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Determinants of household's consumption preference for processed cocoyam in Enugu State, Nigeria

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Cocoyam is a nutritious food crop which is consumed in different parts of Nigeria. Its importance in the food systems of many communities in Nigeria, particularly among the Igbo people is based on its nutritive value and its relative ease in cultivation. Studies on the crop focused more on production and marketing without examining consumer behaviour. Although, an understanding of the determinants of the consumption of various processed forms as well as volume consumed by households is important information for policy makers, this has scarcely been examined in Nigeria. Understanding the socio-economic dynamics that make consumers choose one form of the product and not another is crucial for ensuring the food security of the poor. This study therefore examined the factors that influenced consumption of processed cocoyam and the volume consumed. For the study, multistage sampling technique was used to select the respondents. Data collected was analyzed using multiple linear regression and multinomial logistic regression. The results show that income allocated for cocoyam consumption, hectares of cocoyam cultivated, number of times cocoyam is consumed, distance from home to market and household size are important determinants of volume of cocoyam consumed by households, while, household size, quantity of cocoyam consumed by households, farming experience, age, marital status and income spent on cocoyam are important determinants of consumption of processed cocoyam.

Key words: Consumer behaviour, household, processed cocoyam, food security.

INTRODUCTION

Cocoyam (*Colocasia* spp. *and Xanthosoma* spp.) as a crop has until recently received little attention from international and regional bodies (Agbelemoge, 2013; Onyeka 2014), mainly due to the low value given to it. However, given its potential as an affordable crop for the poor, and the increasing awareness of its health value, there is a growing focus on the crop. It negates fundamentals of increasing demand due to high population pressure as well as urban development. More people now accept the consumption of highly cherished foods within their culture. This threatens the food security of households that consume such crops. According to Onyeka (2014), cocoyam is nutritionally more important than yam and cassava in terms of higher protein, mineral and vitamins content as well as digestible starch. As a tuber crop, it belongs to the class of staple foods that

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provide most calorific intake by Nigerians (Amusa et al., 2011). Cocoyam remains an underutilized and poorly understood crop in spite of its potential as a food and cash crop and its higher nutritive value (Onyeka, 2014). Okeke et al. (2009) noted that the problem of malnutrition of poor nations will be difficult to solve through food aid from developed countries but rather by effective consumption of indigenous plant foods. The reason is because traditional foods are more likely to meet the household food security needs of the population, particularly the rural households than imported foods.

The crop can be processed into many forms that meet the food needs of households. Amongst the Igbo of Southeastern Nigeria, the cocoyam can be prepared in various forms (Okeke et al., 2009). Cocoyam is available almost all year round (Ndabikunze et al., 2011). Household food inadequacy problem can always be solved when the people can have easy access to food they prefer in the forms they prefer them (Amaza et al., 2009). According to Omotesho et al. (2010), food security may be described as conditions or situations which guarantee easy access to highly nutritious, affordable, socially acceptable and environmentally friendly food within a community. In this case, availability means food can be easily produced by the consumer themselves. Accessibility connotes that food can be transformed into different forms that are preferred by consumers. Affordability suggests the consumers have the purchasing power or ability to obtain food at all times (Omonona and Agoi, 2007). Therefore, if cocoyam is processed into different forms, it creates wider opportunity for its accessibility to consumers, because they have a more diverse spread of options for consuming cocoyam.

Food security can be said to be achieved if people can have access to their preferred food and in the forms they prefer it. The study therefore seeks to determine factors influencing consumption of cocoyam and preference for processed cocoyam.

Motivation for cocoyam consumption

Cocoyam (*Xanthosoma sagittifolium*) contributes significant portion of the carbohydrate content of the diet in many regions in sub-Sahara Africa and provide edible starchy storage corms or cormels (Sanful and Darko, 2010). According to Opara (2002), cocoyam is perceived to be less important than other tropical roots such as yam, cassava and sweet potato. However, they are still a major staple in some parts of the tropics and sub-tropics, particularly in the rural areas of these regions (Ojinaka et al., 2009). Cocoyam is being put to different uses like other staple foods such as yam, cassava and potatoes. Although, it is not considered as prestigious as yam, its flour has the added advantage that, it is highly digestible and so is used for ingredient in baby foods (Sanful and Darko, 2010). According to Enwelu et al. (2014), consumption of mixture of cocoyam and beans is fairly good and should be encouraged because most people in rural areas eat unbalanced diets usually made up of carbohydrates. Nutritionally, cocoyam is rich in carbohydrates with nutritional value comparable to potato and superior to cassava and yam in the possession of higher protein, mineral and vitamin contents as well as easily digestible starch (Parkinson, 1984; Splittstoesser et al., 1973). It is highly recommended for diabetic patients, the aged, children with allergies and for other persons with intestinal disorders (Plucknett, 1970). These nutritional attributes make it a good base for food preparation for infants, and it has been shown that cocoyam starch can be incorporated in the development of weaning food which is highly digestible and accessible to low-income earners (Oti and Akobundu, 2008).

Cocoyam chips are popular in the local communities in Nigeria and are used in preparing many different local cocoyam delicacies. For instance, consumers of cocoyam believe that it is both energy giving and a light food, a quality that distinguishes it from other energy giving foods like yam and cassava. The corms and cormels of cocoyam are processed by boiling, baking or frying in oil. They are also processed into different products in many parts of Nigeria. All major parts of cocoyam (corm, cormel and leaves) are edible. The young leaves are a nutritious spinach-like vegetable, which provides a lot of minerals, vitamins and thiamine (Ojinnaka et al., 2009). According to Women Group in Kwaso located in the Ashanti region of Ghana, role of cocoyam in the livelihood of rural dwellers is indispensible. When asked if they could do without cocoyam if provided with support in growing alternative crops such as plantain, cassava or yam, the women overwhelmingly exclaimed that doing without cocoyam production is a recipe for hunger which is practically impossible for them to accept. Consumption of cocoyam is seen as part of their culture and therefore cannot be replaced. Cocoyam is more preferred by the aged in the communities, and often used by mothers as weaning food in the absence of commercial baby foods. Cocoyam stores longer even after harvest, and can be left in the ground until needed, thereby providing food all year round (Onyeka, 2014).

MATERIALS AND METHODS

Study area

Enugu State of Nigeria was the study location. Enugu is among the five south eastern states including Imo, Ebonyi, Anambra and Abia. It consists of 36 States. Enugu is located between latitudes 5°61`N and longititudes 6°53`E and 7°55`E (Enugu State Agricultural Development Programme (ENADEP), 2012). The state has a total land mass of about 8,022.96 km^2. It has a population of about 4,185,509 (NPC, 2006). Most of the population lives in rural communities with farming as their major occupation. The major crops grown in the states are yam, cassava, cocoyam, rice, maize as well as variety of fruits and legumes. It boosts the local economy

of the state as it is predominantly rural and major occupation is farming (Enwelu et al., 2014).

Sampling procedure

The units of analysis were households and household heads and were selected to be the target respondents in selected communities of Enugu State. For sampling procedure, a multi stage sampling technique was employed in selecting the households for the study. In the initial stage, one agricultural zone was randomly selected from the list of agricultural zones in Enugu State. The second stage involves the selection of two (2) local government areas randomly from the list of local government areas in Enugu. The third stage involved random selection of ten communities from each of the 2 local government areas, giving a total of 20 communities. Afterwards from each community, nine households were randomly selected giving 180 households.

Data for the study

Data used for the study were collected from primary sources. The data was obtained using semi-structured questionnaire and group discussion. Personal observations were used to complement the data collected. Data were collected with the use of interview questionnaire. He authors were able to collect information from 170 respondents out of the 180 households selected for the study; this represented 94% of the households sampled for study. The data collected focused on information such as the socioeconomic and institutional characteristics of the cocoyam consumers and factors that facilitate influences, consumer preference for processed cocoyam, perceived attributes of cocoyam and different forms of cocoyam are preferred by consumers.

Model specification

Ordinary linear square (OLS)

Multiple linear regression model was used in the study as stated:

$$Y = \alpha + \beta_1X_1 + \beta_2 X_2, \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \beta_{10}X_{10} + \beta_{11}X_{11} + \beta_{12} X_{12} + \beta_{13}X_{13} + ų)$$

where, Y = is dependent variable (volume of cocoyam consumed per month); ($X_1 - X_{13}$) = explanatory variables (socioeconomic characteristics and institutional factors) ų = error term).

Multiple linear regression was employed to determine the volume of cocoyam consumed within households.

Table 1 describes econometric variables that are included in the regression model.

Multinomial logistic regression

A Logistic Regression Model (MLM) was used in the study. Estimating a Multinomial Logistic Regression involves a series of dependent outcome variables in which one is chosen as the comparison variable (Ogundele, 2014). In this case, cooked tuber which is one of the forms cocoyam is consumed was chosen as the comparison group and all other type of processed cocoyam such as *Achicha*, soup thickening, and cocoyam mixed with beans were compared with the comparison outcome. The equation for multinomial logistic model is stated:

$$\Pr(yi = j) = \frac{\exp(Xi\beta j)}{1 + \sum_{j=1}^{J} \exp(Xi\beta j)} \quad (1)$$

And

$$\Pr(yi = 0) = \frac{1}{1 + \sum_{j=1}^{J} \exp(Xi\beta j)} \quad (2)$$

Where ith represents a single consumer, y_i is the comparison outcome (processed cocoyam), while X_i represents a vector of independent variables. The independent variables exploded in this study included: age, gender, marital status, occupation, household size, farming experience, income spent on cocoyam consumed per month, number of times cocoyam is consumed per week within household, and quantity of cocoyam consumed per month.

RESULTS AND DISCUSSION

The result of descriptive statistics of the socioeconomic and institutional variables used in the analysis of determinants of consumer preference is presented in Table 2. Some of these variables were included in measuring household characteristics expected to influence choice of processed cocoyam. These factors include age, gender, household size, marital status, occupation (farming or trading), number of years spent in school, farm size, farming experience and distance from home to market. The average age of the respondents was 42 years. The average household size was seven out of which three are males and four are females. The average distance of home to market where the consumer purchases the cocoyam tuber was 10 km. Also, the number of times cocoyam is consumed in a week within the households shows whether the number of times cocoyam is consumed influences different forms in which cocoyam is consumed. Furthermore, farming experience was included as part of variables that influence the preference for processed cocoyam to determine if the number of years spent farming influenced the forms in which they prefer to consume cocoyam. The average number of years of schooling of the household head and farming experience are 9 and 18, respectively. The average amount of money the respondents spent on consumption of cocoyam per month is ₦1861. The gender and marital status was also captured to determine whether it influences preference for processed cocoyam. The average hectare of cocoyam cultivated by respondents is 0.9 hectares, whilst, the average farm size is 2.7 hectares. The average monthly income of the respondents is 18,691 naira.

Table 3 shows the result of the multiple regression model. Considering the regression model, it gives a coefficient of multiple determination (R^2) of 0.44. This implies that variations in the explanatory variables explained only 44% of total variation of cocoyam consumed (dependent variable). The result shows that the overall regression equation was significant at 0.05 probability level, since prob > F = 0.000. Factors such as distance from home to market, hectare of cocoyam cultivated, income spent on cocoyam per month and number of times cocoyam is consumed per week are seen to be very important determinants of cocoyam

Table 1. Description of variables included in OLS.

Category	Parameters	Coefficient	Unit of measurement
Volume of cocoyam consumed	Y		Kilogram (kg)/month
Constant	-	α	-
Age	X_1	β_1	Years
Gender	X_2	β_2	Discrete
Marital status	X_3	β_3	Discrete
Occupation	X_4	β_4	Discrete
Household size	X_5	β_5	Numbers
Monthly income	X_6	β_6	Naira
Farming experience	X_7	β_7	Years
Farm size	X_8	β_8	Hectares
Distance from home to market	X_9	β_9	Kilogram
Hectare of cocoyam cultivated	X_{10}	β_{10}	Hectares
Income spent on cocoyam consumption	X_{11}	β_{11}	Naira
Price of cocoyam	X_{12}	β_{12}	Naira
number of times cocoyam is consume per week	X_{13}	β_{13}	Numbers

Table 2. Socioeconomic and institutional characteristics of respondents.

Variable	Mean	Standard deviation	Minimum	Maximum
Age	42.96	15.51	16	90
Gender[a]	0.36	0.48	0	1
Marital status[b]	0.70	0.45	0	1
Occupation (trading)[c]	0.57	0.49	0	1
No of years spent in school	9.67	4.81	0	17
No of male household size	3.2	1.9	1	15
No of female household size	3.8	2.9	1	27
Monthly income	18691.17	15378.85	2000	70000
Farming experience	18.90	12.38	3	75
Farm size	2.70	3.22	0.25	36
Distance from home to market	10.11	16.06	0.50	75
Hectares of cocoyam cultivated	0.87	0.86	0	5
Income spent on cocoyam per month	1861.77	2019.13	0	10000
Number of time cocoyam is consumed Per week	1.33	0.71	0	4

1 if gender[a] is male; 0 otherwise (female), marital status[b] 1 if married: 0 otherwise (divorced), 1 if occupation (trading)[c]; 0 otherwise (farming). Source: Field survey, 2016.

consumed by households. They are significant and have a positive relationship with volume of cocoyam consumed by members of households. For instance, income spent on cocoyam is important because households see cocoyam as a delicacy, therefore the need for cocoyam consumption and the more money spent on cocoyam. This agrees with both the principles of preference and food security, that a consumer will allocate more income to that which has increased utility. Also if food is cheaper that means it is affordable and households can consume it more frequently. This is in accordance with the work of Omotesho et al. (2010) and Omonona and Agoi (2007) which suggest that the consumers have the purchasing power or ability to obtain food at all times. It also agrees with Oti and Akobundu (2008) that cocoyam is accessible by low income earners. The nutritive values of cocoyam may encourage households to cultivate more of it as it can serve as a substitute to other expensive foods that supply the same nutrients, this is supported by Parkinson (1984) which says, cocoyam is rich in carbohydrates with nutritional value comparable to potato, superior to cassava and yam in the possession of higher protein, mineral and vitamin contents. Not only that, cocoyam has been found to be good for infant food for weaning babies and for adult with diabetes (Plucknett, 1970). While, household size is significant and has a negative

Table 3. OLS Parameter estimates of determinants of volume of cocoyam consumed.

Variable	Coefficient/standard error	t-value
Gender	3.188(2.141)	1.49
Age	0.097(0.839)	1.16
Marital status	2.617(2.252)	1.16
Number of year spent in school	0.320(0.208)	1.56
Occupation (trading)	0.555(1.976)	0.28
Household size	-0.491(0.254)	-1.98*
Monthly income	-0.000(0.000)	-1.41
Farming experience	0.150(0.097)	1.55
Farm size	0.033(0.299)	0.11
Price of cocoyam	0.001(0.001)	0.88
Distance from home to market	0.204(0.064)	3.16**
Hectare of cocoyam cultivated	2.273(1.601)	2.06**
Income spent on cocoyam per month	0.002(0.000)	3.80***
Number of times cocoyam is consume per week	6.045(1.545)	3.91***
Constant	-9.769(7.059)	-1.38

Source: field survey, 2016; R^2 = 44%; Adjusted R^2 = 39%; F- ratio = 8.75; ***, **, *show significance levels at 1, 5 and 10%, respectively.

relationship with the volume of cocoyam consumed. This is against our *a priori* expectation that volume of cocoyam consumed will increase with an increase in the number of household members. This may suggests that different members of the household may prefer other tubers crop such as yam and cassava over cocoyam. However, most aged and children in the household consume cocoyam (Oti and Akobundu, 2008), this is because of softness and nutritive value of cocoyam. Hectare of cocoyam cultivated was significant, this shows that because of high level of importance and functions of cocoyam, households devote more of their land on cultivation of cocoyam. This agrees with interview conducted by Onyeka (2014), among women Group in Kwaso located in the Ashanti region of Ghana that received responses that the role of cocoyam in the livelihood of rural dwellers is indispensible. Also, they see cocoyam as part of their culture and therefore cannot be replaced. The characteristics of cocoyam such as energy giving, carbohydrate content, mineral content, easy to cook, light and can be prepared into different local delicacies has made it's consumption frequent within households. This is supported by result of Sanful and Darko (2010). The distance from home to market is significant and positively related, which is against our *a-priori* expectation. This can still be attributed to the importance of cocoyam to the food security of households. That means member of households can go at any length looking for cocoyam to buy for consumption.

Processed cocoyam

Cocoyam can be transformed into different forms for consumption and these forms are preferred differently by individual household. Even within households, members have different affinities for forms of processed cocoyam. In Igbo extraction, cocoyam is consumed in different forms such as cooked tuber, achicha, while some prefer it for thickening soup, others mixed it with beans. Table 4 shows the socio economic factors responsible for different forms in which cocoyam is consumed by households.

The determinants of household's preference for different categories of processed cocoyam were ascertained. Processed cocoyam was categorized into four namely: cooked tuber, *Achicha*, soup thickener and cocoyam mixed with beans. Table 4 presents the result of the findings. The comparison group or base category is cooked tuber. The result shows that some variables significantly influenced preference for processed cocoyam with the χ^2 value of 60.40 at 0.05 level of probability.

First, estimating the category of preference for different processed cocoyam in relation to the comparison group– preference for *Achicha*, the result shows that household size, quantity of cocoyam consumed per month positively and significantly influenced preference for *Achicha* as against cooked tubers. The positive and significant effect of household size indicates that large households are more likely to consume cocoyam in form of *Achicha* than in the form of cooked tuber. Achicha has been seen as a very local delicacy strongly attached to Igbo culture. According to Onyeka (2014), rural households see cocoyam consumption as part of their culture which may be difficult to be replaced by other food types such as yam, cassava and potatoes. This also may be because cocoyam when processed to *Achicha* tends to increase in

Table 4. Parameter estimates of determinants of preference for processed cocoyam.

Preference category	Variables	Multinomial logistic results	Marginal effects
		Coefficients/standard errors	$\frac{dy}{dx}$/standard errors
Achicha	Gender	0.221(0.566)	0.037(0.063)
	Age	-0.018(0.024)	0.002(0.002)
	Marital status	-0.371(0.657)	-0.063(0.064)
	Occupation	0.450(0.516)	0.045(0.061)
	Household size	0.195**(0.0917)	0.013(0.008)
	Farming experience	-0.051**(0.024)	-0.006(0.003)
	Quantity consume	0.031*(0.019)	0.001(0.002)
	Income spent on cocoyam	-0.000***(0.000)	0.000(0.000)
	Constant	2.916(1.095)	
Soup thickening	Gender	-0.096(0.833)	-0.020(0.045)
	Age	-0.073**(0.035)	-0.004(0.008)
	Marital status	0.219(0.918)	0.036(0.041)
	Occupation	0.321(0.744)	-0.005(0.042)
	Household size	0.227**(0.115)	0.003(0.005)
	Farming experience	-0.023(0.039)	0.001(0.002)
	Quantity consumed	0.044(0.027)	0.001(0.001)
	Income spent on cocoyam	-0.000***(0.000)	-0.000(0.000)
	Constant	1.819(1.422)	
Cocoyam mixed with beans	Gender	-0.925(1.450)	-4.84e-07(0.000)
	Age	0.321*(0.172)	1.57e-07(0.000)
	Marital status	17.028*(9.065)	0.000(0.000)
	Occupation	-0.556*(1.913)	-4.84e-07(0.000)
	Household size	0.572(0.431)	1.80e-07(0.000)
	Farming experience	-0.435(0.233)	-1.78e-07(0.000)
	Quantity consumed	0.135*(0.108)	4.82e-07(0.000)
	Income spent on cocoyam	-0.002(0.001)	-7.79e-07(0.000)
	Constant	-31.716(0.000)	

Source: Field survey data 2016; Comparison group- cooked tuber; LR χ^2 (24) = 60.40***; ***, **, * show significance levels at 1, 5 and 10%, respectively.

quantity and may be sufficient for large households. The positive significant effect of quantity of cocoyam suggests that households may eat more cocoyam if it is processed into Achicha, and less when it is consumed as cooked tuber.

On the other hand, farming experience and income spent on cocoyam consumed per month had a negative and significant effect on consumption of cocoyam in the form of *Achicha* as against cooked tubers. This indicates that households with high number of farming experience may prefer to consume their cocoyam in the form of cooked tuber and households with low number of farming experience prefer to eat theirs in the form of *Achicha*. This suggests that those with high farming experience cultivating cocoyam may think it is easy and take no time to process cocoyam into cooked tuber for fast consumption, while the negative and significant effect of income spent on cocoyam depicts that households spend more on cocoyam if it will be consumed as cooked tuber and less if it will be consumed as *Achicha.* This may be it takes more quantity of tuber to satisfy large household as compared to achicha which transform into large quantity.

Considering using cocoyam for soup thickening as against cooked tuber, the result in the Table 4 shows that some variables, namely: age and income spent on cocoyam had negative and significant effect on eating cocoyam as soup thickening as against cooked tuber, while, household size had positive and significant effect on eating cocoyam as soup thickening as against cooked tuber. The positive and significant effect of household size depicts that large households will prefer to use cocoyam as a soup thickening as against cooked tuber. This is a common culture in Igbo land as most soups prepared are thickened with cocoyam. On the other hand,

the negative and significant effect of age of the household suggest that household with elderly household heads will prefer to eat cocoyam as cooked tuber, this support the findings of Pluckett (1970) that cocoyam is highly recommended for diabetic patients and the aged. While the negative and significant effect of income spent on cocoyam indicates that households spend more on cocoyam if it will be consumed as cooked tuber and less if it will be consumed as soup thickener. It also suggests that more quantity will be needed if cocoyam is consumed as cooked tuber as compared to when is used as soup thickener.

Finally, age and marital status have a positive and significant effect and hence control household behavior as regards the consumption of cocoyam in the form of cocoyam mixed with beans as against cooked tuber. For age of the head of the households, findings show that consumption of cocoyam mixed with beans is preferred to cooked tuber if the household head is elderly. This is because beans supply additional nutrient to cocoyam since beans contained protein nutrients. Marital status indicates that household with married people tends to eat cocoyam mixed with beans than against cooked tuber. This may be as a result of having children whose nutrient requirements need to be satisfied with the combinations because cocoyam mixed with beans supply both calories and protein as compared to eating cooked tuber alone.

Farming experience has a negative and significant effect on cocoyam mixed with beans as against cooked tuber. This suggests that households with high farming experience tend to eat less of cocoyam mixed with beans and more of cooked tuber, whilst households with low farming experience prefer cocoyam mixed with beans as against cooked tuber.

Conclusion

The importance of cocoyam as household's food components cannot be over emphasized as its seen as part of their culture and most importantly cannot be replaced by other food crops. Hence there is an urgent need for cocoyam production to be taken as one of the essential crops focused on in the process of nation's food security attainment. Therefore, households should be encouraged to cultivate more of cocoyam to enable its accessibility and affordability. This study reveals essential household's socioeconomic and institutional characteristics that influenced the volume of cocoyam consumed by households. Results from the study also reveal that households have preference for different forms of processed cocoyam. There is therefore an urgent need to invest into the development of different forms of processed cocoyam to improve their quality and make them available for consumers. This is because evidence from the study shows that households may consume cocoyam often since it is economically affordable and culturally acceptable. Also, there is a need to invest in hybrid cocoyam production to boost the quantity. Generally, cocoyam should be seen as indispensible crop as is well accepted at different forms by households. Therefore, government should include cocoyam as part of arable crops transformation programme.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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