

DETERMINANTS OF ADOPTION OF PRO VITAMIN A CASSAVA VARIETIES BY FARMERS IN AKWA IBOM STATE, NIGERIA

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ABSTRACT

The study examined the determinants of adoption of pro vitamin A cassava by farmers in Akwa Ibom State, Nigeria. Using a multistage sampling procedure, 120 pro vitamin A cassava farmers were selected from Akwa Ibom state. Data were obtained using interview schedule with well-structured questionnaire and were analyzed by means of descriptive statistics like five (5) point rating scale and three (3) point rating types, mean and inferential statistics (tobit regression model). Results showed that the coefficients of education, farming experience, access to extension contact and nutritional information had a direct relationship with level of adoption of pro vitamin A cassava and significant at 10%, 5% and 1% respectively. The coefficients of household size had an indirect relationship with level of adoption of pro vitamin A cassava and significant at 1% respectively. The result also showed the grand mean perception of farmers about pro vitamin A cassava varieties ($\bar{x}=4.71$) were regarded as having a positive relationship with level of adoption of pro vitamin A cassava varieties in the study area. The grand mean of $\bar{x}=2.33$ implies that there were moderate adoptions of the first pro vitamin A cassava varieties while the grand mean of $\bar{x}=2.94$ implies that there were high adoptions of the last pro vitamin A cassava varieties in the study area. The reason for high and moderate adoption might be because of the good quality, high yield, marketability, nutritional and health benefits of pro vitamin A cassava. The respondents identified high cost/insufficient pro vitamin A cassava stem and unavailability of cassava flour processing machine as major constraints. This paper therefore recommends that efforts of the extension workers in corroboration with HarvestPlus project are highly needed to organize training programmes, nutritional information campaigns, workshop, agriculture shows and seminars with regards to pro vitamin A cassava to further enhance the level of adoption and acceptance of the technology in the study area.

Keywords: Pro- vitamin A, Cassava, Varieties, Farmers, Adoption.

Introduction

Cassava crop is otherwise the main vehicle used for the delivery of sustainable vitamin A nutrient through bio fortification in Nigeria. Pro-vitamin A cassava is a genetically improved cassava variety containing β -carotene (a precursor of vitamin A) which has the potential for the alleviation of vitamin A deficiency in low income population (Onyenike *et al.*, 2018). In Nigeria, the world's largest producer and consumer of cassava, Vitamin A deficiency affects 30% of children under the age of 5 (WHO estimates), resulting in reduced immunity, impaired vision, and, in some cases, even blindness and death (Njoku *et al.*, 2013). Furthermore, these health impairments cost Africa's largest economy an estimated US \$1.5 billion in lost GDP every year (Egesi *et al.*, 2014). Progressively, IITA, Ibadan in partnership with NRCRI, Umudike, Nigeria, developed these pro vitamin A cassava varieties using traditional breeding methods in a Harvest-Plus-funded project. The first three pro vitamin A cassava varieties were released in 2011 by the National Variety Release Committee of Nigeria as UMUCASS 36, UMUCASS 37, and UMUCASS 38;

and are recognized as IITA genotypes TMS 01/1368, TMS 01/1412, and TMS 01/1371 while the last three varieties released later were UMUCASS 44, UMUCASS 45 and UMUCASS 46 (NRCRI, 2014). The project works with national partners and the private sector to ensure that the pro-vitamin A-rich varieties reach resource-poor farmers in Nigeria (Abdoulaye *et al.*, 2015). According to Ilona (2012), it is estimated that by 2018 more than 2 million farming households will be planting vitamin A cassava and at least 17 million rural and urban consumers will be consuming vitamin A *gari* and *fufu* in their regular diets. The rate of adoption of pro vitamin A cassava in Akwalbom state depends on its profitability in terms of its availability, affordability, accessibility, nutritional value, health benefits, high yield, marketability and quality of the products. The objectives were to assess farmers' perception on Pro-vitamin A cassava, determine the levels of adoption of pro vitamin A cassava among farmers and to analyze the determinants of adoption of pro vitamin A cassava by farmers in Akwalbom state.

Materials and Methods

The study was conducted in Akwalbom State, Nigeria. Akwalbom is credited with a resident population of about 5 million (projected from NPC, 2006). The state is divided into six agricultural zones namely: Abak, Uyo, Etinan, Eket, Ikot ekpene, and Oron. A multistage sampling procedure was used in selecting the sample for this study. In the first stage two agricultural zones (Uyo and Ikot-Ekpene) were purposively selected. This is because pro vitamin A cassava has been massively disseminated in those areas. The second stage involved the selection of three (3) blocks from each of the two agricultural zones, making up a total of six (6) blocks. The third stage involved the random sampling of two circles from each of the blocks totaling twelve (12) circles. Ten (10) pro vitamin A cassava farmers were randomly selected from the list of pro vitamin A cassava farmers in the area, making it a total number of 120 farmers for the study. Focus Group Discussion and interview schedule with well-structured questionnaire were used to elicit information from the respondents. Data were analyzed by the use of descriptive statistics like five (5) point rating scale and three (3) point rating types, mean and inferential statistics (Tobit Regression model). The model as used is specified thus:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9 + ei)$$

Where:

Y = Level of adoption of pro vitamin A cassava (measured by number of adoption score of the respondents) to get the mean score.

X₁ = Educational qualification (years of schooling)

X₂ = Household size: (No. of persons in a household)

X₃ = Farming experience (years)

X₄ = Farm size (hectares)

X₅ = Farm income: (in Naira)

X₆ = Easy access to farm credit (mean: very easy, hardly easy, not at all)

X₇ = Member of cooperative (years)

X₈ = Participation in extension activities (mean: very often, hardly often, never)

X₉ = Nutritional information (yes = 1, no = 0)

ei = Error term.

Results and Discussions

Farmers' Perception of Pro Vitamin A Cassava

The farmers' perception of pro vitamin A cassava is presented on Table 1. The results revealed that farmers had positive perception on nutritional value /health benefit (\bar{x} =4.38), followed by, high yielding (\bar{x} =4.14), rapid growth (\bar{x} =3.93), marketable product (\bar{x} =3.75), good for fufu (\bar{x} =3.69), early maturity (\bar{x} =3.51), resistance to diseases (\bar{x} =3.26), good for garri (\bar{x} =3.17) and easily decay in the soil (\bar{x} =3.03). The findings on the grand mean perception of the farmers (\bar{x} =4.71) were regarded as having a positive relationship with level of adoption of pro vitamin A cassava in the study area. This agree with the findings of Njoku *et al*, (2014) that High pro-vitamin A cassava cultivars have high premium price, nutritional value among others, and were selected for adoption.

Table 1: Farmers' perception of pro vitamin A cassava

Variables	Bad	Fair	Good	Very good	Excellent	Total	Mean
It is a high yielding variety.	0(0)	0(0)	14(42)	75(300)	31(155)	497	4.14**
It is a rapid growth variety.	0(0)	0(0)	27(81)	74(296)	19(95)	472	3.93**
It has nutritional/health. value	0(0)	0(0)	16(48)	42(168)	62(310)	526	4.38**
It is good for garri.	6(6)	14(28)	50(150)	44(176)	6(30)	380	3.17*
It is good for fufu.	2(2)	3(6)	40(120)	60(240)	15(75)	443	3.69**
It is good for flour.	4(4)	50(100)	49(147)	15(60)	2(10)	321	2.68
It is good for starch.	30(30)	59(118)	26(78)	5(20)	0(0)	246	2.05
It is good for value added products: bread, chin-chin, cake, etc.	10(10)	369(72)	51(153)	12(48)	11(55)	338	2.82
It is a marketable product.	0(0)	5(10)	20(60)	45(180)	40(200)	450	3.75**
It decays easily in the soil.	2(2)	31(62)	61(183)	13(52)	13(65)	364	3.03*
It matures early.	0(0)	69(12)	65(195)	31(124)	18(90)	421	3.51**
It is resistant to disease/pests	4(4)	11(22)	70(210)	20(80)	15(75)	391	3.26*
It does not select soil.	52(52)	38(76)	10(30)	24(48)	3(15)	221	1.84
It responds only to fertilizer.	44(44)	51(102)	14(42)	32(8)	3(15)	235	1.96
It is very expensive to maintain.	31(31)	50(100)	23(69)	10(40)	6(30)	270	2.25
Grand mean							3.71

Source: Field survey, 2018.

Figures in parentheses are nominal likert values multiply by frequencies.

Mid Score Decision Rule: 3.0 and above is ** Positive perception * Moderate perception. Bench marks mean 3.00.

Adoption of Pro Vitamin A Cassava

The result of Table 2 on level of adoption of pro vitamin A cassava shows that 55 farmers adopt and still use the first pro vitamin A cassava varieties released and disseminated to farmers in 2011 while 50 farmers adopted and stopped and 15 farmers never adopted. The grand mean of $\bar{x} = 2.33$ implies that there were moderate adoptions of the first pro vitamin A cassava varieties in the study area. The result also showed that 115 farmers adopt and still use the second varieties of pro vitamin A cassava released in 2014 while only 3 farmers adopted and stopped and 2 farmers never adopted. The grand mean of $\bar{x} = 2.94$ implies that there were also high adoptions of the second pro vitamin A cassava varieties in the study area. The reason for higher

adoption could be that the varieties have deep yellow colour and retains the yellow colour than the first varieties. Generally, the high adoption recorded might be because of the good quality, high yield, marketable value and nutritional and health benefits of pro vitamin A cassava. The findings of Abdoulaye *et al*, 2015 on the adoption level of pro vitamin A cassava among farmers in Akwaibom showed that only 38% of farmers adopted it then. Considering the result of this finding, there has been a tremendous improvement of about 95.8% in the adoption level of pro vitamin A cassava in the state. This is also in agreement with the findings of Ironkwe (2012) that farmers adopt technologies that had relative high impact on their socio-economic status.

Table 2: 3 Likert type analysis of famers level of Adoption of pro vitamin A Cassava Varieties

Pro vitamin A cassava Varieties	Never Adopted	Adopted and Stopped	Adopt and still Use	Total	Mean
1st three varieties released					
UMUCASS 36 TMS011368	15(15)	50(100)	55(165)	280	2.33*
UMUCASS 37 TMS1011412					
UMUCASS 38 TMS1011371					
2nd three varieties released					
UMUCASS 44 TMS070220	2(2)	3(6)	115(353)	353	2.94**
UMUCASS 45 TMS1070593					
UMUCASS 46 TMS1070539					
Grand mean				633	5.27***

Source: Field survey, 2018

Mid Score Decision Rule: 2.0 and above is *** Very high Adoption ** High Adoption * Moderate Adoption. Bench marks mean 2.0

Constraints to Adoption of Pro vitamin A cassava

The result in Table 4 showed that pro vitamin A cassava farmers had constraints militating against adoption of pro vitamin A cassava varieties due to high cost of pro vitamin A stem ($\bar{x}=2.74$), Inadequate funding ($\bar{x}=2.67$) unavailability of fertilizer ($\bar{x}=2.67$) and unavailability of cassava flour processing machine ($\bar{x}=2.25$). The finding is in agreement with the study of Nwakor, (2010) who observed the

following as the developmental challenges facing adoption of improved cassava in Nigeria. However, another study noted that direct short-term benefits to farmers usually serve as important incentive in fostering adoption of resource-conserving technologies. The implication is that reduction of these constraints will help to improve production among farmers in the study area as well as other areas with similar constraints.

Table 3: Constraints to Adoption and Consumption of Pro-vitamin A cassava

Constraints	N	S	VS	Total	Mean
High cost of pro vitamin A stem	0(0)	31 (62)	89(267)	329	2.74
Inadequate funding	0(0)	40 (80)	80(240)	320	2.67
Unavailability of flour processing machine	15(15)	60 (120)	45(135)	270	2.25
Herdsmen /cattle menace	65(65)	45(90)	10(30)	185	1.54
Unsteady extension visit	60(60)	40 (80)	20(60)	200	1.67
Unavailability of fertilizer	2(2)	36(72)	82(246)	320	2.67
Grand mean					2.25

Source: field survey, 2018. VS=Very Serious (3), S= Serious (2), NS= Never Serious (1)

Figures in parentheses are nominal likert values multiply by frequencies.

Mid Score Decision Rule: 2.0 and above is Serious Constraints, Less than 2.0 is low Serious Constraints

Determinants of Adoption and Consumption of pro vitamin A cassava by farmers

The tobit regression analysis of the determinants of cassava farmers' level of adoption of pro vitamin A cassava are presented on Table 5. The results revealed that the coefficient of determination (R^2) was 0.0657. This implies that 6.57% of the variations in adoption of pro vitamin A cassava by farmers is determined by the independent variables discussed in the study and statistically significant at 1 % level of probability ($\text{prob} > Z = 0.0096$). Five out of nine explanatory variables were significant at 1%, 5% and 10% alpha level of probability. The estimate shows that educational level had a positive influence on farmers' adoption of pro vitamin A cassava at 10% significant level of probability. This implies that the higher the education, the probability of adoption of pro vitamin A cassava increases. This agrees with the findings of Ume et al, (2013) and Nwakor (2014) who found that education helped to facilitate adoption. This result concurs with the finding of Onumadu *et al.*, (2008) that higher literacy level increases the chances of adoption of a technology. The estimate also showed that year of experience of farmers had a positive and significant relationship at 10% level with their adoption. This implies that increased in years of experience increased the respondent's probability of adoption of pro vitamin A cassava. This finding is in line with *a priori* expectation and findings of Anyanwu *et al.*, (2016) who reported that increase in years of experience would enable farmers to efficiently produce effectively and maximize agricultural output for improved income. Access to extension contact was also positive and significant at 1% level of probability. This factor proved essential in the dissemination and acceptance of the new technology of pro-vitamin A bio fortified cassava varieties. This is in line with the *a priori* expectation that extension provides farmers with information on availability and technical skills for using innovations. This result

agrees with the findings of Bouis and Saltzman, 2017 and Knowler and Bradshaw, 2007 that access to extension has positively influence adoption and continued use of agricultural technologies. Extension contact has number of services they render to cassava farmers that include advice on crop management, crop pest control, and availability of agricultural inputs. Extension contact would inform and build the capacity of farmers, increasing their knowledge and reducing their uncertainty in decision-making. Furthermore, the analysis shows a positive and significant relationship at 10% level between farmers' level of nutritional information and adoption of pro vitamin A cassava. This means that the more they perceived the nutritional and health information of pro vitamin A cassava the more they adopt it. This agrees with Ilona (2012) that Pro vitamin A cassava has the potential to contribute to improved nutritional status among Nigerians, particularly children and pregnant women of rural poor household. This result concurs with the findings of Onyeneke et al, 2016; de Steur *et al.*, 2010; Oparinde *et al.*, 2014 and Birol *et al.*, 2015) that acceptance/adoption of pro vitamin A cassava depended on how well informed they are of its nutritional advantage against the high incidence of the vitamin A micronutrient deficiency in the rural communities. Also, Meenakshiet al. (2012) stated that nutritional campaigns have the potentials of improving the acceptance of people for pro-vitamin A bio-fortified crop varieties where they are introduced. Household size had a negative and 5% significant relationship with adoption of pro vitamin A cassava. This implies that household size decreased the respondents' level of probability of adoption of pro vitamin A cassava. This finding is however contrary to the findings of Anyanwu *et al.*, (2016), because increase in household size implies cheap labour for productive activities which should invariably reduce the cost of labour.

Table 4: Tobit regression estimates of the determinants of adoption of pro vitamin A cassava in Akwalbom state, Nigeria

Variables	Coef.	Std. Err	Z	P> z
Educational qualification	.2246527	.127108	1.86	0.036*
Household size	-.1426762	.1080933	-2.82	0.007**
Farming experience	.3353746	.2296238	1.96	0.044*
Farm size	-.0341179	.2281132	-0.15	0.881
Farm income	-.0000114	.0000238	-0.46	0.647
Easy access to credit	.0475136	.3294483	0.14	0.885
Member of cooperative	.0018698	.0515723	0.04	0.971
Access to extension services	.0692583	.0203489	3.40	0.001***
Nutritional information	.2691976	.3243873	1.92	0.047*
Chi ² (X ²)	21.77***			
Prob>	0.0096			
R ²	0.0657			
Log Likelihood	-154.73683			

Source: field survey, 2018

*, ** and *** is significant at 10%, 5% and 1% level of probability

Conclusion

The study has shown that pro vitamin A cassava varieties have been highly adopted by farmers in Akwalbom state. Nutritional information of pro vitamin A cassava varieties was seen to be very high in the study area. The level of adoption of the last pro vitamin A cassava varieties were higher than the level of adoption of the first varieties as a result of differences in quality of the varieties. The study also concluded that explanatory variables such as years spent in education, farming experience, nutritional information and access to extension contact were positively significant while household size was negatively significant. This paper therefore recommends that efforts of the extension workers in corroboration with HarvestPlus project are highly needed to organize training programmes, nutritional information campaigns, workshop, agriculture shows and seminars with regards to pro vitamin A cassava. It is also very imperative to supply more pro vitamin A cassava stems to the farmers in the study area. This will further enhance the level of adoption and acceptance of the technology in the study area.

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