DETERMINANTS OF ADOPTION OF TME 419 CASSAVA PRODUCTION PRACTICES AMONG FARMERS IN CROSS RIVER STATE

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ABSTRACT
This study was designed to ascertain the determinants of adoption of TME 419 cassava production practices among farmers in Cross River State, Nigeria. Both primary and secondary data was used for the study. A multistage sampling procedure was used to select175 respondents in four Local Government Areas and were interviewed using structured questionnaire. Data were collected on socioeconomic characteristics of farmers, benefits of producing TME 419 cassava variety and levels of adoption of TME 419 cassava production practices. Analysis of the study was done using percent, frequency, mean and regression analysis. The results revealed that 57.7% of the respondents were males, 48.0% were between the ages of 39-58years, 38.0% had secondary education, and 37.0%had 3-5years of farming experience. It was revealed that farmers had high yield ($\overline{x}$=0.99) as the best benefit derived from TME 419 cassava and there was high (61.1%) level of adoption of the production practices among the respondents. Result of regression analysis revealed that age (β=0.112), household size (β=-0.380), farming experience (β=1.295) and farm size (β=0.112) were determinants of adoption of TME 419 cassava production practices in the study area. Policies aimed at improving adoption of other cassava varieties should critically consider the roles of age, household size, farming experience and farm sizes for plausible outcomes.
Keywords: Production practices, TME 419Cassava variety, technologies, Cross River State

INTRODUCTION
The strength of the Nigerian Agricultural Sector is immense and reflected in Nigeria being the world's largest producer of cassava, yam and cowpea in sub-Saharan Africa. The agricultural sector of Nigeria currently plays an essential role in the development of Nigeria's economy and is poised to remain a major source of economic growth in the foreseeable future. The sector provides food, security, employment, foreign reserves, and is set to be a major facilitator in the reduction of poverty and unemployment in the country currently being responsible for engaging about 70% of the labour force (United Nation, 2020). In spite of all its potentials, according to Chiazor and Chinwuba, (2017) there has been low rate of growth in the sector. In many developing tropical countries, cassava has been widely acknowledged as a popular staple crop and its role in food security and poverty alleviation can never be over emphasized (Achem, 2013). It is a drought resistant crop grown mainly in dry areas, which is why globally, production of cassava lies predominantly in the tropical countries of Latin America, Asia and Africa with Nigeria being the largest producer in sub-Saharan Africa. Cassava is ranked 19th in the top crop production in the world, with total annual production at 269,125,963 metric tons (FAOstat, 2021). Cassava is an important staple food crop in Nigeria produced both for household consumption. In Nigeria, the major producers of cassava are the North Central zone, followed by the South-South and South West zones (Igwe, Mbanaso, Okoye, and Imuse, 2018).

In recent years however, the crop has gradually transcended into a cash crop as it is not only produced for household consumption but required by industries and export for the production of flour, animal feed, alcohol, starches for sizing paper and textiles, sweeteners, prepared foods and bio-degradable products (Agricultural Research Council, 2021). Some special initiatives have also become invested in cassava due to its importance. One of these initiatives is the Presidential Cassava Initiative that recognized cassava as a crop which can reduce poverty in Africa. (Donkor, Onakuse and Bogue, 2017). With its new found possibilities of the crop, there has been an increase in demand for the crop hence, the need for a more disease resistant, high yielding cassava varieties suitable for all the aforementioned uses. This need for a more advanced cassava varieties resulted in the development lot of improved varieties by research institutes like the International Institute of Tropical Agriculture (IITA) Ibadan, for the farmers to adopt in order to boost yield. In 2016, IITA introduced The African Cassava Agronomy Initiative (ACAI) project to increase the availability of appropriate and affordable technologies to sustainably improve cassava productivity (ACAI, 2019). The project introduced the high yielding TME 419 cassava variety to local farmers distributing over 500,000 bundles of the cassava cuttings through the state Agriculture Development Projects (ADPs) to farmers alongside other production essentials for the variety.

According to Okulola, (2019), the TME 419 cassava variety has a field yield range of 10.69-23.45 t/ha and has a dry content of cassava estimated as percentage (DM) of total fresh root weight ranging from 30.68 to 31.26%, the level of cyanide in the root (CNP- Cyanogenic Potential) is 6.33ppm. This variety is mainly composed of starch but with

a very low percentage of protein. The quantity of starch contained by percentage in this variety ranges from 63.08 to 73.93% while the quantity of protein by percentage ranges from 0.80 to 1.52%. The other varieties of cassava such as TME-7; which has a field range of 5.73 – 8.80t/ha, dry matter of 33.1%, estimated CNP of 0.53, MS-3, and; MS-6 that gives lower yield in tons of output, contains lesser dry matter low CNP, low starch contents for industrial use, but having high resistance to pest and diseases (Nigerian seed portal initiative, 2020), leading to difference in market requirements.

Dissemination of TME 419 cassava variety suitable for both industrial and domestic is expected to boost cassava production in Cross River State, especially with several benefits accrued to the production. However, it has not been confirmed what informed the cassava farmerswillingness to adopting TME 419 cassava variety production practices. As the first step to assessing the usefulness a technology to farmers is to determine the attributes responsible for the choice of the technology. Early studies by (Adebayo and Sangosina, 2005; Echebiri, 2008; Kanu, 2020) show that farmers decision to adopt a particular technology were influenced by a plethora of reasons, some of which are socio-culturally based or market driven. It therefore becomes important to ascertain the determinants of adoption TME 419 Cassava variety among farmers in Cross River State, Nigeria.

The specific objectives of the study were to:

1. describe the socio-economic characteristics of respondents
2. identify benefits of producing TME 419 cassava
3. determine the level of adoption of TME 419 cassava production practices

The study hypothesized that there is no significant relationship between cassava farmer's socio-economic characteristics and adoption of TME 419 in the area

METHODOLOGY

The study was conducted in Cross River State Nigeria. Cross River State is located in the South-South geopolitical zone of Nigeria, covers a total of 20,156 square kilometres of land mass and belongs to tropical rainfall belt with humid tropical climate of about 1300 to 3000mm rainfall and 300C mean annual temperatures, except on the Obudu Plateau, where the climate is sub temperate, with temperatures of 150C and 230C.

The population for the study consists of cassava growers in Cross River State. A multi- stage sampling procedure was used for this study. Firstly, two agricultural zones from three (based on the Cross River Agricultural Development Project (CRADP) zoning system) were purposively selected using purposive sampling technique. The purposive selection was based on the fact that the TME 419 variety was distributed in these two zones in the State. Secondly using purposive sampling technique, four Local Governments Areas (LGAs) were purposively sampled from the selected zones based on the concentration of cassava farmers and extent of TME 419 cassava production and processing within the LGAs, these are Ikom, Bekwarra, Ogoja and Yala. Simple random sampling technique was then used in the third sampling stage to select 30% of the farmers in each LGA from a list of all registered cassava farmers in the Local Government Areas. All registered cassava farmers by LGAs were; Ikom (201), Bekwarra (120), Ogoja (150) and Yala (111). This amounted to 175 farmers (respondents). Socio economic characteristics such as age, sex, marital status, education levels and monthly income from producing TME 419 cassava variety, were measured using nominal and interval scale. The adoption levels of TME 419 cassava production practices was measured by providing respondents with a list of 19 recommended production practices, they were asked to state the frequency at which they adopt each of the recommended production practices with response option of always (3), occasionally (2), rarely (1) and non-practice (0). Thereafter, a frequency index was computed and use to determine the level of adoption of TME 419 cassava production practices. The mean for the activities were calculated and used to categorized into high and low levels of adoption. Data for this study was collected from primary sources using structured questionnaire. Data for this study was analysed using descriptive statistic and Regression analysis.

RESULTS AND DISCUSSION

Socioeconomic characteristics

Table 1 shows that majority (48.0%) of farmers were between the age brackets of 39-58 years, males (57.7%), married (73.1%) and (38.9%) had secondary education. This implies that cassava farmers are mature middle-aged people who can still be economically productive, males dominated, married and literate, capable of adopting new improved cassava varieties. Education could increase the ability of farmers to use their resources efficiently, while giving them leverage on effective information diagnosis, analysis, and interpretation. Hall andKhan, (2003) showed that education was positive and significantly associated with adoption level. Therefore, it is expected to positively influence adoption of improved cassava varieties.

Most (46.3%) had households with 6-10 persons, 3 to 5 years farming experience of the variety (37.7%), had total annual income above N100,000 (54.9%), farmed on 2 acres or less of land (78.9%) and used a combination of family, friends and hired labour for their farming operations. This indicates that the farmers likely had access to family

support for their farming activities, had acquired some practical skills and knowledge for the production of the variety which will increase with more years of cultivating the variety, this aligns with reports of Ajok, (2016) and Melisse, (2018) that large households lowered labour cost as family members contributed immensely to farm labour and farmers experience enhance decision making which is more likely to enhance adoption of new technologies, but opposes the reports ofVitale,Vitale and Epplin (2019) that an increase in farmers farming experience would result in decrease of farmer's efficiency and production levels.

It can also be inferred that producing the variety played a major role in the increased total income of the respondents as from the 95% of them with high total annual income, 75% of them are high earners from TME 419 cassava production even with prevailing land tenure issues resulting in shortage of agricultural land in the area, leading to cassava production being dominated by small holder farmers. This is supported by Danso-Abbeam, Bosiako, Ehiakpor and Mabe (2017) who stated that high income benefits facilitates adoption of technology. Farmers using all-labour types arrangement hire workers mainly for bush clearing, land mounding and weeding, friends for weeding where herbicides are not used, planting and harvesting while family labour is engaged mostly for planting, processing and supervision. This corroborates Abila, (2012) that family labour is featured in most of the labour sources as farmers and their spouses are involved in the supervision of most operations.

Table 1: Distribution of respondents by socio-economic characteristics

Variables	Frequency	Percentages
Age Range		
19-38	77	44.0
39-58	84	48.0
59 and above	14	8.0
Sex		
Male	101	57.7
Female	74	42.3
Marital Status		
Single	31	17.7
Married	128	73.1
Divorced/widowed	4/12	2.3/6.9
Educational Level		
No Formal Education	26	14.9
Primary school	31	17.7
Secondary school	68	38.9
Tertiary Education	50	28.6
Household size		
Less than 5	72	41.1
6-10	81	46.3
11-15/16 and above	15/7	8.6/4.0
Farming Experience		
0-2	49	28.0
3-5	66	37.7
Above 5 years	60	34.3
Labour Source		
Family only	10	5.7
Hired only/ Friends only	25/1	14.3/0.6
Family and friends/ Family and Hired	16/27	9.1/15.4
Family and Friend and Hired	96	54.9
Annual Income /income from TME 419 production		
Less than 50,000	9/44	5.1/25.1
50,000 – 100,000	70/99	40.0/56.6
Above 100,000	96/32	54.9/18.3
Farm Size (Acre)		
0 – 2	138	78.9
3–5/6 and above	31/6	17.7/3.4

Source: Field survey, 2021

Benefits of producing TME 419 cassava variety

Table 2 shows that the main benefit of cultivating the variety was its high yield ($\overline{x}$=0.99), high nutritive value ($\overline{x}$=0.95), increased income ($\overline{x}$=0.92), resistance to pest ($\overline{x}$=0.82) and improved storage quality ($\overline{x}$=0.81). This connotes that with high yield farmers could have enough produce both for consumption and economic purposes which would invariably increase Their financialincome and improve their wellbeing. Furthermore, farmers would be willing to adopt varieties which they feel possessed some high nutrient attributes necessary for body improvement or medicinal value. Similarly, Ugochukwu, (2020) progressive health and nutritional impacts are major gains from high nutrients varieties research and dissemination in countries. Reduced cost of production and reduced expense on chemical were ranked 9th and 10th respectively as the least benefits the respondents derived from producing the variety which could probably deter them from producing the variety on a larger scale. This implication is consistent with findings of Agwu and Anyaeche, (2007) who noted that farmers' adoption of improved cassava varieties could be determined by the extent to which they possess desirable qualities. Ebewore and Okedo-okojie, (2016).

Table 2 Distribution of respondents by benefit derived from producing TME 419 cassava

Benefits	Mean	Std. deviation	Rank
High yield	0.99	0.11	1st
High nutritive value	0.95	0.22	2nd
Increased income	0.92	0.27	3rd
Resistance to pest	0.82	0.39	4th
Improved storage quality	0.81	0.39	5th
Better market	0.79	0.41	6th
early maturity	0.76	0.43	7th
Reduced labour	0.43	0.5	8th
Reduced cost of production	0.32	0.47	9th
Reduced expense on chemical	0.3	0.46	10th

Source: Field Survey, 2021

Level of adoption of TME 419 cassava production practices

Table 3 shows the adoption frequency of TME 419 cassava by production practices. Most of the practices are always practiced, but majorly the respondents always processed cassava in neat environment using neat utensils (92.0%), 91.4% stored produce in neat containment to prevent spoilage, 80.6% ploughing the field before planting, 77.1% harvest cassava at eighth months and 74.9 slash and clear farmland before cultivation TME 419 cassava variety.

Table 3: Frequency of adoption of TME 419 cassava variety production practices

Production practices	Always	Occasionally	Rarely	Not at all
Plant on non-stony or shallow soils	52.6	30.3	10.9	6.3
Do not plant on sloped land	48.0	28.6	17.1	6.3
Slash and clear land before cultivation	74.9	20.0	4.6	0.6
Stump before ploughing	53.1	18.9	28.0	0.0
apply glyphosate containing herbicides at recommended rates for weed control	70.3	22.9	6.9	0.0
Plough field before planting	80.6	13.1	5.1	1.1
Plant on ridges	52.0	28.6	6.3	13.1
plant recommended disease free cuttings	67.4	21.1	11.4	0.0
plant in lines 1m between rows	61.7	22.3	9.7	6.3
Plant in moist soils after two good rains	60.6	31.4	7.4	0.6
Apply recommended fertilizers	69.7	22.9	7.4	0.0
Confirm profitability of fertilizers before use	58.9	24.0	16.6	0.6
Weed each time weed cover 1/3 of the field and reach 4-5 leaf stage	61.7	22.9	14.9	0.6
Apply fertilizer when soil is moist after 1 or 2 rain showers	60.6	19.4	20.0	0.0
Apply first split of fertilizer one month after planting	62.3	20.0	17.1	0.6
Apply fertilizer in furrow 20cm away from each plant	60.6	19.4	18.3	1.7
harvest cassava after 8 months and no less	77.1	17.1	5.1	0.6
Process cassava in neat environment using neat utensils	92.0	6.3	1.7	0.0
Store produce in neat containment to prevent spoilage	91.4	6.3	1.7	0.6

Source: Field Survey, 2021

Occasionally, some respondents plant on stony or shallow soils (30.3%), plant on sloped land (28.6%), plant on ridges (28.6%) and apply glyphosate containing herbicides at recommended rates for weed control (22.9%). This may be due to prevailing land tenure issues and increasing cost of purchasing herbicides. This agrees with (Adetomiwa, Iseoluwa and Babatunde, 2020) that the available land rental system do not make the cassava farmers land secure as land can be revoked at any time period from the farmers and it will have an effect on the continuous adoption of improved cassava varieties as guarantee of continuous access to farmland by farmers is ambivalent.

Table 3.1 indicates the level of respondents' adoption of TME 419 cassava variety production practices. Most (61.1%) of the respondents were in the high adoption category for the production practices of the variety, while 38.9% were in the low adoption category. The high adoption of these practices implies that majority of the respondents had gone past the evaluation level of the variety, with the practices not having much difference from what the farmers are used to and could be linked to farmer's scale of production as most of the practices are easily applied on a small scale.

Table 3.1: Cassava farmer's level of adoption of TME 419 cassava variety production practices (n=175)

Category	Frequency	Percentage	Mean
Low	68	38.9	47
High	107	61.1	

Source: Field Survey, 2021

Determinants of adoption of TME 419 cassava

Age (β=0.112), farming experience (β=1.295) and farm size (β=0.112) positively and significantly determined the adoption of TME 419 cassava variety production practices among cassava farmers in the study area. This finding suggests that the higher the farming experience the more a respondent is likely to adopt the cassava variety. Meanwhile a negative coefficient observed in household size household size (β=-0.380) of the higher the household size, the less a respondent is likely to adopt TME 419 cassava variety. The findings agree with (Ntshangase, Muroyiwa and Sibanda, 2018) who confirmed in a similar study that farming experience influenced the adoption of improved technologies. The findings is also in line with (Kanu, 2020) and Salum, (2016) who found out in a similar study that young beneficiaries adopt new technology faster than older ones because of their level of exposure and education which eventually results into improved agricultural production and adoption of improved cassava varieties decreases as farmer's household size increases.

Table 4: Result of linear regression model for farmers

Variables	β	Std. Error	Beta	t-value	P-value
Age	0.112	0.039	0.238	2.843	0.005*
Sex	-0.207	0.879	-0.019	-0.235	0.814
Marital status	0.607	0.488	0.095	1.242	0.216
Education	-0.052	0.433	-0.010	-0.120	0.905
Household size	-0.380	0.120	-0.278	-3.168	0.002*
Farming experience	1.295	0.555	0.191	2.333	0.021*
Annual income	0.396	0.623	0.050	0.635	0.526
Farm size	3.021	1.256	0.505	1.686	0.016*
Labour source	0.017	0.247	0.005	0.068	0.946

R^2 = 0.334 adjusted R^2=0.069

*Significant at $p \leq 0.05$

CONCLUSION AND RECOMMENDATIONS

The study concluded that respondents were within the economically active age group, more likely to take risk and have energy to cope with the rigors of TME 419 cassava production practices. High yield from TME 419 cultivation was a major benefit derived and respondents always apply the recommended practices. There was high level of adoption of the variety production practices thus, implying that farmers were comfortable with the variety. Age, household size, farming experience and farm size determined adoption of TME 419 cassava production practices. Hence, extension strategy for subsequently introduction of new cassava varieties should consider cassava farmers' age, household size, farming experience and farm size as well as benefits to be derived from such variety ahead dissemination. As revealed in this study, reduced expense of chemicals, labour and access to better market are not esteemed benefits of cultivating the variety, these could pose danger to adoption of production practices. It is therefore recommended that cassava markets should be sited

closer to the farmers and subsidies on farm inputs be provided to farmers by government and other stakeholders to facilitate adoption and production.

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