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### Gender analysis of cassava based technologies adoption among farmers in Ondo state, Nigeria

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#### Abstract

The study was conducted to assess the gender analysis of cassava based technologies among farmers in Ondo state Nigeria. The study specifically ascertained the socioeconomic characteristics of cassava farmers, examined the level of awareness of cassava based technologies by male and female farmers, determined the level of adoption of cassava based technologies by male and female farmers, determined the effects of male and female cassava adoption of technologies on the farm and identified the factors influencing the adoption of technologies by male and female cassava farmers. A multi-stage sampling procedure involving purposive random sampling technique was adopted to select 3 Local Government Areas, 2 communities and 12 male and female respondents each to give a sample size of 144 respondents. Primary data were collected through interview schedule using a well-structured questionnaire. Data were analyzed using descriptive and inferential statistical tools. The result of socio-economic characteristics of respondents revealed a mean age of 50.88 years, dominance of male farmers (63.2%), farming experience (22.70 years) land size cultivated (11.26 hectares), cassava output (27.76 tonnes) and annual farm earning (₦2,721,333.33). The result of adoption level of cassava based technologies revealed higher awareness among male farmers compared to female farmers. The result of adoption level of cassava based technologies revealed higher adoption among female farmers compared to the male farmers. The analysis of the effect of male and female adoption of cassava based technologies on farm production revealed that a negative effect exists on security and conservation of resource base ( $p=0.037$ ). The result of factor influencing adoption of cassava based technologies revealed that cultural barriers and lack of storage facilities were seen as major factors to female farmers but minor factors to male farmers. A positive significant relationship exist between adoption of cassava based technologies adoption and the size of land cultivated by the respondent ( $p=0.034$ ). Furthermore, there is a significant difference between the male and female adoption of cassava based technologies [ $p=0.726$ ] in the study area. It is recommended that agricultural research institutes take into consideration gender perspective, cultural barriers and regional peculiarities in designing agricultural technologies for farmers.

**Keywords:** Gender, male, female, cassava, adoption, technology

#### Introduction

Technology is one of the resources for agricultural production. According to Ingold (2002) <sup>[8]</sup>, technology differs widely, depending on whether the intent is to embrace the totality of human works, in all societies and during all epochs. Technology can reach farmers through transfer and are expected to adopt or reject the technology. According to Loevinsohn *et al.* (2013) <sup>[9]</sup> adoption is the integration of a new technology into existing practice and is usually proceeded by a period of 'trying' and some degree of adaptation. Several technologies have being advanced by root and tuber researchers so as to increase the yield of cassava ranging from use of improved varieties, cropping patterns, planting materials, planting style and so on (Sodiya, *et al.* 2007) <sup>[12]</sup>. The adoption of these technologies have been proven to significantly increase the yield of cassava farmer hence efforts have been put by agricultural extension practitioners to encourage their adoption among the small holder farmers (Uchemba *et al.*, 2021) <sup>[14]</sup>. Over the years improved cassava seedlings, planting spacing, fertilizer application, use of herbicides, and time of

harvesting and processing methods have being taught farmers to help them maximize the potentials of cultivating the crop which has yield dividends towards increased output (Yuniwati *et al.* 2015) <sup>[16]</sup>. Even with these technologies their adoption still remain a challenge as farmers prefer to stick to their old practices and the general extent of compliance to guideline introduced has not been adequately complied with by the farmers. This has been attributed to be caused by several factors which differ across the several farming communities in Nigeria. Ayinde *et al.*, (2013) <sup>[3]</sup> affirmed that bridging the gap in access to technology between men and women and technological adoption among male and female farmers is crucial to improved productivity. Hence, the recognition of gender disaggregated constraints, gender imbalances, differentials in gender roles and decision making as related to agricultural technology among arable crop farmers is important for any transformation of Nigeria agricultural sector and achievement of food security. There is the need to analyze the accessibility and technology adoption response of arable crop farmers in the state. The general objective of the study is to analyze the gender

perspective of adoption of agricultural technology by cassava farmers in Ondo State, Nigeria. The specific objectives are to:

1. ascertain the socioeconomic characteristics of cassava farmers in the study area
2. determine the level of awareness of cassava based technologies by male and female farmers in the study area;
3. determine the level of adoption of cassava based technologies by male and female farmers in the area;
4. determine the effects of male and female cassava adoption of technologies on the farm, and;
5. identify the factors influencing the adoption of technologies by male and female cassava farmers

The hypotheses for the study were stated in null form as follows;

**H<sub>01</sub>:** There is no significant relationship between the socioeconomic characteristics of the respondents and their adoption of cassava based technologies,

**H<sub>02</sub>:** There is no significant difference between the level of adoption of cassava based technologies by male and female farmers.

### Research Methodology

The study was carried out in Ondo state Nigeria. The population of the study was arable crop farmers adopting various technologies in Ondo State, Nigeria. A multistage sampling procedure was used to select the respondents. Three (3) local government areas prominent for cassava cultivation were purposively selected from eighteen (18) LGAs in the state. Two rural communities were randomly selected from each of the selected local government areas. The last stage involve purposive selection of twelve (12) female and twelve (12) male cassava farmers in each selected communities, given a total of one hundred and forty-four (144) cassava farmers as sample size. Primary data were collected from the respondents using a well-structured questionnaire based on the objectives of the study. Analysis of data was carried out using both descriptive and inferential means.

### Results and Discussion

The results on Table 1 shows the socioeconomic characteristics of the respondents which revealed that majority of the respondents were between 31-60 years of age (75.1%) while the average age was 50.88 years. This shows high number of youth involvement in cassava production confirming the work of Vihi *et al.* (2022) <sup>[15]</sup> who pointed out the increasing younger people taking up the opportunities in cassava production., There were more male respondents (63.2%) compared to the female (36.8%) which further confirmed male dominance in agricultural activities. The finding contradicts the 60-80% reported by Gbemisola, *et al.* (2013) <sup>[6]</sup> on female involvement in cassava

production which is not denying an increase but certainly not as high in this region where most of the farm activities are manual requiring a lot of physical energy. Result on marital status showed that 1.4 percent were singles while 93.8 percent were married, also, 4.7% of the respondents belonged to the traditional religion group while majority were Christian (67.6%) implying that religion and cultural beliefs still play a huge role in the farm decision of the people. The result of respondent's level of education revealed that those who completed primary education formed the largest group (32.6%), followed by those who completed secondary education (29.2%) while those who had other forms of education were least (1.4%). This implies that majority of the farmers were literate and as such would be more proactive towards information and opportunities for increase productivity. This supports the assertion by Babatunde, *et al.* (2012) <sup>[4]</sup> that educational level of farmers in South Western Nigeria is a factor when taking right farm decisions. The result of farming experience showed an average farming experience of 22.7 years which indicates that most of respondents have adequate experience about the farming activities. Furthermore, the mean household size was five (5) with majority of the respondents (75.7%) being heads of household which means they take major farm decisions concerning farm activities. Also the major primary occupation of the respondents was farming (85.4%) which conform to Ofuoku (2020) <sup>[11]</sup> that agricultural activities has remained the major occupational source of livelihood across Nigeria. The result of respondents' major source of farm labour was family and hired labour (51.4%) while the least was communal labour (0.7%). More than half of the respondents (52.1%) cultivated land size of 1-5 hectares followed by those who cultivated above 16 hectares (31.9%) while those who cultivated 11-15 hectares were few (6.3%). The result showed that land ownership system was mostly through rented (41%), inheritance (21.5%) and communal (14.6%) ownership. The above findings confirm the earlier assertion that the farmers in the study area make more use of hired labour for cassava production because they cultivate large expanse of their rented land which span in hectares. Majority (61.8%) of the respondents had no access to credit facilities while the r the mean annual farm income of the respondents was ₦2,721,333.33 with those earning above ₦2.0 million (34.7%) followed by those earning in the range of ₦500,000 to ₦1million (33.3%) while those earning ₦1.51 to ₦2million were few (7.6%). The result further showed the mean of cassava output and cost of cassava production to be 27.76 tonnes and ₦57,881.9 respectively. Majority (85.4%) of the respondents identified as members of farmers association while only few (14.6%) did not belong to any group. The above findings further implies that access to finance for agricultural activities is limited especially from the formal sector even as the average annual earnings from cassava farming is above two million naira. This shows why the farmers' cooperative and associations are created and majority of the farmers become members to attract funds for their farm operations.

**Table 1:** Socio-economic characteristics of respondents

Variables	Frequency	Percentages (%)	Means
<b>Age (years)</b>			50.88
≤30	8	5.6	
31-40	23	16.0	
41-50	42	29.2	
51-60	43	29.9	
61-70	18	12.5	
≥71	10	6.9	
<b>Sex</b>			
Male	91	63.2	
Female	53	36.8	
<b>Marital status</b>			
Single	2	1.4	
Married	135	93.8	
Widowed	7	4.9	
<b>Religion</b>			
Christianity	96	67.6	
Islam	39	27.5	
Traditional	7	4.9	
<b>Educational level</b>			
Non-formal	8	5.6	
Attempted Primary school	6	4.2	
Completed primary school	47	32.6	
Attempted secondary school	17	11.8	
Completed secondary school	42	29.2	
Tertiary education	22	15.3	
Others	2	1.4	
<b>Farming experience (years)</b>			22.70
≤5	1	0.7	
6=10	26	18.1	
11-15	21	14.6	
16-20	25	17.4	
21-25	24	16.7	
≥26	47	32.6	
<b>Head of family</b>			5
No	35	24.3	
Yes	109	75.7	
<b>Household size (persons)</b>			
1-3	15	10.4	
4-6	80	55.6	
Above 6	49	34.0	
<b>Primary occupation</b>			
Farming	123	85.4	
Civil service	8	5.6	
Trading/ Business	7	4.9	
Artisan	3	2.1	
Others	3	2.1	
<b>Secondary occupation</b>			
Farming	93	64.6	
Civil Service	0	0	
Trading/Business	31	21.5	
Artisan	15	10.4	
Others	5	3.5	
<b>Source of labour</b>			
Family Labour	5	3.5	
Hired labour	62	43.1	
Communal labour	1	0.7	
Family and Hired labour	74	51.4	
Family and Communal labour	2	1.4	
<b>Land size cultivated (hectares)</b>			4.6
1-5	83	57.7	
6-10	34	23.6	
11-15	11	7.6	
>15	16	11.1	

Land ownership system			
Communal	21	14.6	
Inheritance	31	21.5	
Leased	14	9.7	
Rent	59	41.0	
Freehold	3	2.1	
Tenant at Government will	1	0.7	
Purchased	4	2.8	
Access to credit			
Inaccessible	89	61.8	
Accessible	44	30.6	
Very accessible	11	7.6	
Annual income (naira)			
100,000-500,000	20	13.9	₦1,871,333
500,001- 1,000,000	48	33.3	
1,000,001- 1,500,000	15	10.4	
1,500,001- 2,000,000	11	7.6	
>2,000,000	50	34.7	
Cassava output (tonnes)			
<10	9	6.3	22.7
11-20	68	47.2	
21-30	21	14.6	
31-40	23	16.0	
>40	23	16.0	
Cost of production (naira)			
10,000-20,000	1	0.7	₦57,881
21,000-30,000	9	6.3	
31,000 - 40,000	50	34.7	
41,000 - 50,000	44	30.6	
>50,000	40	27.8	
Membership of farmers association			
Yes	21	14.6	
No	123	85.4	

Source: Field survey 2023

**Awareness level of cassava based technology**

The result revealed high level awareness of cassava based technologies among the respondents with 139 respondents representing 96.5% of the total sample size, with only a few (3.5%) not being aware. The result further revealed that there was high level of awareness among male for 8 of the listed cassava based technologies such as improved varieties (3.55), NPK (3.55), Urea (3.52), insecticide (3.58), manure (3.50), presser (3.50) and grater while there was moderate awareness for the reaming 13 technologies including fryer (3.43), grinder (3.42), peeler (3.34), washer (3.41), milling (3.41), chipper (3.40), dryer (3.35), extractor (3.34), fermenter (3.33), sifter (3.32), pelleting (3.33), boiling (3.33) and distiller (3.27). On the other hand there was high

awareness among the female respondents for insecticide (3.51) while awareness for the other 20 listed technologies were moderate. This implies that the male farmers in the study area were more aware about cassava based technologies than the female farmers. Also, the male farmers were more awareness of production technologies than technologies use for processing which conforms to the report of Anyanwu (2018) [2] that farmers were less aware of improve cassava processing technologies. This shows that there is generally low understanding of cassava based technologies in the study area thereby collaborating report of Hasa (2020) [7] that awareness should bring about an understanding to enable an individual take an advantageous cause of action.

**Table 2:** Awareness level of cassava based technology

Cassava Based Technology	Level of Awareness	
	Mean Score (Male)	Mean Score (Female)
Improved Varieties	3.55	3.41
NKP	3.55	3.31
Urea	3.52	3.35
Insecticide	3.58	3.51
Herbicide	3.51	3.35
Manure	3.50	3.27
Presser	3.50	3.43
Grater	3.50	3.31
Fryer	3.43	3.24
Grinder	3.42	3.33
Peeler	3.34	3.14

Washer	3.41	3.10
Milling	3.41	3.16
Chipper	3.40	3.14
Dryer	3.35	3.22
Extractor	3.34	3.20
Fermenter	3.33	3.18
Sifter	3.32	3.18
Pelleting	3.33	3.22
Boiling	3.33	3.18
Distiller	3.27	3.06

Source: Field Survey 2023 Decision <3.0 Low, <3.5 Moderate, ≥3.5 High

**Level of adoption of cassava based technology**

The result of Table 3 shows the level of adoption for cassava based technologies across gender which revealed that male respondents had high adoption level for 3 of the listed cassava based technologies which were improved varieties (2.53), herbicides (2.50) and manure (2.51) while there was low adoption level for NPK (2.45), Urea (2.49), insecticide (2.44), presser (2.40), grater (2.32), fryer (2.29), grinder (2.36), peeler (2.39), washer (2.44), milling (2.39), chipper(2.43), dryer (2.36), extractor (2.37), fermenter (2.36), sifter (2.34), pelleting (2.34), boiling (2.35) and distiller (2.29). Furthermore, the female respondents had high adoption level for 5 listed cassava based technologies;

improved varieties (2.53), herbicides (2.60), manure (2.54), presser (2.61) and fermenter (2.50) while they have low adoption level for 16 other technologies. This revealed a general low adoption level, preference was given to improved varieties, herbicides and manure adoption for both male and female farmer. This findings contradict Vihi *et al.* (2022) [15] that revealed high adoption of cassava processing technologies among farmers, this could be due to the difference in the regions these studies were conducted. The cassava processing technologies seem to be more useful to farmers in dryer regions than those in wet regions of the country.

**Table 3:** Level of adoption of cassava based technologies

Cassava Based Technology	Adoption Level	
	Mean Score (Male)	Mean Score (Female)
Improved Varieties	2.53	2.53
NKP	2.45	2.29
Urea	2.49	2.35
Insecticide	2.44	2.43
Herbicide	2.50	2.60
Manure	2.51	2.54
Presser	2.40	2.61
Grater	2.32	2.43
Fryer	2.29	2.42
Grinder	2.36	2.44
Peeler	2.39	2.33
Washer	2.44	2.33
Milling	2.39	2.38
Chipper	2.43	2.37
Dryer	2.36	2.39
Extractor	2.37	2.41
Fermenter	2.36	2.50
Sifter	2.34	2.36
Pelleting	2.34	2.38
Boiling	2.35	2.36
Distiller	2.29	2.39

Source: Field Survey 2023 Decision <2.5 Low, ≥2.5 High

**Effects of cassava based technologies adoption on farm production**

The result of Table 4 shows the effect of cassava based technologies adoption on respondents’ farm production. The R value (0.302) shows a low degree of correlation between male and female adoption of cassava based technologies. R<sup>2</sup> value (0.20) shows that only 20% of the variation of male and female adoption of cassava based technologies can be explained by the independent variables which in this case is low. The regression result shows that only security and conservation of resource based was significant (0.037) at

5% confidence level with a negative coefficient value of -0.258 implying that an increase in the security and conservation of resource based of respondents leads to a decrease in the male and female adoption of cassava based technologies. This finding conform with report of Aduwo *et al.* (2019) [1] that adoption of some technologies across gender plays a role in food security either positively or negatively. As seen here cassava based technologies adoption across gender seem to have an inverse relationship with security and conservation of resource based.

**Table 4:** Effects of cassava based technology adoption on farm production

Variables	$\beta$	Standard error	t-value	Significance
Production expansion				0.123
Increased output/yield	0.227	0.146	-1.553	0.072
Increased production quality	-0.233	0.128	-0.1812	0.837
Increased in farm size	-0.031	0.149	-0.206	0.908
Better standard of living/well being	0.012	0.095	0.122	0.112
Increased income	0.215	0.135	1.598	0.878
Acquired new skills	-0.025	0.163	-0.154	0.815
Increased social status	0.043	0.181	0.235	0.407
Reduced stress	-0.086	0.104	0.832	0.553
Security and conservation of resource based	-0.085	0.143	0.595	0.037**
Constant	-0.258	0.123	-2.104	0.000
R <sup>2</sup>	1.521	0.283	-5.371	0.091

Source: Field Survey, 2023 R 0.302, Adjusted R square 0.020, Standard error of the estimate 0.47885

**Factors affecting male and female adoption of cassava based technologies**

The result of Table 5 shows the factors affecting both male and female adoption of cassava based technologies which were identified as major and minor factors. For the male respondents the following factors were identified including cost of technologies (1.73) complexity of technologies (1.64), inadequate information about technologies (1.70), unstable market prices (1.63), inadequate credit facilities (1.64), inadequate extension visit (1.66), difficult planting operation (1.74) and unavailability of technologies (1.74) as major factor while cultural barriers (1.23) and lack of storage facilities (1.40) were identified as minor factors affecting the male adoption of cassava based technologies. For the female respondents, all the factors under consideration, including cost of technologies (1.71), cultural

barriers (1.55), complexity of technologies (1.59), inadequate information about technologies (1.69), unstable market prices (1.71), lack of storage facilities (1.78), inadequate credit facilities (1.76), inadequate extension visit (1.73), difficult planting operation (1.63) and unavailability of the technologies (1.61) were identified as major factors affecting female adoption of cassava based technologies. This finding conform to report of Neway and Zegeye (2022)<sup>[10]</sup> that certain attributes of agricultural technologies constitute restricting factors to the adoption try some gender. In this case the female respondents find all the identified factors as constraints to adoption of cassava based technologies when compared to the male who do not find cultural barriers and lack of storage facilities as major factors.

**Table 5:** Factors influencing the adoption of cassava based technologies

Factors	Mean score (Male)	Mean score (Female)
Cost of technology	1.73	1.71
Cultural barriers	1.23	1.55
Complexity of technologies	1.64	1.59
Inadequate information about technologies	1.70	1.69
Unstable market prices	1.63	1.71
Lack of storage facilities	1.40	1.78
Inadequate credit facilities	1.64	1.76
Inadequate extension visit	1.66	1.73
Difficult planting operation	1.74	1.63
Unavailability of the technologies	1.78	1.61

Source: Field survey, 2023. Decision <1.5 Minor factor; ≥1.5 Major factor

**Relationship between respondents’ socio-economic characteristics and adoption of cassava based technologies**

The result of Table 6 shows the relationship between socio-economic characteristics of respondents and the adoption of cassava based technology which revealed that only size of land cultivated by the respondents (p=0.034) had significant relationship with adoption of cassava based technologies.

This finding conforms to the report of Tufa *et al.* (2022)<sup>[13]</sup> that land resource allocation across gender has significant relationship with adoption of agricultural technologies. The implication is that, with lower access to land resources there would be less land cultivated and no need for adoption of cassava based technologies that are required for mass production and processing.

**Table 6:** Relationship between socio-economic characteristics of respondents and adoption of cassava based technologies

Variables	r-value	P-value	Decision
Age	0.110	0.198	NS
Level of education	0.064	0.455	NS
Farm size	0.180	0.034	S
Family Headship	-0.076	0.376	NS
Household size	-0.155	0.069	NS
Years of farming experience	0.164	0.054	NS

Source: Field Survey, 2023

**Level of significance between male and female adoption of cassava based technologies**

The result of Table 7 shows the level of significant difference between male and female adoption of cassava based technologies. It revealed that there is a significant difference ( $p = 0.726$ ) in the adoption level of cassava based technologies by male and female in the study area. This finding further highlighted the report of FAO (2022) that certain social phenomenon, policies and processes creates situations that lead to differences in adoption across gender. Cultural gender discrimination and cassava based technologies design flaws could also bring restrictions that could also be responsible for the difference in adoption of technology between genders.

**Table 7:** Relationship between levels of adoption of cassava based technology of male and female respondents

Variable	N	Mean	Standard deviation	Df	F	t-value	Significance
Male	88	19.73	3.24	1370	0.124	0.403	0.726
Female	51	19.89	3.51				
Total	139						

Source: Field Survey, 2023 @5% confidence level

**Conclusion and Recommendation**

**Conclusion**

The assessment of gender analysis of cassava based technologies adoption in Ondo State Nigeria has been able to establish that there are more younger people involved in cassava production with the mean age being 50.88 years, also the production space remain dominated by the male respondents as well as those who are married and only a few have access to credit facilities. Also an average farming experience of 22.70 years, cultivated land of 11.26 hectares and annual earnings from cassava of ₦2,721,333.33 was realized. The study also found that there was high awareness and adoption of production technologies but low awareness and adoption of processing technologies across all gender with female however adopting more processing technologies compared with male. This adoption pattern was seen to only have an inverse effect on the security and conservation of resource based of the respondents in the study area. The study also revealed that cultural barriers and lack of storage facilities were the major factors influencing cassava based technologies adoption by female farmers in the study area while a significant positive relationship was seen to exist between farmers adoption of cassava based technologies and size of land cultivated. Conclusively, the study revealed that there is a significant difference in the adoption of cassava based technologies between male and female farmers in the study area.

**Recommendation**

Based on the above findings the following recommendations were made;

1. With the high number of young people involvement and annual earnings from cassava production, financial institutions should increase lending to these farmers to help them maximize the opportunities available in production.
2. Cassava based technologies developers should consider changing their technology transfer strategy so as to

increase awareness and adoption of processing technologies among farmers in the study area

3. Agricultural research institutes should always take into consideration gender roles and responsibilities, cultural barriers and regional peculiarities in the design of technologies meant for the farmers.
4. For the attainment of food security, there is the need for government intervention in land allocation to enable female farmers enjoy increased access to land resources and maximize opportunities available in the agricultural sector.

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