both men, and women, were utilizing improved cassava technologies, which bodes well for agricultural productivity. Factors such as level of education, marital status and income significantly influence utilization of improved cassava technologies. However, gender disparities persist in selected socioeconomic characteristics. Despite this, there was no significant difference in technology utilization between male and female farmers. The findings underscore the need for targeted interventions to address gender disparities in resource access and empower women in agriculture since women produce majority of the staple foods consumed in South-east and Nigeria as a whole.

Recommendations:

Based on the research findings, the following recommendations are proposed:

Strengthen women's access to resources: Even though women are already actively engaged in cassava production, it is crucial to ensure they have equal access to productive resources such as land, credit, and inputs. Government and development agencies should implement policies that promote women's ownership and control of resources, enabling them to expand their cassava cultivation and increase productivity.

Enhance women's education and training: The positive influence of education on the farmers' resource utilization has been noted, in this

regard, there is need to strengthen the current policies on education such as the universal basic education, adult education and nomadic education.

To further improve cassava production and utilization, invest in educational and training programs specifically targeted at women. Providing them with technical skills, and management techniques will empower them to adopt improved cassava technologies more effectively and increase their overall productivity.

Promote women's participation in decision-making: Encourage women's active participation in decision-making processes related to agricultural development and technology adoption. Including women in local agricultural committees, cooperatives, and extension services will ensure their voices are heard and their needs are addressed in designing and implementing agricultural policies and programs..

The positive findings of this research indicate that women in Southeast Nigeria benefit more from technologies in cassava production, offering a chance to boost both women's empowerment and agricultural productivity. Addressing gender disparities through targeted interventions can promote inclusive and sustainable agricultural development in the region. Empowering women in agriculture will not only enhance cassava production but also improve food security and overall economic growth in Nigeria.

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