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# DETERMINANTS OF ADOPTION OF YELLOW ROOT CASSAVA VARIETY AMONG FARMERS IN IMO STATE, NIGERIA

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## ABSTRACT

*The study analyzed the determinants of the adoption of yellow root cassava varieties among cassava farmers in Imo State. Specifically identified the yellow root cassava varieties available to cassava farmers in the study area; determined the level of adoption of yellow root cassava varieties; evaluated the determinants of adoption of yellow root cassava varieties and identified the constraints to adoption of yellow root cassava varieties among cassava farmers in the study area. Primary data were collected from 120 cassava farmers through a multi-stage sampling procedure using a well-structured questionnaire. Frequency, percentage, mean score, and ordinary least square regression (OLSR) tools were used for data analysis.* Results *revealed that UMUCAS 38(55.8) and UMUCAS 36 (83.3%) were identified as the available varieties in Imo State. The adoption of yellow root cassava varieties was low ($(\bar{x}$ =2.3). Low output after processing (90.8%), poor access to yellow root variety stem cutting (75.8%), and high moisture content (80.8%), among others, were the major constraints. Age,* sex, *educational level, income, cooperative membership, and access to extension agents, were the determinants of adoption of yellow root cassava varieties among cassava farmers in Imo State. The study therefore recommended that Scientists {Crop breeders and Genetist} should find a solution to the high moisture content in the yellow root cassava, which is responsible for low starch content when processed.*

**Keywords**: *Determinant of Adoption, Yellow-root cassava, Farmers*

## INTRODUCTION

Cassava which is botanically known as *Manihot esculenta*, is a root crop and is valued for its source of carbohydrate. Cassava is known for its high carbohydrate content and is the fourth largest staple food after wheat, maize, and rice consumed in developing countries (Oweseni, Okunlola, and Akinwale, 2021). Cassava is processed into various forms such as *garri*, *fufu*, *Tapioca*, and flour, and apart from its use as food, cassava is an important industrial raw material for the production of alcohol, pharmaceutical gum, and confectionaries starch (Efiong, Efiong, and Udo, 2015). According to Ayinde and Adewunmi (2016) majority of Nigerian households eat cassava at least once a day, they further stated that it is virtually impossible for an average household in Nigeria to not consume cassava products in a day.

Vitamin A deficiency has been a major nutritional challenge across the world. The World Health Organization (WHO) (2017) reported that approximately 228 million children are affected subclinically and 500,000 children become partially or totally blind every year due to Vitamin A deficiency. In Nigeria, about 30 percent of children under age five and almost 20% of pregnant women are deficient in micronutrients like Vitamin A (WHO, 2017). Vitamin A deficiency in children leads to stunted growth, Diarrhoea, Measles, and premature death (Olumba, 2019). In pregnant women, Vitamin A deficiency can cause severe night blindness and a high mortality rate (NRCRI, 2015). In order to cushion the effect of this vitamin A deficiency, the yellow root cassava variety was developed since it was observed that every household in a rural area consumes one form of cassava product in a day, hence fortifying cassava with vitamin A (Yellow root Cassava) means consuming vitamin A on daily basis.

The basic goal of agricultural development organizations is to influence farmers to adopt agricultural technologies like the yellow root cassava variety (Kifle, Shibru, Tolossa, and Alemu, 2023).

The transfer of technologies and knowledge from research units to farmers will trigger development. Therefore, the basic role of agricultural extension agents in the transfer of technology is to assist farmers in putting blueprints or readymade technologies into practice (Udemezue and Agwu, 2018). Understanding the determinants of adoption of agricultural technologies is essential in planning and executing technology-related programmes for meeting the challenges of food production in developing countries like Nigeria, especially Imo State. Agricultural technology embodies a number of important characteristics that may influence adoption decisions, Agricultural extension can be said to be effective and efficient when farmers adopt improved technologies (Kifle *et al*. 2023). The adoption of enhanced agricultural technologies is a technique for boosting productivity in the agricultural sector, alleviating poverty, ensuring food security, and reducing nutrition challenges. Farmers cannot easily adopt improved agricultural technology due to various factors (Kifle *et al*., 2023). Solomon (2020) reported that there are multiple barriers to adoption including technology awareness, risk aversion, institutional restrictions, and lack of human, and financial capital and infrastructure.

The Yellow root cassava technology was introduced in Imo State in the year 2015 TMS 07/539 popularly called UMUCASS 45; the yellow root cassava is a new variety of cassava developed at the National Root Crop Research Institute (NRCRI) in collaboration with the International Institute of Tropical Agriculture (IITA). Yellow cassava variety has a yellow fresh inside the root. The root has three parts namely: the central pith, a vascular bundle with the pith, an excellent source of vitamin A and carbohydrates while the peel can be used as livestock feed, the yellow varieties, have high yields and are resistant to many pests and diseases(Olumba, 2019).

Understanding the factors which affect yellow root cassava variety adoption is vital in promoting the use of improved stem cuttings to enhance its production across the country, especially in Imo State. Taking into cognizance the introduction of the yellow root cassava varieties to farmers for some years now, the study needs to ascertain the extent to which cassava

farmers in Imo State have adopted yellow root cassava variety and probably assess the factors influencing the adoption of this variety in the study region.

Several intervention strategies have been advanced to address the devastating consequences of VAD in children and women. As part of these efforts, the yellow-fleshed provitamin A-biofortified cassava was introduced recently as a sustainable strategy for increasing the dietary intake of vitamin A especially in rural communities where supplementation has not been successful. The yellow root cassava cultivars have been accumulated with high levels of pro-vitamin A and other pro-vitamin A carotenoids. These new cassava varieties are 25% higher in β-carotene and are capable of providing up to 40% of vitamin A recommended daily allowance (RDA) for children who are vulnerable to VAD (Olumba, 2019). Seventy percent of the farmers in the rural areas across Nigeria are poor and suffer malnutrition (Ume *et al*., 2020). Bio-fortified cassava cultivar is believed to address the problem of Vitamin A deficiency to achieve improvement in nutrition and improve the standard of living of farmers in rural areas across the 36 states of Nigeria, especially in Imo State. The adoption of yellow root cassava variety among cassava farmers will help in solving the problem of vitamin A deficiency. The new yellow varieties have high beta-carotene (Vitamin A), high high-yielding, and resistant to major diseases and pests (Olumba. 2019). Given the potential benefit of this variety to cassava farmers in Imo State, awareness, level of adoption, and its determinants appear not very obvious in Imo State. This can only be ascertained by assessing the determinants of the adoption of yellow root cassava varieties among cassava farmers in Imo State, hence the study.

**Objectives of the Study**

i. ascertain cassava farmers' awareness of yellow root cassava varieties in the study area;
ii. determine the level of adoption of yellow root cassava varieties among cassava farmers;
iii. evaluate the determinants of adoption of yellow root cassava varieties among cassava farmers and
vi. identify the constraints to adoption of yellow root cassava varieties among cassava farmers in the study area.

It was hypothesized that the socio-economic characteristics of Cassava farmers do not significantly influence the level of adoption of yellow-root cassava varieties in the study

## RESEARCH METHODOLOGY

The study was carried out in Imo State Nigeria. Cassava farmers in the three agricultural zones (Okigwe, Owerri, and Orlu) of Imo State served as the study population. A multistage sampling procedure was employed in choosing the respondents for this study.

Stage I involved the purposive selection of four Local Government Areas from each of the three agricultural zones in Imo state namely: Ohaji-Egbema, IsialaMbano, AbohMbaise, EzinihiteMbaise, Owerri North, Ehime Mbano, Obowo, Okigwe, Nkwere, OruEast, Nwagele and Owerri West, making a total of 12 LGAs based on large concentration of cassava farmers and closeness of ADP establishment in the area.

Stage 2, employed a random selection of one community each from the twelve local government areas selected making a total of twelve autonomous communities for the study.

Stage 3, also involved a random selection of ten cassava farmers from each of the twelve selected communities, making a sample size of one hundred and twenty cassava farmers (120). The list of cassava farmers was obtained from ADP in Imo State.

Primary data were obtained through the use of a structured questionnaire. Data were analyzed using simple descriptive statistics such as frequency, mean, and percentages, and inferential statistics, such as ordinary least square regression analysis. Objectives I, ii, and iv were realized using descriptive statistics, while objective ii, which was to determine cassava farmers' level of adoption of yellow root cassava variety, was realized using mean score analysis through a

4-point Likert-type scale of not adopted 1, adopted 2, adopted and discontinued 3, adopted and continued 4 The mean score was obtained by adding 1+2+3+4 = 10 which was later divided by 4 to get a mean score of 2.5. This was used as a discriminating adoption index. Any mean score equal to or above 2.5 was considered high adoption and less than 2.5 was regarded as low adoption. Objective iii**,** which is to ascertain the determinants of yellow root cassava variety adoption among cassava farmers was analyzed using regression analysis.

The hypothesis was tested using multiple regression analysis.
The implicit model:

$Y = F(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8)$……1

Y = level of adoption (total rating score of not adopted 1, adopted 2, Adopted and discontinued 3, Adopted and continued 4)

Where;

$X_1$ = age (years)

$X_2$ = Sex (female =0, male =1)

$X_3$ =level of education (years)

$X_4$ =household size (number of persons)

$X_5$ =Total household income (Naira)

$X_6$ = access to credit (yes=1, no=0)

$X_7$ =Farm size (Number of Hectares)

$X_8$ =Extension contacts (yes=1, no=0)

$X_9$ =Membership of cooperative Society (yes=1, no=0)

ei = error term

The four functional forms are explicitly specified as follows:

Linear function: $Y= b_0 +b_1x_1 +b_2x_2 +b_3x_3 +b_4x_4 +b5x5 +ei$ ……..2

Double log function: $Ln(Y) = b_0 + b_1lnx_1 + b_2lnx_2 + b_3lnx_3 + b_3lnx_3 + b_4lnx_4 + b_5lnx_5$

+ ei..…3

Semi-log function: $Y = b0 + b_1Lnx_1 + b_2Lnx_2 + b_3Lnx_3 + b_4Lnx_4 + b_5Lnx_5 + ei$……..……4

Exponential Function$Ln(Y) = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + ei$ ----------5

## RESULTS AND DISCUSSION

**Awareness of Yellow Root Cassava variety among Cassava farmers in Imo State**
The result of the farmer's distribution based on awareness of the yellow root cassava variety (Table 1) revealed that all the farmers sampled for the study (100%) were aware of the yellow root cassava variety disseminated

**Yellow root cassava varieties available to cassava farmers in Imo State**
The result of the farmer's distribution based on Yellow root cassava varieties available (Table 2) revealed that *Umucas* 38(55.8%) and *Umucas* 36 (83.3%) were identified as the available varieties from the list of yellow root varieties such as *umucas 44, umucas 45, umucas46* and *umucas 37* by the farmers in the study area.

**Table 2: Distribution of yellow root cassava varieties available to cassava farmers in Imo State**

| Yellow root cassava varieties available | Frequency | Percentage |
|---|---|---|
| *umucas 36* | 100 | 83.3 |
| *umucas 38* | 67 | 55.8 |

***Source; field survey, 2023 multiple responses***

**Level of adoption of yellow root cassava varieties among cassava farmers**
The result of the level of adoption of yellow root cassava varieties (Table 3) showed that the mean score was below 2.5 (adoption index). This implied that the adoption of yellow root cassava varieties in the study area was low ($\bar{x}$ =2.3). This could be attributed to high moisture content, and low starch after processing as confirmed by farmers (32.5%). This is in agreement with Chidiebere-Mark and Anyanwu (2020) who asserted that farmers in Imo State were constrained in the use of yellow root due to high moisture content.

**Table 3:Distribution according to** the **level of adoption of yellow root cassava varieties among cassava farmers**

| Adoption level | Never Adopted(1) F | Adopted (2) F | Adopted and continued(3) F | Adopted and discontinued(4) F | MS | SD |
|---|---|---|---|---|---|---|
| Yellow root cassava variety | 60 | 11 | 10 | 39 | 2.3 | 6. 1 |

***Source; field survey, 2023; Mean score ≥2.5; High adoption (H); <2.5 Low adoption (L), Discriminating index 2.5***

**Determinants of adoption of yellow root cassava varieties among cassava farmers**
From the result in Table 4, age, sex, educational level, income, cooperative membership, and access to extension agents were the significant socioeconomic determinants of level of adoption of yellow root cassava varieties among cassava farmers in Imo State.
The coefficient of **age** (-0.011) was negative and significantly related to the level of adoption of the yellow root cassava variety at a 1% probability level. This implies that younger farmers adopted the technologies more and faster than older farmers. Akintade *et al* (2016) also asserted that older farmers are known not to be enthusiastic about improved technology. The coefficient of **education** (0.182)

was positive and significantly influenced the level of adoption of the yellow root cassava variety among farmers at a 1% probability level. Tekeste *et al*. (2023) revealed that farmers' decisions to adopt wheat and maize varieties were significantly influenced by educational level.

**Farm Income (**2.050E-5**):** Farm income had a positive coefficient with the level of adoption of yellow root variety among farmers and the relationship is statistically significant at a 1% level of probability. The finding is in line with the study of Gausset and Larsen (2013) who asserted that adequate fund is a key determinant in the technology adoption process. Similarly, Eva (2012) opined that farmers with higher farm income will perform better than those with low farm income

**Farming Experience ($X_6$):** Farming experience had a positive coefficient with the level of adoption of yellow root variety among farmers and it is statistically significant at a 1% level of probability. Similarly, the study of Mustapha *et al.,* (2012) opined that experience improves farmers' production skills such as good processing methods and the use of improved technologies to enhance their production.

**Extension Contact (**0.300**):** Extension contact was found to be positively and significantly related to the level of adoption of yellow root variety among farmers at a 1% level probability.

**Membership of Cooperative (**0.345**):** Membership of a cooperative society had a positive coefficient on the level of adoption of yellow root cassava among farmers. Akintade *et al.,* (2016) reported that if a farmer belonged to a cooperative society, he will be more likely to be exposed to the improved technologies related to cassava production and boosting the adoption of innovation effectively and efficiently.

The coefficient of **sex** (0.040) was positive and significantly related to the level of adoption of the yellow root cassava variety This implies that both males and females increase the level of adoption of the yellow root cassava variety.

The F-ratio (962.547), which determines the overall significance of the regression model, is highly significant at a 1% level of probability. This implied that the explanatory variables jointly exerted great influence on the level of adoption of yellow root cassava variety.

**Table 4.4: Estimate of Determinants of adoption of yellow root cassava varieties among cassava farmers**

| Variables | Linear | Double –log | Semi-log | Exponential |
|---|---|---|---|---|
| Constant | -0.134 | -14.255 | -0.786 | -19.566 |
| | (-0.619) | (-9.599)*** | (-5.242) *** | (-9.132) *** |
| Age ($x_1$) | -0.011 | -0.330 | -0.476 | -0.476 |
| | (-4.238)** * | (-3.033) ** | (-4.238)*** | (-3.033) ** |
| Sex ($x_2$) | 0.040 | 0.036 | -0.028 | -0.052 |
| | (1.847) * | (2.016) * | (-0.982) | (2.016) * |
| Marital Status ($x_3$) | 0.038 | -0.001 | -0.026 | -0.002 |
| | (1.346) | (-0.046) | (1.346) | (-0.046) |
| Household size ($x_4$) | 0.007 | 0.025 | 0.005 | 0.035 |
| | (1.550) | (0.868) | (1.550) | (0.868) |
| Education ($x_5$) | 0.182 | 0.151 | 0.126 | -0.218 |
| | (5.077)** * | (5.562) *** | (5.077)*** | (5.562) *** |
| Experience ($x_6$) | -0.004 | -0.068 | -0.03 | -0.098 |
| | (-1.827) | (-1.950) * | (-1.827) | (-1.950) * |
| Credit ($x_7$) | -0.090 | -0.315 | -0.468 | 0.131 |
| | (-1.719) | -(5.365) *** | (-12.917) *** | (1.545) |
| Income ($x_8$) | 2.050E-5 | 1.388 | 1.421E-5 | 2.029E-005 |
| | (14.009)*** | (11.911)*** | (14.009)*** | (6.711)*** |
| Cooperative Membership ($x_9$) | 0.345 | -17.646 | -0.239 | 0.355 |
| | (2.976)* * | (-5.450) | (-2.976)* * | (2.775) ** |
| Access to extension ($x_{10}$) | 0.300 | 0.070 | -0.79 | 0.515 |
| | (2.331) * | (0.715) | (-0.899) | (3.668) *** |
| $R^2$ | 0.989 | 0.970 | 0.978 | 0.982 |
| f-ratio | 962.547*** | 509.585*** | 492.724*** | 509.585*** |

***Source; field survey, 2023, *** = significant at 1%, ** = significant at 5%, $H0_1$*: **rejected at 5% level**

**Constraints to adoption of yellow root cassava varieties**

Table 5 revealed that a greater proportion of cassava farmers (90.8% ranked 1st), complained of low output after processing, Poor access to information on yellow root variety (72.5%) high moisture content (80.8% ranked 2nd), and poor access to yellow root variety stem cutting (75.5% ranked 3rd) among others. The constraint left most of the farmers unable to continue with the technology in the area.

**Table 5: Distribution according to constraints to adoption of yellow root cassava varieties**

| S/No | Constraints | Frequency | percentage | Rank |
|---|---|---|---|---|
| 1 | Low output after processing of cassava variety | 109 | 90.8 | 1st |
| 2 | High moisture content | 97 | 80.8 | 2nd |
| 3 | Lack of access to yellow root cassava variety stem cutting | 91 | 75.8 | 3rd |
| 4 | Poor access to information on yellow root variety | 89 | 74.1 | 4th |
| 5 | Yellow nature of the starch/colour with respect to fufu | 88 | 73.3 | 5th |
| 6 | Poor income realized from the variety | 67 | 55.8 | 6th |
| 7 | The short life cycle of the variety which causes decay when not harvested on time | 52 | 43.3 | 7th |
| 8 | Lack of extension agent visits to cassava farmers | 40 | 33.3 | 8th |
| 9 | Lack of access to land for cassava cultivation | 23 | 19.2 | 9th |
| 10 | Poor educational status of farmers | 3 | 2.5 | 10th |
| 11 | Poor knowledge of the yellow-root cassava | 2 | 1.7 | 11 th |
| 12 | High growth of weed | 1 | 0.8 | 12th |

***Source; field survey, 2023 multiple responses***

## CONCLUSION

The study concluded that cassava farmers were aware of yellow root cassava varieties and the varieties available In Imo State were *umucas* 36 and *umucas*38. The adoption of the yellow root was low($\bar{x}$=2.3). Low output after processing, poor high moisture content and poor access to yellow root variety stem, access to information on yellow root variety among others were the major constraints to adoption. Age, sex, educational level, income, cooperative membership, and access to extension agents were the significant determinants of the level of adoption of yellow root cassava varieties among cassava farmers in Imo State

## RECOMMENDATIONS

The following recommendations were made based on the major findings of the study:

1 Extension agents should have more contact with cassava farmers to make information on yellow root cassava varieties available and enlighten the farmers more, especially on the nutritional values of the yellow root cassava variety.

2 Crop breeders and Genetist should find a way of reducing the moisture content in the yellow root cassava which is responsible for low starch when processed

3 Cassava farmers should be supported with inputs like credit and yellow root cassava stem cuttings to increase their production.

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