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Farmers' Willingness to Cultivate Pro-vitamin-A Cassava Variety in Kwara State, Nigeria

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Abstract

The study examined factors underlying farmers' perception about pro-vitamin-A cassava varieties and their willingness to cultivate them in Kwara State, Nigeria. One hundred and twenty-two (122) cassava farmers, selected through a multistage sampling procedure, were used for the study. Data were collected through the use of interview schedule and analysed using percentages, mean and standard deviation. Chi-square, likelihood ratio and factor (principal component) analysis were used for inferential deduction. Results showed that about half (50.8%) of the respondents had high knowledge about the improved cassava variety and a vast majority (93.4%) expressed willingness to cultivate it. Sex ($\chi^2 = 3.542$) and knowledge level ($\chi^2 = 15.732$) had significant association with willingness to cultivate at $p \leq 0.05$, with female farmers found to be about 3 times more likely willing to cultivate than male. Also, farmers with more knowledge were found to be about 6

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times more likely willing to cultivate pro-vitamin-A than those with little knowledge. Three crucial factors ('ethno-based preference', 'culturally induced personal preference' and 'colour dislike') were found to be associated with farmers' perception about the cassava variety. Farmers in Kwara State were willing to cultivate the pro-vitamin-A cassava variety. Women and those who had more knowledge were more willing to cultivate the variety than men and those with little knowledge, respectively. Factors underlying farmers' perception about the variety were linked to ethno-cultural background and dislike for yellow root cassava. The need for more female integration and increased nutritional education in the drive towards popularisation of pro-vitamin-A cassava variety are thus recommended.

Key words: Pro-vitamin-A cassava, willingness to cultivate, nutritional education

Introduction

Global political and development agenda have not been able to successfully address hunger and under-nutrition for decades (Food and Agriculture Organization, 2018). Poor diet is foremost among the causes of micronutrient deficiencies. Large proportion of people in developing world consumes an insufficient amount of the fruits, vegetables and animal products that provide the micronutrients essential for good health. They lack access to adequate quantities of nutritious and balanced diets required for optimum growth and development, which remains a major impediment to their health and well-being (Govender, Pillay, Siwela, Modi & Mabhaudhi, 2017).

While millions of poor households in Africa rely on cassava for half of their daily energy, the crop contains only small amounts of micronutrients such as vitamin A. The diets of most Nigerians are based mainly on cassava products which are high in dry matter but low in vitamin A, protein, and other essential nutrients (Chandrasekara & Kumar, 2016; Ilona, Bouis, Palenberg, Moursi & Oparinde, 2017). The vitamin A recommended dietary allowance (RDA) for adults (men and women) and children (4 to 9 years) is 0.75 and 0.3 to 0.4 mg/day retinol activity equivalents (REA)/day, respectively, are not adequately supplied by these diets, especially in children, pregnant women who have high nutrient needs that often go unmet (Harvest Plus, 2018).

Hidden hunger, which denotes a chronic lack of micronutrients – vitamins and minerals in diet of people is a major cause of under-nutrition (Gani, Beenish, Omar, Tashooq, Bazila, Tahiya & Nusrat, 2018). The term has gained significant currency among nutrition scientists and policy-makers in recent years, simply because micronutrient deficiencies often occur even when food supplies are marginally adequate, and because the symptoms of these deficiencies may not be immediately apparent, and can exist for a long time before clinical signs of malnutrition become obvious, yet causing overarching long-term and profound ill-health consequences (Abeshu & Geleta, 2015; Palmer, Healy, Barffour, Siamusantu, Chileshe, Schulze, West & Labrique 2016). Hidden hunger is, therefore, a growing threat to public health, particularly in the developing world (Kassandra, Víctor & Patrick, 2017).

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Biorfortification, a process whereby certain crops are bred/fortified with essential micronutrient is increasingly becoming common in addressing the menace of hidden hunger. Biofortified crops are particularly effective in delivering micronutrients to rural communities, where the majority of lower-income, small-holder farmers who produce staple food crops (and whose families' diets comprise mainly of such crops) reside, and where year-round diverse diets or micronutrient supplements are often inaccessible (Harvest Plus, 2018). It is cost-effective and sustainable agricultural investment that can help to reduce mineral and vitamin deficiencies, especially in the diets of the rural poor (Bouis, Saltzman, Low, Ball & Covic, 2017).

Cassava is one of the crops targeted for biofortification because it is consumed daily by millions of poor households who rely on it for their daily energy needs. Biofortified cassava variety holds promise for improving the nutritional status and health of poor populations in Nigeria (Odoemelam & Anyim, 2019). With zero tolerance for hunger and poverty in the newly enunciated Sustainable Development Goals (SDGs), popularization and adoption of the pro-vitamin A cassava variety is therefore very essential to effectively combat hidden hunger and poverty among the rural populace and thus vital to attaining the SDGs in the critical areas of achieving food security and improved nutrition.

The interconnectedness of poverty and hunger can never be over emphasized. While poverty seems intractable and insurmountable to totally eradicate despite concerted global effort, drastic hunger reduction, and particularly, addressing the problem of hidden hunger through provision, dissemination and popularization of biofortified varieties of cassava will go a long way to enhance the socioeconomic well-being of the peasant farmers. This is more so, given the popular belief that when hunger is addressed in a poverty situation, poverty is deemed overcome. So, with Nigeria currently the world's largest producer of cassava with production estimated at 47.4 million metric tons (Sen Nag, 2017), combined with the multifarious uses of cassava in Nigeria, the crop, no doubt, has a special capacity to bridge the gap in food security and poverty alleviation among Nigeria's farmers (Akaa, Amonjenu & Akaa, 2016).

A major challenge, however, is making more farmers aware of the nutritional importance and adoption of the biofortified varieties which is of utmost concern given the low adoption rate of the elite cassava cultivars by farmers (Ayinde, 2017). The study is part of a larger project aimed at popularisation of biofortified cassava varieties and dissemination of its stem cuttings among farmers in Kwara State, which had, hitherto, been unreached before now. Also, for biofortification programmes to be successful, farmers must be willing to cultivate the biofortified cassava varieties. Given that farmers select cultivars based on multiple criteria such as colour and taste preferences (Ilona et al. 2017; Oparinde, Banerji, Birol & Ilona, 2016) amongst others, it is necessary to examine farmers' willingness to cultivate the pro-vitamin-A cultivars, thereby seeking to understand factors underlying farmers' perception about

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this variety. The study is, thus, conceived against this background. Willingness to cultivate is a term used to investigate whether farmers would be willing to accept a particular crop variety of relative advantage, followed by its cultivation (i.e. accept and cultivate). Ali and Rahut (2018) referred to it as 'willingness to grow' in their study that investigated farmers' willingness to grow genetically modified food and cash crops in Pakistan. Ginigaddara and Disanayake (2018) used the term when they investigated whether famers would be willing to cultivate traditional rice in Sri-lanka, as a result of increasing health problems common with modern rice. Also, Burli, Lal, Wolde, Jose and Bardhan (2018) studied factors affecting willingness to cultivate switchgrass in Missouri.

Objectives of the study

- Determine farmers' willingness to cultivate the pro-vitamin cassava varieties;
- Examine factors underlying farmers' perception about the pro-vitamin-A cassava varieties.

Hypothesis of the study

H_o1: There is no significant association between selected socioeconomic attributes of the farmers and their willingness to cultivate the pro-vitamin-A cassava varieties.
H_o2: There is no significant association between knowledge level of farmers and their willingness to cultivate the pro-vitamin-A cassava varieties.

Methodology

The research work was carried out in Kwara State, Nigeria. Kwara State (8.9848°N and 4.5624°E) is located within the North Central geopolitical zone of Nigeria commonly referred to as the Middle Belt. It is bounded by Niger State in the north, Kogi State in the east, Oyo, Ekiti and Osun States in the south and an international boundary with the Republic of Benin in the west (nigeria.gov.ng, 2019).It has 16 local government areas with the state capital in Ilorin. The majority of the people rely on agriculture as means of livelihood. It covers an area of 36,825 km² and regarded as the ninth-largest Nigerian state by size (wikipedia.org, 2019). Consisting of mostly of wooded savanna, but with forested regions in the south (Britannica.com, 2019), agriculture constitutes the main source of the state's economy. Farming is the major occupation of the people (nigeria.gov.ng, 2019). The state has two main climatic seasons; the dry and wet seasons with rainfall between 1000-1500 mm. This rainfall pattern favours the cultivation of cassava which is one of the most consumed crops by the people.

Data for the study emanated from baseline survey conducted, in September 2018, at the onset of a larger project aimed at popularisation and dissemination of pro-vitamin-A biofortified cassava stem cuttings to farmers in Kwara State. In identifying and selection of project participants, four local government areas (LGAs) were selected through proportionate sampling from the 16 LGAs of the state viz; one from Kwara North Senatorial District which has four LGAs, 1 from Kwara Central which

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has five LGAs, and lastly, two LGAs from Kwara South which has seven LGAs. Next, one community each, was purposively selected from each LGA based on historical background as a cassava-producing community/village giving four communities. Then, a proportionate sampling technique was used to respectively sample 32, 28, 32, and 30 respondents in each of the four communities to give a total of 122.

A five point Likert-type scale was used to evaluate farmers' perception about the pro-vitamin-A cassava variety, vis: 'strongly agreed' – 5; 'agreed' – 4; 'undecided' – 3; 'disagreed' – 2 and 'strongly disagreed' – 1. 'Willingness to cultivate' was measured by asking farmers if they would be willing to cultivate the pro-vitamin A variety and 'Yes' response was scored 1 while 'No' scored 0. As for knowledge level, respondents were asked some four questions aimed at evaluating their knowledge with 'Yes' response scored 1 and 'No' scored 0. With a maximum of 4 points obtainable, median value of 2 was set as benchmark to demarcate between low and high knowledge level: 2 or less than (low); greater than 2 (high). The low and high levels were coded 1 and 2, respectively, with low been reference category and high as target category.

Data were collected through the use of interview schedule and analysed using percentages, mean and standard deviation. Chi-square analysis was used to test significant association between selected socioeconomic attributes of farmers, knowledge level, and their willingness to cultivate pro-vitamin-A cassava varieties. Likelihood ratio was also used to estimate the chances that the target category of a categorical independent variable will likely be more willing to cultivate the improved variety than the reference category. Factor analysis was used to examine factors underlying farmers' perception about the pro-vitamin-A variety. Kaiser's criterion, i.e. retaining Eigen value above one, was used in the study. Also, Varimax rotation was done to allow for more even spread of percentage variation accounted for by each of the extracted factors. The extracted factors were named based on underlying similarities reposed in the variables with highest loadings under each factor.

As a preliminary check on appropriateness of use of factor analysis for the study, the Kaiser-Meyer-Olkin measure of sampling adequacy of 0.613 reported is adjudged satisfactory being greater than 0.60 minimum required (International Business Machines (IBM) Knowledge Center**,** 2020), thus indicating that the sample size of the study was adequate to justify the use of factor analysis. Also, Bartlett's test of sphericity yielded chi-square of 419.610, which was significant at $p \leq 0.01$. Again, the significant chi-square test is necessary for conduct of factor analytical procedure. IBM-SPSS Statistics (version 23) was used for data analysis.

Results and Discussion

Cassava Enterprise Related Characteristics

Table 1 shows that the majority (81.1%) of the farmers often sell their cassava roots after harvest. The Table also shows that about 55% sometimes process the roots after harvest. About 34% and 27% processed into *garri* and *fufu*, respectively. This

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finding is similar to that of Ilona et al. (2017) that *garri* and *fufu* are amongst most prominent cassava products. The results indicate that more farmers sell raw cassava roots than those processing, which is the common practice among smallholder farmers. They sell the roots to earn money to meet their immediate and short term needs. However, for the pro-vitamin A variety to be beneficial to the farming households, farmers would have to process and consume it. Therefore, it is important that farmers be encouraged to process some of the pro-vitamin A variety for consumption, in order for them to have access to its vitamin A content.

The majority (68.9%) had never heard about the pro-vitamin A variety. Only about 30% had heard or were aware about it (See Table 1). This indicates that pro-vitamin A variety is new to most farmers in the area. This is because, until the start of the project on which this study is based, there had been no record of prior effort to introduce the improved cassava varieties to farmers in Kwara State. Among the proportion who had heard about pro-vitamin A variety, the majority (73.68%) had never cultivated it. Also, the majority (75%) of this category gave unavailability of the stem cuttings as reason for non-cultivation, while 25% were not just fascinated about the improved variety.

These results indicate that the likelihood that farmers would be willing to cultivate these variety is high given that only fewer proportion were not interested in the cultivars, whereas, larger proportion didn't cultivate due to lack of stem cuttings. Table 1 further shows proportion of farmers willing to cultivate the pro-vitamin A variety. It shows that a vast majority (93.4%) expressed willingness to cultivate the cassava varieties. This is similar to the finding by Oparinde, Banerji, Birol and Ilona (2016) that farmers were willing to cultivate the pro-vitamin A variety once they were told about its nutritional benefits. Also, the table indicates that, although about 85% had never consumed the pro-vitamin cassava varieties before, as much as 94.3% were willing to consume them.

Table 1 further shows that about half (50.8%) had high knowledge about the pro-vitamin cassava variety, while 49.2% had low knowledge. This is similar to the findings of Oparinde, Abdoulaye, Mignouna and Bamire (2017) that more farmers had knowledge about the improved variety in Oyo state, southwestern, than their counterparts in Benue state, northcentral Nigeria. Close proximity to Ibadan, where the International Institute of Tropical Agriculture (IITA), the pioneer institution who disseminated the improved variety, is situated could be responsible for appreciable number of farmers who had knowledge about the variety.

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Table 1: Cassava enterprise related characteristics

Variable	Percentage (n=122)
Sell cassava after harvest	
Yes	81.1
Process after harvest**	
Yes	54.9
Process into *garri*	33.6
Process into *fufu*	27.0
Process into other products (flour, tapioca, starch)	32.8
Aware/Heard about Pro-vitamin A cassava (Yellow roots cassava)?	
Yes	31.2
If heard/aware, ever cultivated? (n = 38)	
Yes	26.32
Aware but never cultivated, why? (n = 28)	
Stem cuttings not available	75.0
Not just fascinated about the variety	25.0
Willingness to cultivate	
Yes	93.4
Consumption: ever consumed the variety?	
Yes	14.8
Willingness to consume	
Yes	94.3
Knowledge level	
Low	49.2
High	50.8

**Multiple response
Source: Field survey, 2018

Relationship between Personal Characteristics and Willingness to Cultivate Pro-Vitamin A Cassava

Table 2 shows that sex (χ^2 = 3.542; p≤0.05) had significant association with willingness to cultivate the pro-vitamin A cassava variety with likelihood ratio of 3.007. The results indicate that female farmers (target category) will be more likely willing to cultivate the cassava variety about 3 times more than male farmers (reference category). This finding underscores the need for more female integration in the drive towards popularisation of pro-vitamin A cassava variety. The finding is also similar to that of Esuma, Nanyonjo, Miiro, Angudubo and Kawuki (2019) that female youth were six times more willing to grow yellow roots cassava than any other gender group such as male youth, adult men and adult women in eastern Uganda.

Also, knowledge level (χ^2 = 15.732; p≤0.05) had significant association with willingness to cultivate the pro-vitamin A cassava variety. The result agrees with the submission of Oparinde et al. (2017) that knowledge of nutritional benefits was

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positively related to farmers' willingness toward cultivating the Provitamin A cassava. With likelihood ratio of 6.087, the result indicates that farmers who know more about the improved variety will be more likely willing to cultivate it about 6 times than those who had less knowledge. The implication is that efforts should be made to sensitize farmers more about the nutritional benefits of the variety. This is similar to the submission by Esuma et al. (2019) on the need for nutritional education when disseminating improved pro-vitamin-A cassava varieties among rural farmers in eastern Uganda.

Table 2: Relationship between selected farmers' personal characteristics and willingness to cultivate pro-vitamin A cassava

Variable	Df	Chi-square Value	Likelihood ratio
Sex	1	3.542*	3.007*
Marital status	2	0.521	0.979
Educational level	5	4.470	3.346
Awareness/Heard about the cassava variety	1	4.947	
Knowledge level	1	15.732*	6.087*

*P≤0.05
Source: Field survey, 2018

Key Factors Underlying Farmers' Perception of pro-Vitamin A Cassava Variety
Table 3 shows that three crucial factors were found to be associated with farmers' perception about the pro-vitamin A cassava variety. These factors, in all, accounted for about 64% variation in the dependent variable – willingness to cultivate the improved cassava variety. The remaining 36% could be due to other factors unaccounted for. First among them was named 'ethno-based preference', which singly accounted for 23.64% variation. Variables that loaded highly on this factor were: 'consumption of yellow roots cassava is common among *south easterners* only' (0.842), consumption of yellow roots cassava is common among *south southerners* only' (0.814), as shown in Table 3. Also, 'adding palm oil to cassava during processing make it likeable to my customers' and 'adding palm oil to cassava increases the market value' had negative loading values of -0.725 and -0.714, respectively, thus indicating negative perception of farmers in Kwara State about yellowish cassava products.

The second factor was named 'culturally induced personal preference'. It accounted for 21.72% of the total variation. Variables that informed naming of this factor were 'yellow roots cassava processed into *garri* is not good for drinking' (0.621); 'I cannot eat/do not like to eat *fufu* made from yellow roots cassava' (0.834) and 'yellow roots cassava is not acceptable in our community' (0.645). Third factor was labeled 'colour induced dislike' factor, which accounted for 18.57% of the total variation. Variables that contributed to naming of this factor were: 'I do not like to cultivate

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yellow roots cassava because my customers complain about its colour' (0.879), 'I do not like to consume yellow roots cassava products (e.g. *garri*) basically for its colour' (0.794) and 'I just dislike the yellow roots cassava' (0.623).

The results show that factors underlying farmers' perception about the pro-vitamin A cassava variety in Kwara State may be said to be linked to ethno-cultural background and dislike for yellow roots cassava. This is not surprising given the preponderance of white flesh cassava roots in the study area. This is contrary to the findings of Ilona et al. (2017) that farmers in south-eastern Nigeria perceived colour of pro-vitamin A cassava as attractive, with the yellow cassava more liked than white cassava.

The south-western and south-eastern regions, before the advent of yellow roots cassava, were known to commonly add palm oil to cassava products during processing. With roots of pro-vitamin variety being yellowish in colour due to its high carotene content. These finding, is similar to that of Onyeneke, Emenekwe, Munonye, Olaolu, Izuogu, Ibrahim-Olesin, Amadi, Njoku and Obi (2020), and underscores the need for rigorous efforts, through nutrition education, to bring about change in orientation of farmers towards increased acceptance of yellow roots cassava. This is because variations in farmer perceptions and attitudes towards crop varieties are critical considerations when targeting to deploy improved cultivars (Oparinde et al., 2017; Alomia-Hinojosa, Speelman, Thapa, Wei, McDonald, Tittonell & Groots, 2018).

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Table 3: Factors associated with farmers' perception about the pro-vitamin cassava variety

Perception Statements	Factors		
	1	2	3
I dislike yellow roots cassava	-.007	.483	**.623**
I can never cultivate yellow roots cassava	.345	.674	.303
Yellow roots cassava processed into garri is not good for drinking	.065	**.621**	.154
I cannot eat/do not like to eat fufu made from yellow roots cassava	-.099	**.834**	.006
Yellow roots cassava is not culturally acceptable in our community	.219	**.645**	.165
Adding palm oil to cassava during processing make it likeable to my customers	**-.725**	-.254	.086
Adding palm oil to cassava increases its market value	**-.714**	-.075	.131
I do not like to consume yellow roots cassava products (e.g.garri) basically for its colour	-.029	.229	**.794**
I do not like to cultivate yellow roots cassava because my customers complain about its colour	.108	.043	**.879**
Consumption of yellow roots cassava is common among south easterners only	**.842**	-.110	.157
Consumption of yellow roots cassava is common among south southerners only	**.814**	-.262	.244
Eigen values	3.058	2.653	1.321
% variation	27.795	24.117	12.010
Cumulative % variation	27.795	51.912	63.923

Source: Field survey, 2018

Conclusion and Recommendation

Farmers in Kwara State were willing to cultivate the pro-vitamin A cassava variety, although, women and those who had more knowledge of the pro-vitamin A variety were found to be more willing to cultivate it more than male and those with less knowledge, respectively. Factors underlying farmers' perception about the variety were linked to ethno-cultural background and dislike for yellow roots cassava. The

need for more female integration in the drive towards popularisation of pro-vitamin A cassava variety is recommended. Also, need for nutritional education when disseminating improved pro-vitamin A cassava varieties should be emphasized in order to enhance farmers' knowledge and change their perception about the variety by emphasizing its nutritional and health benefits.

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