Comparative Analysis of Consumption Level of Pro-Vitamin A Cassava Products among Farmers in South-East and South-South Nigeria

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ABSTRACT

Pro-vitamin A cassava products which include garri, fufu, flakes, tapioca, flour for cake, bread, chin-chin, boons etc, have nutritional, health and economic values for consumption among farmers in south-east and south-south Nigeria. On that note, multistage random sampling was adopted in the selection of the sample size of 480 pro-vitamin A cassava households cumulatively chosen from Imo, Anambra, Delta and AkwaIbom states. About 8 agricultural zones, 24 blocks, 48 circles and 120 respondents from each state were randomly selected. Focus group discussion and well-structured questionnaire were used to elicit information from the respondents while descriptive (standard deviation, tables, mean) and inferential statistics (Duncan multiple range test) were used to analyze the data collected. Result emerging from analysis showed that ANOVA result detected differences in the level of consumption of pro vitamin A cassava products across the states indicating mean scores in Imo as (1.9150), Delta (1.9150), Anambra (1.9961) and AkwaIbom (2.1426) and significant at 1% level of probability. The study concluded that there were low levels of consumption of pro-vitamin A cassava products in Imo, Anambra and Delta states but high in AkwaIbom state. Therefore, promotional activities, such as awareness campaign and trainings should be organized for farmers in order to encourage more consumption of vitamin A cassava products since the result of level of consumption form and usage of pro vitamin A cassava products indicated low level of use in as flour, flakes (abacha), cassava chips, value added: bread, cake and tapioca is recommended.

Keywords: *Pro vitamin A cassava, Products, Farmers, Consumption, Comparative, Nigeria.*

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1. INTRODUCTION

Pro-vitamin A cassava products which include *gari, fufu, flakes, tapioca, High Quality Cassava Flour(HQCF)* for preparing*cake, bread, chin-chin, boonsand other snacks* have nutritional, health and economic values for consumption among rural households in Nigeria [1]. B-carotene (pro vitamin A) which is a vitamin A precursor is an important nutrient required for maintaining immune function, eye health, vision, growth and survival in human beings. Vitamin A deficiency is among the most serious problems in third world countries and the common cause of childhood blindness. In developing countries, vitamin A deficiency remains a major bottleneck to improved nutrition with approximately 250,000 to 500,000 malnourished children going blind each year, half of whom die within a year of becoming blind [2]. Millions of Nigerians, irrespective of age, sex or geographic location consume less vitamin A than the body needs while women and children remain the most vulnerable [3]. A sustainable way of mitigating vitamin A deficiency is by breeding food staples such as cassava to produce vitamin A by itself, a process known as biofortification [4].

Progressively, International Institute for Tropical Agriculture, Ibadan in partnership with the National Root Crops Research Institute, Umudike, Nigeria, developed and released the first pro vitamin A cassava varieties in 2011 and the second one in 2014 using traditional breeding methods in a Harvest-Plus-funded project. These pro vitamin A cassava varieties have been distributed to about 100,000 households in Nigeria as at October 2013 namely; Anambra, Abia, Ebonyi, Enugu, AkwaIbom, Cross River, Imo, Delta among others through the Extension Services Programme of the National Root Crops Research Institute, Umudike [4]; [5] and other partners. According to Ilona, *et al.* [6] as at the end of 2013, a cumulative total of 106,000 farm households in Nigeria had been reached with vitamin A cassava. 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 eating vitamin A *gari*and *fufu*in their regular diets [4].

The application of adoption of innovation theory as propounded by Rogers 2003 is very crucial in understanding the adoption and consumption of pro vitamin A cassava by farmers in south-east and south-south Nigeria. Obviously, the theory is focused on how individuals (farmers) respond to information in the environment where they occupy. Actually, individuals or groups respond to information or innovation based on awareness of innovation.

The consumption of pro-vitamin A cassava could help Nigeria reduce economic losses in gross domestic product estimated at about $1.5 billion [6]. Most importantly, it improves nutrition, especially of women and children who are the most vulnerable. These products are expected to be continuously consumed by farmers to improve their uptake of vitamin A. However, the rate of consumption of pro vitamin A cassava products in south-east and south-south Nigeria is subject to its profitability, degree of risk associated with it, capital requirements, nutritional information, agricultural policies and socio-economic attributes of consumers. This research is necessitated by dearth of information on consumption level of pro vitamin A cassava products in spite of breakthrough recorded by NRCRI and IITA in the technology development, released and transferred in Imo, Anambra, AkwaIbom and Delta states eight years ago. The objectives were to determine the levels of consumption form and usage of pro vitamin A cassava products among farmers; assess the factors influencing farmers' consumption of pro vitamin A cassava products and to analyze the consumption levels of pro vitamin A cassava products across the states.

2. METHODOLOGY

The study was conducted in south-east and south-south Nigeria. The population of the study consisted of pro vitamin A cassava farmers in the study area purposively selected from Imo and Anambra states representing south east and AkwaIbom and Delta states representing south-south Nigeria. This is because pro vitamin A cassava has been massively disseminated in those areas. Multistage sampling procedure was used in selecting the sample size of 480 respondents cumulatively chosen from the four states. The first and second stages involve purposive selection of eight (8) agricultural zones and twenty-four (24) blocks from the four states. In the third stage, forty-eight (48) circles were randomly selected from the blocks. Finally, ten (10) pro vitamin A cassava farmers were randomly selected from the circles, giving one hundred and twenty (120) respondents from each state and a total of 480 respondents across the states. Focus group discussion and interview schedule with well-structured questionnaire were used to elicit information from the respondents to achieve the study objectives which were in sub-sections. Objectives 1 and 2 were analyzed using descriptive statistics such as standard deviation, mean and tables while objective 3 was analyzed using ANOVA (Duncan multiple range test and a Post-Hoc test) to estimate different response for consumption level of pro vitamin A cassava products. The model is specified as follows:

$$DMRP = QP\sqrt{MSE/r}$$

Where:

DMRP = Duncan multiple range.

QP = Shortest significant range.

√MSE = Mean square error.

r = Number of states.

3. RESULTS AND DISCUSSION

3.1. Level of Consumption Form and Usage of Pro Vitamin A Cassava Products

Table 1 show that the pro vitamin A cassava products were consumed in varying degrees. The mean scores of consumption form and usage of pro vitamin A cassava products among farmers in Imo Statewere ($\bar{\mathbf{x}}$ =1.90), Anambra State($\bar{\mathbf{x}}$ =1.97), Delta State ($\bar{\mathbf{x}}$ =1.91) and Akwa Ibom State ($\bar{\mathbf{x}}$ =2.0). The pooled mean score was ($\bar{\mathbf{x}}$ =1.80). Using the consumption indicator, the level of consumption and usage of the products in Akwa Ibom State was high while Imo, Anambra and Delta States had low level of consumption and usage of the products. This could be as a result of some factors such as complexity and inadequacy of the technology, inadequate enlightenment training on the potentials of pro vitamin A cassava, inadequate processors and pattern of preparation for consumption. Theresult further shows that there were high level of consumption of fewvariablessuchasgari, fufu and flakes (abacha) acrossthestates. This finding disagrees with the estimation of Ilona, et al. [6] 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 eating vitamin A *gari*and *fufu* in their regular diets. Comparatively, south-south had high level of consumption than south-east.

Table-1. Level of consumption form and usage of pro vitamin A cassava products.

Variables	Imo(n=120)		Anambra (n=120)		Delta(n=120)		AkwaIbom (n=120)		Pooled (n=120)	
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Consume in gari form	2.98	.15678	2.94	.23536	2.50	.1568	2.83	.4613	2.81	.1691
Consume in fufu form	2.97	.20066	2.88	.42133	2.10	.2007	3.00	.0000	2.74	.3709
Dispose as fresh root	2.00	.00000	2.13	.57570	2.00	.0000	2.30	.2048	2.11	.3120
Dispose as stem	2.00	.00000	1.93	.55250	2.00	.000	1.99	.2048	1.98	.2987
Use as flour	1.14	.49017	1.35	.57468	1.14	.4902	1.74	.6673	1.43	.6020
Consume in flakes (abacha)	2.65	.6169	2.65	.81581	2.30	.6169	2.73	.7214	2.60	.6752
Use as cassava chips	1.02	.1286	1.28	.58242	1.02	.1286	1.01	.0913	1.08	.3236
Consume in value added: bread, cake, etc.	1.35	.6032	1.57	.56111	1.35	.6032	1.43	.6044	1.41	.5669
Tapioca	1.00	.00000	1.00	.50875	2.75	.4719	1.00	.0000	1.21	1.022
Grand mean	1.90		1.97		1.91		2.00		1.80	

Source: Field survey, 2018.
Decision: $\bar{x} \geq 2.0$ indicates high consumption; $\bar{x} \leq 1.9$indicates low consumption.

3.2. Factors Influencing Consumption of Pro Vitamin A Cassava Products

From the result in Table 2 majority of the pro vitamin A cassava rural households in South-East and South-South Nigeria indicated that pro vitamin A cassava products have health benefits; highly nutritious; good for diabetes patients and very good for obsessed/overweight people. The grand mean result was above the bench mark of 3.0 across the states respectively, Imo state ($\bar{x}$=3.53**),** Anambrastate ($\bar{x}$=3.84**),** Delta state ($\bar{x}$=3.65) and Akwa Ibom state ($\bar{x}$=4.1) show that the consumption of pro vitamin A cassava products across the states were strongly influenced by the aforementioned factors, as a result boosting the consumption level of pro vitamin A cassava. The pooled mean score was ($\bar{x}$ =3.78). This implies that pro vitamin A cassava consumers across the two zones have identified the health benefits of this crop and its products. This will definitely increase the consumption level of pro vitamin A cassava products across the two zones. This agree with the findings of Njoku, et al. [7] that high pro-vitamin A cassava cultivars and products have high premium price, nutritional value among others, and were selected for adoption and consumption. According to Harvest Plus Bio-Fortification Progress Brief [8] and Oparinde, et al. [9] a consumer acceptance study conducted in 2011 in two Nigerian States revealed that, if delivered together with nutrition information, varieties were generally preferred both after sensory evaluation of taste, appearance and texture and this enhances consumption level.

This result also agrees with Bouis and Saltzman [10] who states that acceptance, adoption and consumption of pro vitamin A cassava was now based on how well informed consumers are of its health benefits and nutritional advantage against the high incidence of the vitamin A micronutrient deficiency in their communities.

Table-2. Factors influencing consumption of pro vitamin A cassava products among farmers.

Factors influencing consumption	Imo State (n=120)		Anambra State (n=120)		Delta State (n=120)		AkwaIbom State(n=120)		Pooled(n=480)	
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
It has health benefits	4.25	.4348	4.31	.4637	4.51	.5020	3.91	.8300	4.24	.6172
It is highly nutritious	4.22	.4193	4.18	.3886	4.51	.5020	4.44	.6584	4.34	.5202
Good for diabetes patients	3.89	.4259	4.18	.3886	4.29	.4564	4.20	.6298	4.14	.5054
Always available, affordable and accessible	2.85	.8059	4.07	.4976	3.04	.9907	4.02	.7668	3.49	.9584
Good for obsessed people	3.83	.5239	4.03	.2220	2.70	.6430	3.81	.7702	3.59	.5874
Very simple to process	4.03	.4287	4.00	.0000	3.89	.4815	3.85	.6693	3.94	.4693
It has good colour	2.82	.8048	4.03	.1568	3.88	.4335	4.17	.5528	3.72	.4483
It has good texture	2.93	.8716	2.79	.8898	3.23	1.133	4.19	.5233	3.29	.9129
It has good quality	2.99	.8877	3.01	.0911	2.82	.8349	4.27	.6181	3.27	.6072
Grand mean	3.53		3.84		3.65		4.1		3.78	

Source: Field survey, 2018.
Decision: $\bar{x} \geq 3.0$ indicates influential factors; $\bar{x} \leq 3.0$ indicates not influential factors.

3.3. Duncan's Multiple Range Tests for Level of Consumption Form and Usage of Pro Vitamin A Cassava Across the States

The results of analysis of the Duncan multiple range test of the significant relationship between farmers' level of consumption of pro vitamin A cassava products in Table 3 revealed that the ANOVA detected differences in the consumption form and usage of pro vitamin A cassava products (*gari*, *fufu*, stem, fresh roots, *tapioca*, *flakes*, *flour* for *cake*, *bread*, *boons*, etc.), indicating F-value (92.12) and statistically significant at 1% level of probability across the states. The results also revealed that there were statistical differences across the states at 1% alpha level. Furthermore a close look at the result revealed that there was no significant difference in the consumption form of pro vitamin A cassava products between Imo State with mean of $(1.9150)^{ab}$ and Delta State $(1.9150)^{ab}$ but both States significantly differed with Anambra $(1.9961)^{a}$ and AkwaIbom $(2.1426)^{a}$, implying that farmers in AkwaIbom and Anambra states consumed pro vitamin A cassava products more than their Imo and Delta counterpart. This also implies that states were determinant to consumption form of pro vitamin A cassava in south-east and south-south Nigeria. This could be as a result of nature of delivering authority, accessibility, affordability, nutritional information/awareness, location-specific variables. This is in agreement with Abdoulaye, et al. [11] that the proximity to research institutes and their output is more likely to determine the consumption of pro-vitamin A cassava products across the states. According to Ilona [4] by mid-2014, more than 150,000 household members across the states in Nigeria would be expected to be eating vitamin A cassava products. This is in agreement with the study, though, the level of consumption is high in some states and low in other states. This is also in tandem with the estimated report of Ilona [4] that by 2018, 17 million rural and urban consumers will be eating vitamin A *gari*and *fufu*in their regular diets.

Table-3. Duncan's multiple range tests for level of consumption form of pro vitamin A cassava across the states.

States	R	Mean	Std. deviation	Std. error	F-value	Sig.
Imo State	120	1.9150[ab]	.27700	.01264		
Anambra State	120	1.9961[a]	.34223	.03124		
Delta State	120	1.9150[ab]	.27700	.01264		
AkwaIbom	120	2.1426[a]	.19011	.01735		
Total	480	1.9150	.27700	.01264	92.12	.000***

Source: Field survey, 2018.
*** Duncan multiple range test estimate significant 1% level of probability.

3.4. Post Hoc on the Level of Consumption Form and Usage of Pro Vitamin A Cassava Products

The result on Table 4 showed that the mean consumption form and usage of pro vitamin A cassava products in the study area was higher among farmers in AkwaIbom and Anambra States, followed by Delta and Imo States. Comparatively, there was significant difference in the consumption form and usage of pro vitamin a cassava products in South-south states than states in South-east. This implies that farmers in south-south were consuming pro vitamin A cassava products more than their counterpart in South-east Nigeria.

Table-4. Result of post Hoc test showing where significant difference occurred on the level of consumption form and usage of pro vitamin A cassava products.

States	N	Subset for alpha = 0.05		
		1	2	3
Imo	120	1.9537[c]		
Anambra	120			2.9917[a]
Delta	120		2.94176[b]	
AkwaIbom	120			3.0000[a]
Sig.		1.000	1.000	.669

Source: Field survey data, 2018.
Mean for group in homogenous subsets displayed.
Use Harmonic mean sample size =120.

4. CONCLUSION

The study concluded that the farmers had low level of consumption and usage of pro vitamin A cassava products in Imo and Delta states and high level of consumption in AkwaIbom and Anambra states as indicated by the analysis. The study also concluded that the consumption of pro vitamin A cassava products across the states were strongly influenced by health benefits, highly nutritious, good for diabetes patients and very good for obsessed/overweight factors, as a result boosting the consumption level of pro vitamin A cassava among farmers in some of the study states. The Duncan multiple range test of the significant relationship between farmers' level of consumption of pro vitamin A cassava products concluded that there were differences in the level of consumption of pro vitamin A cassava products across the states. The study hereby recommends that promotional activities, such as awareness campaign and trainings should be organized for farmers in order to encourage more consumption of vitamin A cassava products since the result of level of consumption form and usage of pro vitamin A cassava products indicated low level of use, as flour, flakes (abacha), cassava chips, value added products: bread, cake and Tapioca. This is necessary to reduce the level of vitamin A deficiency among rural poor farmers in Nigeria.

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