DETERMINANTS OF CHOICE OF YELLOW YAM CONSUMPTION IN NIGERIA: CASE STUDY OF DELTA STATE, NIGERIA

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Abstract
The research analyzed various factors that affect farmers' choice of yam species they consume in Delta North Agricultural Zone of Delta State. Yam is important as a source of food, income and livelihood. The quest for convenient, nutritious and cheap food by consumers has necessitated the cultivation and maintenance of the yam varieties to avoid extinction of some yam species. Primary data were collected from one hundred and forty-three households; yam producers (69) and yam consumers (74). The data were analyzed using descriptive statistics and multiple regression analysis. Findings show that 97.1% of the farmers are male, 81.2% married, 47.8% had primary education, 68.1% engaged in mixed-farming and most of the farmers preferred planting white yam (62.3%) over yellow yam (33.3%). Yam producers had more yield from white yam than yellow yam producers. Majority (78.4%) of the yam consumers preferred white yam over yellow yam. Many (43.2%) of the yam consumers were highly educated. It was also found that educational background (t=2.419) and preferred specie (t=-2.154) were statistically significant at 5%, as consumption determinants alongside household expenses (t=-3.030), household size (t=4.252) and income (t=2.907) - all significant at 1% level. The study therefore recommends the promotion of white yam for commercial production, while yellow yam should also be promoted; especially for subsistence consumption to increase biodiversity. In addition, more land should be made available for yam production, as this will encourage yellow yam production, since the result indicates a positive correlation between land and the propensity to produce yellow yam in the study area.

Keywords: Yellow yam, consumption, consumer choice, determinants of choice of yellow yam

Introduction
Nigeria was a major producer of a number of food crops before the oil boom in the 70's with various regions of the country growing on every large scale specific cash crops such as, millet, groundnut in the North, Cocoa in the west, Cassava, yam, rubber, oil palm in the south, for the both national consumption and for international trade. Roots and tubers are cultivated predominantly in the rain forest of the South, while grains and cereals are cultivated in the Savanna zone of the Northern Nigeria. The International Institute of Tropical Agriculture, IITA, (2009) puts average yam consumption per capital per day in west African countries as follows; Benin(364kca1), Cote D' Ivoire (342kca1), Ghana(296kca1) and Nigeria(258kcal), with Nigeria as the least consumer, but with very significant consumption per capita per day. Yam can be consumed either in barbecue form, roasted form, or fried, grilled, boiled, pounded into paste (pounded yam), it may be cooked or fried with rice, beans, plantain, sweet potato, chicken, etc (Umar, Nwafor, Likita & Adoko, 2016). In recent times, population growth has overwhelmingly surpassed agricultural productivity (Okuneye, 2001). This mounts pressure on sustainability of the general population and food security as *per capita* consumption increase with population. White yam (*Dioscora rotundata*) is the most popular yam species in the West Africa according to FAO, (2002). The stem of white yam is round without wings and prickly at the base. The white flesh of the tubers, produces mainly starch, which can be utilized in various forms, the tuber also contains the highest protein content (along-side potato), of all roots and tuber crops, with approximately 2% protein on fresh weight bases (Opara, 1999). Yams are rich in carbohydrates, vitamin c, potassium, manganese and have more than 21% of dietary fibre (IITA, 2009). The crop also provides a much greater proportion of starch intake in the region. The tuber is roughly cylindrical in shape; the skin is smooth and brown, with white and firm flesh. Yellow yam (*Dioscorea cayenensis*), a native to West Africa, is very similar to the white yam in appearance, but has a yellow flesh, which is caused by

the presence of *Carotenoids*. Apart from some morphological differences (the tuber skin is firm and less extensively grooved), the yellow yam has a longer period of vegetation and a shorter dormancy than white yam.

Yam is important as a source of; food, income and livelihood means. The quest for convenient, nutritious and cheap food by consumers has made necessary, the cultivation and maintenance of the yam varieties. Some families in the regions where yams are grown eat it all day (Verta and Becvarova, 2015). This may be due to its availability especially during the harvesting season, but, as world population increases, household demand for staples (yam) consumption also increases. However, the consumption patterns of yams differ between the poor and rich people in Nigeria. Richer households were found to consume more yams but selling less harvested unlike the poorer households. The poorer households consume fewer yams apparently because they depended on yam for income than their richer counterparts who have other sources of income (National Bureau of Statistics, NBS, 2012). Yams are among major cash and most consumed food crops in Nigeria (Babaleye, 2003). Yam cultivation is very profitable despite high costs of production and price fluctuations in the markets (IITA, 2013). An average profit per yam seed, after harvest and storage in Nigeria, was calculated at over 3.8 million Naira per hectare harvested (IITA, 2013). Households demand for yam consumption is very high in Nigeria. Nutritionally yam is major staple food, providing food for millions of people in Nigeria. It is eaten in various forms such as fufu (pounded yam), boiled or roasted, and taken with palm oil or any other source, or fried (Aidoo, 2009; IITA, 2009). The dietary value of the crop, amongst small holder farmers, cannot be ignored. It contributes about 200 dietary calories per capita per day for over 150 million people in West Africa (Babaleye, 2003). Yams have high moisture contents, dry matters, potassium, starch and low vitamin A. They also contain 5-10mg/100g edible part, vitamin C, in addition to steroid 'sapogenin' compound called 'disogenin' which can be extracted and used as base drugs, with the limiting amino acids, as isoleucine and those with sulphur content (Opera, 1999). Many yam belt areas in Nigeria continually proclaimed, "Yam is food and food is yam" (Maikasuwa and Ala, 2013). More so, yam plays significant roles in the socio-cultural activities in Nigeria (Izekor and Olumese, 2010; Bamire and Amujoyegbe, 2005). For instance, some households use it during marriage and fertility ceremonies. In addition, festival (especially amongst the Igbo ethnicity) takes place yearly to celebrate its harvest, and other social ceremonies (IITA, 2013). Hence, yam is a major staple food, providing much needed nutrient for millions of people in West Africa. Unfortunately, studies aimed at investigating the relevance of conserving yam production and consumption as well as its determinants is scanty. There is therefore, a need for a continuous study of the various yam species and their consumption levels across the region and their determinants to help guide policy makers on factors to consider in promoting biodiversity conservation of yam. Consequently, this research assessed the factors that impacted on the consumption of yam in the study area.

Methodology

Study Area

The study was conducted in Delta North Agricultural Zone, Delta State. The Zone comprises of 9 (nine) Local Government Areas, which are; Aniocha North, Aniocha South, Ika North-East, Ika South, Ndokwa East, Ndokwa West Oshimili North, Oshimili South, and Ukwuani Local Government Areas. Delta State covered a land mass of 5,793km^2 (NBS, 2012) of which, more than 60% is land. The region lies approximately between Longitude 5°.00 and 6°.45 East and latitude 5°.00 and 6°30 North. Delta state has a population of 4,112,445 (males: 2,069,309, females: 2,043,136) (NPC, 2006). The majority of this population are rural dwellers, with those living in the central and southern Delta agricultural zone, involved in fishing as a means of livelihood and the Delta North agricultural zone dwellers involved in crop cultivation (mostly cassava and yam). The State has an average annual rainfall of about 2,665mm in the coastal areas and 1,905mm in the extreme north (Delta North agricultural zone), with the highest and heaviest rainfall occurring in July. Temperature increases from south to north in the State, with the south having an average daily temperature of 30°C, and a daily average temperature of 44°C in the northern part of the State (NBS, 2012). Delta North agricultural zone, has good basic infrastructure such as; good road network, electricity, basic and post-primary schools, and tertiary institutions.

Population and Sampling procedure

All the yam (white and yellow) consumers in Delta North agricultural zone made up the survey sample. There are over 1,700 consumers of the product in the study area, and the sample for this study was drawn from this population. However, due to cost and time constraints on the study, a two-stage sampling technique was adopted for the survey. In stage one, simple random sampling was used to select 3 communities from each of the local government areas giving a total of 27 communities in the study area. In stage two, 3 producers and 3 consumers were randomly selected per community to give a total of 81 producers and 81 consumers for the study. A total of 162 questionnaires were administered (81 questionnaires to the producers and 81 questionnaires to the consumers). Of the 162 questionnaires administered, 143 questionnaires were valid and adopted for analysis. Primary data were obtained from field survey using well-structured and standardized questionnaires that were administered to the survey respondents. One on one interview was also conducted to augment the validated filled questionnaires. Also, secondary data on the subject were obtained from authors on reliable websites and text books.

Analytical Technique

Data from this study were analyzed using different tools

and techniques. Quantitative analytical techniques were employed in order to achieve the objectives. Specifically, the socio-economic characteristics of yam consumers in the study area, was achieved using descriptive statistics i.e. measures of central tendencies, measures of variability (standard deviation or variance), skewness and kurtiosis. T-test was used to compare the productivity of white yam and yellow yam following Olatunji, Kpolovie, Ajayi, Ndubueze-Ogaraku, Onoja and Agaviezor, (2017) and is stated thus;

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{n_1+n_2-2}\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}} \quad \dots \dots \quad (1)$$

The factors which influenced the choice of yam species consumed by the respondents were examined using descriptive statistical tools such as means and standard deviation. While the factors that determined the levels of consumption of white and yellow yam in the study area were analysed using OLS regression analysis. Some of these variables to be regressed include; price of the species, income of consumers, preferred species, household size, household expenses, level of education. The various forms of regression model were used to examine the influence of socio economic characteristics on the consumption of yam. The model is implicitly expressed as:

$Y = f(x_1, x_2, x_3, x_4, x_5, x_6) + e$ ...... (2)

Explicitly the model is stated thus:

$Y = \beta_0 + \beta_1 EDUHD + \beta_5 HHDEXP + \beta_4 HHSZ + \beta_3 INCM + \beta_2 LnPREFSP + \beta_1 PRICEYAM + u$ .... (3)

Y = quantity of either yam species consumed (kg)
β_0 = intercept
β_1 to β_6 = regression coefficients
EDUHD = educational level of the consumer (years)
HHDEXP = house-hold expenses (naira)
HHSZ = house-hold size (counts)
INCM = income of the consumer (naira)
PREFSP = preferred specie (1 = white yam, 0 = yellow yam)
PRICEYAM = price of the species of yam in the area (naira)
e = error term
ln = natural log of the respective variable

Results and Discussion
The socio-economic characteristics of the respondents in Delta North agricultural zone is presented in Table 1. Results show that 97.1% of the respondents were males, which may be connected to the laborious nature of yam production that most females cannot contend with. It is deduced from the table that majority of the yam farmers 81.2% are married who contribute directly or indirectly to household food security and national food availability. The result further indicates that many (47.8%) of the respondents' attained primary education, and 8.7% with no formal educational background. The result on Table 1 further portrays that majority (68.1%) of the yam farmers engaged in mixed-cropping, while 31.9% engaged in mono-cropping. On the preferred yam species for planting, majority (62.3%) of the respondents preferred white yam to yellow yam, while only 4.3% of the yam farmers cultivated both yam species. This finding agrees with the study of Ojofeitimi and Olufokunbi (2003) which stated that 70% of root and tuber crop consumers preferred the white yam variety. On the level of experience gathered in yam production, majority (76.5%) of the yam farmers had 11-20 years of yam farming experience. From the findings, the socio-economic attributes of the farmer, affects the choice of species they choose to cultivate. The result shows that most of the respondents (97.1%) do not have access to extension service and only 2.9% of the sampled yam farmers had access. This implies that majority of the yam producers in the study area do not have access to recent technologies on the best practices in the study area, and this affects the productivity of yam farmers greatly.

Difference in yield between Yam species
The difference in mean yield between yellow yam and white yam in the study area is presented in Table 2. The result shows that the mean yield made from yellow yam production was estimated at 37976.562kg, while the mean yield of white yam as 40717.348kg. The t-Statistics was -1.676 which indicates that the mean yield between yellow yam and white yam is significant at 5% level. This implies that yam producers achieved higher yield from white yam other than yellow yam. This could be as a result of specie difference (anatomy).

Factors Affecting Yam Consumption
This section discusses the factors that determine the choice of yam species consumption in the study area. The variables that influence the choice of yam species selected for consumption by yam consumers in the study area, as observed by the study is presented in Table 3. From Table 3, it can be seen that majority (78.4%) of yam consumers prefer white yam to yellow yam. On the accessibility of the preferred specie of consumption, most of the yam consumers (93.2%) indicated that they access their preferred choice easily. The result on educational background of yam consumers shows that most 43.2% of the yam consumers were NCE / Diploma degree holders. The result also indicated that the yam consumers access more of white yam (yes=87.9%) than yellow yam (yes=9.5%). On the choice of yam consumed with respect to health related issues, the result indicates that the respondents prefer white yam to yellow as a result of their health status. However, the result shows that many of the yam consumers are not aware of the benefits of yellow yam (59.5%), while 79.9% of the yam consumers were aware of the benefits of white yam. The result from Table 3 indicates that yam consumers in the study area prefer white yam over yellow yam because it is the choice of their peers. The result also indicates that yam consumption is encouraged by ceremonial activities in the study are. This means that most ceremonial activities in the study area serve yam as a delicacy. Furthermore, the result

indicates that beliefs do not in any way hinder the consumption of yam in the study area. The findings from result Table 3 indicates that most of the respondents (95.9%) consume yam because it does not cause any form of eating disorder. All (100%) yam consumers in the study area indicated that they prefer white yam over yellow yam because the time of preparation for white yam is less than that of yellow yam.

Factors That Determine Yam Consumption in the Study Area

The determinants of the consumption of white and yellow yams in the study area were analyzed using multiple regression. The results are presented in Table 4. The F- ratio for each functional form is significant at 1% and this implies that each of the functional can be used for further analysis and are adequate. The model chosen was not only based on the strength of the R-squared but also on the considerations of the signs of the coefficients with respect to economic theory as well as low Akaike Information Criterion. Therefore, the lead equation chosen is the linear model. From the table, educational level is significant at 1% which implies that a unit increase in the educational level of the respondents brought about an increase in the yam consumption expenses by 204 units. The coefficient of household expenses was negative and significant at 1%, which implies that a unit increase in household expenses decreased yam consumption expenses by 0.232 units. This implies that as a result of an increase in household expenses, less income proportion is allocated to yam purchase and that decrease the respondents' yam consumption. This is in line with Aidoo (2009), who asserted that expenditures on other household food items significantly influenced household yam budget share. The result of household size had a positive coefficient and is significant at 1%. This implies that as household size increases by one unit, yam consumption expenses increased by 189.6 units. This study is consistent with the findings of Sdrali (2006), Burger, Servaas and Sihaan, (2004) and Cage (1989) who also found a positive relationship between household size and consumption expenditure. Income, having a positive coefficient is significant at 1%. This indicates that as income of yam consumers increased by a unit, yam consumption expenses increased by 0.011 units. The preferred specie of yam (white yam or yellow yam) is significant at 5%. This implies that based on their preference of white yam, the consumption of yellow yam decreased by 0.411 units. This maybe because white yam is easily accessible in the market and the time required to prepare white yam is less than that required for yellow yam. The R^2 of 0.37 implies that 37% of the variation in the dependent variable was accounted for by the independent variables in the model.

Conclusion

From this study, it can be deduced that the yield derived from white yam was much more than that gotten from yellow yam. This can affect the preference for cultivation of white yam over yellow yam specie. It was also observed that white yam is preferred to yellow yam

in the study area. This can threaten the sustainability of yellow yam production unless some practical measures are taken to conserve the yellow yam specie which is very nutritious but have lower yield. Efforts are therefore needed by agronomists to improve the yields of yellow yam so that they can become commercially accepted as viable option to white yam cultivation. This will ultimately promote its consumption too especially if the output increases and the prices fall within the reach of most household consumers. Factors such as educational background, household expenses, household size, income and preferred specie were all significant determinants of yam consumption. It is therefore recommended that government should emphasize human capital development in development policies, and increase wages of workers to improve household consumption of yam. White yam production should also be promoted by the State and Federal Government to generate more foreign exchange especially given the fact that Nigeria is the highest producer of yam in the world. In addition, more land should be made available for yam production, as this will encourage yellow yam production since the result indicates a positive correlation between land and the propensity to produce yellow yam in the study area.

References

Aidoo, R. (2009). An analysis of yam consumption patterns in Ghanian Urban Communities. PhD. Dissertation. Kumasi, Ghana; Department of Agricultural Economics Agribusiness and Extension, KNUST.

Babaleye, T. (2003). West Africa: Improving Yam Production Technology; ANB-BIA, 463:56-69.

Bemire, A. S & Amujoyegbe, B. J. (2005). Economic analysis of Land improvement techniques in Small holder yam based production system in the agro-ecological zones of the South western *Nigeria. Journal of Human Ecology*. 18(1):1-12.

Burger, R., Servaas, V. B. and Sihaan, N. (2004). Consumption patterns of South Africa's rising black middle class: Correcting for measurement errors. A paper delivered at the conference of the Center for the Study of African Economies (CSAE) on: Poverty Reduction, Growth and Human Development in Africa, Oxford, March, 2004.

Cage, R. (1989). Spending differences across occupational fields. *Monthly Labour Review*,112(12):33-43.

FAO (2002). FAOSTAT Agriculture data. Food and Agriculture organization of the United Nations https://apps.fao.org/collections. Retrieved: 2nd April, 2019.

1ITA (2009). IITA Home Page. International Institute of Tropical Agriculture, Ibadan, Nigeria; http://www.iita.org.

IITA (2013). Healthy yam seek production. IITA Publications Retrieved from IITA website http://www.vita.org/publicaitons on 27th March, 2019.

Izekor, O. B. and Olumese, M. I. (2010). Determinants of yam production and profitability in Edo State,

Nigeria. *African Journal of General Agriculture*, 6(4):205-213.

Maikasuwa, M.A. and Ala, A.L. (2013). Determination of profitability and Resource-use efficiency of yam production by women in Bosso local government area of Niger state, Nigeria. *European Scientific Journal*, 9 (16): 196-205.

National Bureau of Statistics (NBS), (2012). LSMS-Integrated Surveys on Agriculture: General Household Survey Panel 20 10/11.

NPC (2006). National Population Commison. Estimated Population Figures, Abuja, National Population Commission of Nigeria.

Ojofeitimi, E. and Olufokunbi, B. (2003). Food preferences: An implication for nutrition education and agricultural production; Working Paper, University of Ife, Ile Ife, Nigeria.

Olatunji, S.O,, Kpolovie, P.J., Ajayi, F.O., Ndubueze-Ogaraku, M.E., Onoja, A.O. and Agaviezor, B.O. (2017*). Demystified Introductory and Advanced Statistical Methods for Investigation in Science, Agriculture, Education and the Behavioral Sciences.* 1st Ed..

Opera, L.U. (1999). Yam storage; mi Bakker-Arkema et al., (eds) (2010). *CGIAR hand book of Agricultural Engineering* IV Agro Processing. The American Society of Agricultural Engineers, St. Joseph, MI.

Sdrali, D. (2006). *Effects of socio-demographic and economic factors on food expenditure in a prefecture of Greece*. Ph.D Dissertation, Department of Home Economics and Ecology. Harokopio University of Athens, Greece.

Umar, A. G., Nwafor, M. S., Likita, S. and Adoko, S. (2016). The indigenous yam storage technology and post-harvest losses in Nigeria: The Benue State perspective. *International Journal of Food and Agricultural Research.* 5(2):113-139.

Verter, N. and Becvarova, V. (2015). An analysis of yam production in Nigeria. *Journal of Acta Universitas Agriculturae et Silviculturae Mendelianae Brunensis.* 63(2):659-665

Table 1: Socio-Economic Characteristics of the respondents

Variables	Items	Frequency (n=70)	Percentage (%)
Gender	Male	67	97.1
Marital status	Married	56	81.2
Educational Level	Primary	33	47.8
Farming system	Mixed-cropping	37	68.1
Preferred yam specie	White yam	43	62.3
Farming Experience	11-20	61	76.5
Extension Visit	No	67	97.1

Source: Field Survey, 2019

Table 2: Difference in yield between Yellow yam and White yam

Parameters	Mean yield of Yellow yam	Mean yield of White yam
Mean profit	37976.562	40717.348
Df	44	
t-Stat	-1.676**	
P (T≤t)	0.05	
No of observations	24	45

Field survey, 2019

Table 3: Perceived Factors influencing yam consumption by Various Households

Variables	Items		Frequency (n=74)	Percentage (%)
Preferred specie	White yam		41	51.2
	Yellow yam		39	48.8
Access to preferred specie	Easily accessible		17	24.3
	Hardly accessible		20	26.7
Educational Background	Primary		17	21.3
	Secondary		26	32.5
	NCE/Diploma		28	35.0
	HND/B.Sc.		9	11.2
Accessibility of specie	Yellow yam	No (67)		No (90.5)
	White yam	Yes (65)		Yes(87.8)
Yam choice based on health	White yam	No (69)		No (93.2)
	Yellow yam	No (72)		No (97.3)
Yam benefit awareness	White Yam	Yes (59)		Yes (79.7)
	Yellow Yam	No (44)		No (59.5)
Peer's specie choice	White Yam		73	89.6
	Yellow Yam		61	82.4
Ceremonial activities	Yes		66	89.2
	No		8	10.8
Time of preparation	Yellow yam		71	95.9

Source: Field Survey, 2019

Table 4: Estimated factors that influence yam consumption (Dependent Variable: Value of money spent on yam consumption in Naira)

Variables	Linear[+]	Semi-log	Double-log	Exponential
Constant	747.786	6.871	7.517	995.888
	(589.703)	(0.378)	(2.567)	(4052.289)
	0.209	18.158 ***	2.928 ***	0.246
Educational Level	204.795	0.121	0.274	415.949
	(84.661)	(0.054)	(0.134)	(212.182)
	2.419 **	2.235 **	2.038 **	1.960
Household Expenses	-0.0325	-0.000020	-0.176	-268.336
	(0.0107)	(0.00000689)	(0.102)	(161.450)
	-3.0302 ***	-2.900 ***	-1.722 *	-1.662
Household Size	189.602	0.121	0.644	964.391
	(44.589)	(0.029)	(0.163)	(257.724)
	4.252 ***	4.212 ***	3.945 ***	3.719
Income	0.0117	0.00000688	0.141	253.892
	(0.00401)	(0.00000257)	(0.163)	(121.609)
	2.907 ***	2.673 ***	1.831*	2.088
Preferred Specie	-498.045	-0.285	-0.345	-589.643
	(231.229)	(0.148)	(0.209)	(330.231)
	-2.154 **	-1.920 **	-1.649	-1.786
Yam Price	0.411	0.00007	-0.199	-204.437
	(1.890)	(0.00121)	(0.417)	(657.981)
	0.218	-0.06012	-0.477	-0.311
R-Squared	0.371	0.363	0.328	0.319
F-statistic	6.571***	6.354***	5.442***	5.220***
Akaike Information Criterion	15.155	0.452	0.506	15.234
Durbin-Watson Statistics	1.663	1.652	1.593	1.610

Source: Field data survey, 2019
***, ** = significant at 1% and 5% respectively
Figures in parenthesis are Standard errors of the coefficient
+: lead equation