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IMPACT OF ADOPTION OF IMPROVED CASSAVA PRODUCTION TECHNOLOGIES ON OUTPUT, INCOME AND POVERTY STATUS OF MALE AND FEMALE HEADED CASSAVA FARM HOUSEHOLDS IN ABIA STATE, NIGERIA

[1]Onwusiribe C.S, [2]Nmerengwa J.K, [3]Amadi P.E
[1]National Root Crops Research Institute, Umudike
[2]Department of Agricultural Economic and Extension, Abia State Univeristy, Umuahia Campus
Corresponding Email: justinnmerengwa@gmail.com & chizaramonwusiribe@gmail.com

ABSTRACT

The study specifically described socio-economic characteristics of male and female headed cassava farm households; assess and compare level of adoption of improved cassava production technologies by male and female headed cassava farm households analyzed pre and post poverty profile of male and female headed cassava farm households in the study area; identified problems of adopting improved cassava production technologies. Multi-stage random sampling technique was adopted in the selection of two hundred and sixteen (216) respondents (108 male and 108 female headed cassava farm households. Data for the study were subjected to descriptive and inferential statistics. The Socio-economic profiles of male and female-headed cassava farm households in Abia State showed that the mean ages of the male and female respondents were 46.10 and 38.29 years respectively, while56.48% and 54.62% of the male and female respondents had secondary school education respectively. The mean farm sizes of male and female were 1.98 and 1.30 hectares respectively. Meanwhile, 53.70% and 62.96% of male and female had no access to extension contacts. The level of adoption of selected cassava production technologies by the male and female respondents showed that cassava production technologies adopted by male and female headed cassava farm households were improved cassava varieties such as NR 8082 ($\bar{X}$= 3.68 and $\bar{X}$= 3.58) and UMUCASS 43 ($\bar{X}$= 3.73 and $\bar{X}$= 3,69), ploughing and ridging before planting ($\bar{X}$= 4.37 and $\bar{X}$= 4.19), application of recommended fertilizer to improve soil fertility ($\bar{X}$= 4.69 and $\bar{X}$ = 4.79) supplying/replacement of ungerminated cassava stem cuttings ($\bar{X}$= 4.25 and $\bar{X}$= 4.39) and weeding at least two times in a year ($\bar{X}$= 4.02 and $\bar{X}$= 4.68). The study further revealed significant difference in income, output and food security status of male and female head cassava farm households before and after adoption of cassava production technologies. Male and female headed cassava farm households were constrained majorly by insufficient land for cultivation (96.29% and 100.00%), inadequate capital (93.52% and 100.00%) and inadequate access to credit facilities (95.37% and 100.00%) respectively.

INTRODUCTION

The adoption of improved cassava production technologies is an important route out of poverty for many male and female cassava farm households by enhancing cassava farming productivity and income. Some improved cassava production technologies include recommended herbicides application, use of stem multiplication technology, use of hybrid cassava stem, use of pesticides, use of inorganic fertilizer, appropriate spacing, and planting date and tillage practices. Poverty which is a situation where an individual lives on less than US $1.25 a day or incapable of meeting basic requirements of life is a phenomenon that is multidimensional, widespread and severe in Nigeria (IFAD, 2012). Recently, it was observed that 40 percent of the total population (about 83 million people), live below the country's poverty line of 137,430 naira ($381.75) per year (NBS, 2019).

Cassava production in Nigeria by male and female farm households is still characterized by low yields compared to other cassava growing regions in the world due to factors such as; inadequate knowledge of recommended herbicides application, inadequate knowledge of cassava stem multiplication technology, inappropriate plant spacing, planting date and use of unrecommended tillage practices. Many male and female cassava farm households still depend on local cassava varieties for their planting materials which in turn results in a very low yield at harvest. For instance, research as shown that ten (10) years ago, cassava yi1d in farmers field stood at 5-10 tonnes per hectare (Nwosu, 2005). This figure shows a very poor yield in cassava production.

The realization that most male and female farm households in Nigeria do not adopt improved cassava production technology as expected to increase cassava production, output, income and improve poverty level has posed great attention at the technology adoption process. This result of this study will therefore provide new vista and depended insights into the state's adoption of improved cassava production technologies and its effect on output, income and poverty status of the male and female headed cassava farm households. This will form a formidable basis for formulating appropriate sub-sectoral policies and dependable platform for taking informed decisions.

This study will stimulate wider interest and attract more attention to the need to adopt improved cassava production technologies in the bid to improve cassava output, income and poverty status of male and female headed cassava farm households in Abia state and Nigeria at large.

The study specifically:

i. described the socio-economic characteristics of male and female headed cassava farm households;

ii. assessed level of adoption of improved cassava production technologies by male and female headed cassava farm households in the study area;
iii. determined effect of adoption of improved cassava production technologies on income, output and poverty status, of male and female headed cassava farm households in the study area;
iv. identify problems constraining male and female headed cassava farm households from adopting improved cassava production technologies in the study area.

RESEARCH METHODOLOGY

This study was conducted in Abia State, Nigeria. Abia State is geographically located in the South East region of Nigeria. The State covers a geographical area of 6,320 square kilometers and has a total population of 2,833,999, consisting of 1,434,193 males and 1,399,806 females with a relatively high density of 580 persons per square kilometer (NPC, 2006).

Multi-stage random sampling technique was adopted in the selection of respondents. First, two blocks were randomly selected from the three agricultural zones in the study area to give six (6) blocks. Second, two (2) circles were randomly selected from the six (6) selected blocks to give a total of twelve (12) circles. Third, in each of these circles, three (3) sub circles were randomly selected to make a total of thirty six (36) sub-circles. Finally, six (6) cassava farm households (i.e. 3 male and 3 female headed cassava farm households) were randomly selected from each of the selected sub-circles. This gave a total of two hundred and sixteen (216) respondents (108 male and 108 female headed cassava farm households).

Descriptive statistical tools such as frequencies, mean and percentages were used to achieve objectives (i) and (iv). Objective (ii) was analyzed with adoption score while objective (iii) was achieved with the aid of paired Z-test analysis.

Model Specification

Adoption Score

The level of adoption of improved cassava production was determined using adoption score Index (objective iii). It was achieved with the aid of a 7 point likert scale graded thus; Unaware = 0, Aware = 1, Interest = 2, Evaluation = 3, Trial = 4, Adoption = 5 and Satisfaction = 6.

The mean adoption level was determined as follows:

$$\overline{X_s} = \frac{\Sigma x}{n}$$

Mean score was computed by multiplying the frequency of each response pattern with its appropriate nominal value arid dividing the same with the number of respondents to the terms. This is summarized with the equation below.

$$X_2 = \frac{\Sigma fn}{nr}$$

Where; $\bar{X}$ = Mean score

Σ = Summation

f = Frequency

n = Likert nominal

n_r = number of respondents

$$\bar{X} = \frac{0+1+2+3+4+5+6}{7} = \frac{21}{7} = 3.0$$

Decision Rule

Less than 1.0	=	Unaware stage of the technology
1.0 – 1.49	=	Awareness stage of the technology
1.5 – 1.99	=	Interest stage of the technology
2.0 – 2.49	=	Evaluation stage of the technology
2.50 – 2.99	=	Trial stage of the technology
3.0 – 3.49	=	Adopting of the technology
3.5 and above	=	Satisfaction

RESULTS AND DISCUSSION

Socio Economic Characteristics of Respondents

The Socio-economic profiles of male and female-headed cassava farm households in Abia State is presented in Table 1. The Table shows that the mean ages of the male and female headed cassava farm households were 46.10 years and 38.29 years respectively. This implies that both male and female headed cassava farm households were middle aged and still energetic, thus were capable of withstanding the stress and rigours involved in farming. These people were also capable of

managing risks associated with new idea, product or practice than their older counterparts who were less active (Adamu *et al.*, 2013).

Table 1 also showed that 56.48% and 54.62% of the male and female headed cassava farm households had secondary school education respectively. Educational level would affect the level of acceptance and adoption of improved cassava farming technologies as education increases the ability of male and female headed cassava farm households to obtain, process, and use information relevant to the improved cassava farming technologies (Emerole *et al.,* 2014).

Table 1 further shows that the mean farm sizes of the male and female headed cassava farm households were 1.98 hectares and 1.30 hectares respectively. This implies that both male and female headed cassava farm households were involved in small scale farming (producing at subsistence level). This finding is in line with *a priori* expectation and lends credence to Badru (2002) assertion that farmers with small farms are more constrained to adopt improved agricultural technologies.

Meanwhile, 53.70% and 62.96% of male and female headed cassava farm households had no access to extension contact. These contacts could be considered as being very low probably as a result of the inadequate funding of extension in Nigeria by the government (Ozor, *et al*., 2007). Also the prevalence of Covid-19 pandemic reduced contact of own farm producers with extension agents. According to Parwada (2020) only 5% of extension staff were allowed/permitted to come to work during the lockdown period leading to reduced service delivery in all sectors especially agriculture sector which was left in adverse food supply situation in 2020.

Table 1: Socio-Economic Characteristics of Male and Female Headed Cassava Farm Households

	Male Headed Cassava Farm Households		Female Headed Cassava Farm Households	
Variables	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Age				
>31	20	18.52	39	36.11
31-40	14	12.96	29	26.85
41-50	30	27.78	24	22.22
51-60	31	28.70	12	11.11
61 and above	13	12.04	4	3.70
Mean (years)	**46.10**		**38.29**	
Std. Deviation	**12.31**		**11.26**	
Level of Education				
No formal education	3	2.78	4	3.70
Primary education	27	25.00	32	29.63
Secondary education	61	56.48	59	54.62
Tertiary education	17	15.74	13	12.04
Farm size				
< 1.0	4	3.70	5	4.63
1.1 - 2.0	63	58.33	92	85.52
2.1 – 3.0	35	32.41	9	8.33
> 3.0	6	5.56	2	1.85
Mean(ha)	**1.98**		**1.30**	
Standard deviation	**0.78**		**0.60**	
Extension Contact				
Yes	50	46.30	40	37.04
No	58	53.70	68	62.96
Total	**108**	**100.00**	**108**	**100.00**

Source: Field survey, 2020

Level of Adoption of Selected Cassava Production Technologies by Male and Female Headed Cassava Farm Households in Abia State

The level of adoption of selected cassava production technologies by the male and female headed cassava farm households in Abia state, Nigeria is shown in Table 2. The table shows that cassava production technologies adopted by male and female headed cassava farm households were improved cassava varieties such as NR 8082 ($\bar{X}$= 3.68 and $\bar{X}$= 3.58) and UMUCASS 43 ($\bar{X}$= 3.73 and $\bar{X}$= 3,69), ploughing and ridging before planting ($\bar{X}$= 4.37 and $\bar{X}$= 4.19), application of recommended fertilizer to improve soil fertility ($\bar{X}$= 4.69 and $\bar{X}$= 4.79) supplying/replacement of ungerminated cassava stem cuttings ($\bar{X}$= 4.25 and $\bar{X}$= 4.39) and weeding at least two times in a year ($\bar{X}$= 4.02 and $\bar{X}$= 4.68) and all had mean score values that were greater than the threshold value of 3.0. The result shows that there were still gaps in adoption of the selected agricultural

technologies as some of the cassava production technologies were not adopted by male and female headed cassava farm households in Abia State. However, this result lends credence to the findings of Mgbakor (2017) that cassava farmers in Enugu State adopted and used various cassava production technologies such as improved varieties, fertilizer application, and ploughing and ridging before planting.

Table 2: Level of Adoption of Selected Cassava Technologies by Male and Female Headed Cassava Farm Households in Abia State

	Male Cassava Farmers									Female Cassava Farmers								
Improved Technologies Cassava varieties	**Unaware (0)**	**Aware (1)**	**Interest (2)**	**Evaluation (3)**	**Trial (4)**	**Accept (5)**	**Adoption (6)**	**Total**	**MS**	**Unaware (0)**	**Aware (1)**	**Interest (2)**	**Evaluation (3)**	**Trial (4)**	**Accept (5)**	**Adoption (6)**	**Total**	**MS**
i. NR 8082	3(0)	10(10)	20(40)	14 (42)	18(72)	25(125)	18(108)	397	3.68	8(0)	8(8)	16(32)	15 (45)	22(88)	20(100)	19(114)	387	3.58
ii. UMUCASS 43	6(0)	13(13)	12(24)	13(39)	19(76)	19(95)	26(156)	403	3.73	8(0)	11(11)	12(24)	12(36)	17(68)	17(85)	29(174)	398	3.69
Ploughing and ridging before planting	2(0)	5 (5)	13(26)	14(42)	13(52)	19(95)	42(252)	472	4.37	0(0)	7 (7)	15(30)	15(45)	17(68)	22(110)	32(192)	452	4.19
Use of machineries	0(0)	33(33)	23(46)	23 (69)	11 (44)	10 (50)	8 (48)	290	2.69	0(0)	62(62)	27(54)	8 (24)	6 (24)	5 (25)	0(0)	189	1.75
Use of irrigation	2 (0)	36(36)	32(64)	21 (63)	10 (40)	8 (40)	0(0)	243	2.25	2 (0)	67(67)	37(74)	2(6)	0 (0)	0 (0)	0(0)	147	1.36
Recommended herbicides/pest and disease control	17 (0)	13(13)	11(22)	16 (48)	14 (56)	16 (80)	9 (54)	273	2.53	10 (0)	33(33)	39(78)	8 (24)	7 (28)	4 (20)	7 (42)	225	2.08
Application of fertilizer to improve soil fertility	0(0)	3(3)	7(14)	15(45)	18(72)	18(90)	47(282)	506	4.69	0(0)	0(0)	8(16)	15(45)	18(72)	18(90)	49(294)	517	4.79
supplying /replacement of ungerminated stem cuttings	4(0)	7(7)	9(18)	12 (36)	19(76)	20(100)	37(222)	459	4.25	2(0)	5(5)	11(22)	10 (30)	21(84)	20(100)	39(234)	475	4.39
Weeding at least two times in a year	0(0)	5(5)	10(20)	9(27)	17(68)	23(115)	44(264)	499	4.62	0(0)	3(3)	7(14)	11(33)	21(84)	25(125)	41(246)	505	4.68
Grand mean									3.65									3.39

Source: *Field Survey, 2020*

Decision Rule: 3.0 and above = Adoption stage; 2.50 – 2.99 = Trial stage; 2.0 – 2.49 = Evaluation stage; 1.5-1.99 = Interest stage; 1.0 – 1.49 = Awareness stage

Figures in parentheses are Likert scores.

Effect of Improved Cassava Production Technologies on Annual Income from Cassava Production and Cassava Output of Male and Female Headed Cassava Farm Households Before and After Adoption in Abia State

The paired Z-test for differences in income and farm output of male and female headed cassava farm households before and after adopting improved cassava production technologies in Abia State is presented in Table 3. The Table shows that the mean farm income of male headed cassava farm households before adoption of improved cassava production technologies was ₦129,171.29 while the mean farm income after adopting improved cassava production technologies was ₦167,405.56. The mean difference in their farm income after adopting improved cassava production technologies was ₦28,234.26 and Z value of 3.08 which was statistically significant at 1.0% probability level.

On the other hand, the mean farm income of female headed cassava farm households in Abia state before adoption of improved cassava production technologies was ₦111,039.44 while the mean farm income after adopting improved cassava production technologies was ₦134,622.22. The mean difference in their farm income after adopting improved cassava production technologies was ₦23582.78 and Z value of 2.32 which was statistically significant at 1.0% probability level. Therefore the null hypothesis of no difference in farm income of male and female headed cassava farm households before and after adoption of improved cassava production technologies in Abia state was rejected. This implied adoption of improved cassava production technologies in Abia State greatly increased the farm income of the male and female headed cassava farm households. Income is a major indicator of the farmer's livelihood. This collaborated with the findings of Owuor *et al*. (2004) that adoption of improved crop production technologies increased farmers income which in turn improves the capacity to adopt other agricultural innovations as they have the necessary capital to start the innovation hence reduce poverty status of the farmers.

The Table 3 also showed that the mean output of male headed cassava farm households before adoption of improved cassava production technologies was 2.01 tonnes/ha while the mean output after adopting improved cassava production technologies was 2.45 tonnes. The mean difference in their farm output after adopting improved cassava production technologies was 0.44 tonne and Z value of 3.94 which was statistically significant at 1.0% probability level.

On the other hand, the mean farm output of female headed cassava farm households before adoption of improved cassava production technologies was 1.77 tonnes while the mean cassava

output after adopting improved cassava production technologies was 2.13 tonnes. The mean difference in their farm output after adopting improved cassava production technologies was 0.36 tonnes and Z value of 3.26 which was statistically significant at 1.0% probability level. This implies that adoption of improved cassava production technologies by male and female cassava farmers in Abia State increased their cassava output. Adoption of improved crop production technologies apparently offers opportunity to increase production (output) substantially (Nweke and Akorhe, 2002) and reduce poverty status of the farmers (Nata *et al.,* 2014).

Table 3: The Paired Z-test for Differences in Farm Income and Output of male and female Headed Cassava Farm Households Before and After Adopting Improved Cassava Production Technologies in Abia States, Nigeria

Variable	Individual mean	Mean difference	Standard error	Z-Value	Sig (2-tailed)
Male Headed Cassava Farm Households:					
Income before adopting improved cassava production technologies	129,171.29				
		28234.26	129093.43	3.08***	0.003
Income after adopting improved cassava production technologies	167,405.56				
Female Headed Cassava Farm Households:					
Income before adopting improved cassava production technologies	111,039.44				
		23582.78	105750.6863	2.32**	0.022
Income after adopting improved cassava production technologies	134,622.22				
Male Headed Cassava Farm Households:					
Output before adopting improved cassava production technologies	2.01				
		0.44	0.11	3.94***	0.000
Output after adopting improved cassava production technologies	2.45				
Female Headed Cassava Farm Households:					
Output before adopting improved cassava production technologies	1.77				
		0.36	0.11	3.26***	0.001
Output after adopting improved cassava production technologies	2.13				

Source: Field Survey data, 2020.

***significant at 1.0%
**significant at 5.0%

Effect of Adopting Improved Cassava Production Technologies Poverty Status of Male and Female Headed Cassava Farm Households in Abia States

The paired Z-test on the effect of adopting improved cassava production technologies poverty status of male and female headed cassava farm households in Abia States is presented in Table 4. The Table showed that the Mean monthly per capita food expenditure of male headed cassava farm households before adopting improved cassava production technologies was ₦13,722.96 while the Mean monthly per capita food expenditure of male headed cassava farm households after adopting improved cassava production technologies was ₦16,556.48. The mean difference in the male farmers' monthly per capita food expenditure after adopting improved cassava production technologies was ₦2,833.52 with a standard error mean of 893.087 and Z value of 3.17 which was statistically significant at 1.0% probability level. The null hypothesis of no significant difference in poverty status before and after adopting improved cassava production technologies was therefore rejected.

On the other hand, the mean monthly per capita food expenditure of female headed cassava farm households before adopting improved cassava production technologies in Abia state was ₦13,339.91 while the Mean monthly per capita food expenditure after adopting improved cassava production technologies was ₦14,965.7407. The mean difference in their monthly per capita food expenditure after adopting improved cassava production technologies was ₦1,625.83 with Z value of 2.20 which was statistically significant at 5.0%alpha level. Therefore the null hypothesis of no difference in poverty status before and after adopting improved cassava production technologies was therefore rejected. This implied that the adoption of improved cassava production technologies by male and female headed cassava farm households in Abia states has greatly reduced their poverty status.

Table 4. Poverty Status of Male and Female Headed Cassava Farm Households in Abia State Before and After Adopting Improved Cassava Production Technologies

Variable	Individual mean	Mean difference	Standard error	Z-Value	Sig (2-tailed)
Male Headed Cassava Farm Households:					
Poverty Status before adopting improved cassava production technologies	13,722.96				
		2833.52	2309.40	3.17***	0.002
Poverty Status after adopting improved cassava production technologies	16,556.48				
Female Headed Cassava Farm Households:					
Poverty Status before adopting improved cassava production technologies	13,339.91				
		1625.83	1211.06	2.20**	0.030
Poverty Status after adopting improved cassava production technologies	14,965.74				

Source: Field survey, 2020
***significant at 1.0%
**significant at 5.0%

Constraints to Adoption of Improved Cassava Technologies by Male and Female Headed Cassava Farm Households in Abia State

The distribution of the male and female headed cassava farm households according to constraints to adoption of improved cassava production technologies is shown in Table 5. The table shows that the male and female headed cassava farm households were constrained by insufficient land for cultivation 96.29% and 100.00%), inadequate capital (93.52% and 100.00%), inadequate access to credit facilities (95.37% and 100.00%), poor extension coverage (72.22% and 75.92%) and Inadequate information/knowledge on improved cassava production technologies (71.30% and 74.07%) respectively. According to Ijioma and Osondu (2015) rural farmers in Nigeria are mostly resource poor farmers with little capital and require access to credit facilities to enable them afford the cost of adopting agricultural innovations and boost their farm productivity and income. This result is also consistent with Okereke (2014) findings that major problems constraining cassava farmers from using production technologies are inadequate capital, inadequate access to credit facilities, high cost of innovations, inadequate farm land and poor extension services.

Table 5: Distribution of Male and Female Headed Cassava Farm Households according to Constraints to Adoption of Cassava Production Technologies

	Male Headed		Female Headed	
Constraints	*** Frequency**	**Percentage**	*** Frequency**	**Percentage**
Insufficient land for cultivation	87	80.55	104	96.29
high cost of agricultural inputs and services	104	96.29	108	100.00
Inadequate access to credit facilities	101	93.52	104	96.29
Inadequate capital	103	95.37	108	100.00
high risk and uncertainty in agriculture	69	63.88	78	72.22
Poor extension services coverage	78	72.22	82	75.92
Inadequate information/knowledge on improved cassava production technologies	77	71.30	80	74.07
Inadequate labour	87	80.56	95	87.96

***Source**: Field survey, 2020*
** Multiple Responses Recorded*

CONCLUSION AND RECOMMENDATIONS

Based on the findings of this research work, it was concluded that there was a difference in income, output and food poverty status of male and female head cassava farm households before and after adoption of cassava production technologies.

The study therefore recommended that:

i. Government agricultural initiative should be extended to Abia state male and female cassava farmers to make cassava production attractive to the people, in other for them to engage in cassava production not just at the subsistence level but at a commercial level.

ii. Also, policy measures to support micro-credit institutions especially through linkage with commercial banks would enhance credit delivery to male and female cassava farmers.

iii. Government should make available cassava technologies to male and female farmers since it is one of the major constraints against the use of it.

iv. Access roads should be provided by government because it discourages the extension workers from going to the interior villages to do their jobs.

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