FINAL

Analysis of Determinants of Demand For Sweet Potatoes by Households in Kaduna State, Nigeria

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Abstract

This study examined the Determinants of Demand for Consumption of Sweet Potatoes by Households in Kaduna State, Nigeria. The objectives were to describe the socio-economic characteristics of the respondents, examine their income and expenditure levels, determine factors that affect demand for sweet potatoes, and identify constraints they face. A multi-stage sampling technique was used in the selection of 130 respondents. The data were analysed using descriptive statistics and ordinary least squares (OLS) regression. The result revealed that 76.9% of the respondents were male, with a mean age of 42 years, and 71.5% of the respondents were married, with a mean household size of 2 persons. The average monthly income of the respondents was ₦65,853.85, while average monthly expenditure on food was ₦9,986.22, with a mean of ₦1,091.15 being spent on sweet potatoes monthly. The result of the regression shows that the educational level, the income level of the respondents, the price of substitute crops and the taste preferences of the respondents were statistically significant at 1%, 1%, 1% and 5% levels, respectively, in affecting the demand of sweet potatoes by households in Kaduna State, Nigeria. The major constraints faced by sweet potato consumers in the study area include difficulty in storing sweet potatoes for a long time, perishability of the product, and price fluctuation. The study recommends better means of storage for the consumers and a price review for affordability.

Keywords: *Sweet Potatoes, Demand and Regression Analysis*

1.0 INTRODUCTION

Sweet potato (Ipomoea batatas L.) is one of mankind's highest-yielding crops, with a higher food value consumed and total production per unit area than other staple foods such as sorghum, maize, millet, and rice (Mwangagi et al., 2021). It is the world's seventh most important food crop after wheat, rice, maize, barley and cassava (Saitta et al., 2020; Opiyo, 2021). Sweet potato presence and adaptation to tropical areas, where per capita incomes are generally low and its nutritional value makes it an important component in food production and consumption,

A comparison with other food crops shows that it yields more calories per unit area than maize and nearly as much as cassava, while their protein yield is far higher than the latter (Saitta, 2020). Due to its adaptation to the tropical areas and its nutritional value, it is increasingly becoming an important food security and famine relief crop during seasons of crop failure. Subedi et al. (2021). On a worldwide scale, the economic importance of sweet potato among all food crops is exceeded only by cereals (wheat, rice, maize and barley) (Uhlig et al., 2017).

Sweet potatoes are one of the stable and common foods in the diet of most Nigerians, as well as in the study area. This is due to the versatility of the sweet potatoes for different dish preparations; they can be boiled, fried, chipped, made into porridge and even eaten raw by some

people. The demand for sweet potatoes by consumers, especially in the study area, depends on the consumers' needs and also on some quality characteristics that are peculiar to individual consumers. It may also be dependent on the income level as well as other factors like the family size and occupation of the consumer.. The objectives of this research are to;

i.   describe the socioeconomics characteristics of the respondents;

ii.   examine the income and expenditure level of respondents;

iii.   determine the factors affecting the demand for sweet potato by respondents;

iv.   Identify the constraints faced by sweet potato respondents in the study area?

2.0 METHODOLOGY

2.1   Study Area

The study was conducted in Chikum, a local government area of Kaduna State, Nigeria. Kaduna State is located in the northwestern part of Nigeria. Kaduna State was founded by British colonists in 1900 (Toyin et al., 2018). The state has twenty-three (23) Local Government Areas, or LGAs. It occupies a mass of approximately 46,053 square kilometres with a population of 6,153,503 people (NPC, 2006). With a population growth rate of 1.80%, the projected population of the state in 2021 stood at 7,764,148. The latitude of Kaduna State is 10.037° N and longitude 70.70° E. The major crops that are marketed include sweet potato, maize, ginger, soybeans, groundnuts, vegetables, pepper, sheanuts, and onions.

Table 1: Sampling procedure of the respondents in the study area.

Zone	Selected LGA	No. of communities	Selected Communities (18%)	Sample Frame	Sample Size (10%)
Samaru	Jema'a	18	Kagoma	126	13
			Jibin	120	12
			Alfana	125	13
Lere	Makarfi	18	Mayere	105	11
			Ruma	122	12
			Gimi	132	13
Birningwarri	Chikun	10	Kakau	135	14
			Sabon-yelwa	141	14
Maigana	Sabongari	9	Zabi	130	13
			Saulawa	152	15
Total	**4**	**55**	**10**	1288	130

S. C= selected communities, S. F= sample frame, S. S= sample size

Source; **Kaduna Agricultural Development Project, 2021.**

2.2. Sampling procedure and Size

A three-stage random sampling was used for this study. The first stage is the selection of one local government area from each of the four zones in Kaduna State. The second stage is a selection of 18% of the communities in each Local Government Area to make a total of ten communities for convenience, and the third stage is the random selection of 10% of households from each of the selected communities. Thus, a total of one hundred and thirty (130) households was used for the study.

2.3. Method of data collection

Primary data was used for this study; information was elicited from the household head with the aid of a well-structured questionnaire. Information elicited includes age, education level, income and expenditure levels, etc.

2.4 Method of data analysis

Objectives i, ii and iv was achieved using descriptive statistics such as frequencies, mean and percentages. Objective iii was achieved by the use of demand function, which was fitted into OLS regression model. The explicit from of the demand model as used by Obalola *et al* (2021) is specified in Equation (1)

$$Q_d = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + e \quad (1)$$

Where:
Qd= quantity demanded by respondent (kg/month)
β_0 = constant
β_0 - β_{10} = coefficient to be estimated
X_1= Price of the commodity (₦/kg)
X_2= Price of substitute commodity (₦/kg)
X_3= Taste/preference for the commodity (High preference=1 low preference=0)
X_4= Income of the respondent (₦)
X_5= Age of the respondent (years)
X_6= Sex of the respondent (male=1 female=0)
X_7= Educational level of respondent (years spent in school)
X_8= Household size of respondent (number)

X_9= Frequency of purchase of commodity (number of month)
X_{10}= Nearnest to market (km)
e= error term

The data was fitted into four (4) functional forms of linear, semi log, cobb-Douglas and exponential. The lead equation was chosen based on coefficients of multiple determination (R^2 value), statistical significance of estimated regression coefficient, sign of estimated regression coefficient, as well as the F ratio.

3.0 DISCUSSIONS

3.1 socio economic characteristics of respondents

This section describes the socio-economic characteristics of respondents in the study area. The socio-economic characteristics considered for this study were age, gender, marital status, household size, level of education, farming experience, and farm size and land ownership

The result in Table 2 shows that about 56.2% of the consumers have a mean age of 42 years. Which implies that the respondents were still in their active productive age. Hence, the demand for sweet potato consumption would relatively be high among the farming households. This result is in line with the result of Alabi et al. (2020), who reveal that the majority (57.6%) of the respondents are between the ages of 31 and 50 years, which shows that the respondents were still in their active productive age, with a mean age of 41 years.

Table 2 also revealed that the majority (76.9%) of the respondents were male, while (23.1%) were females. This implies that there is a male-dominated household head in the study area. Which could be attributed to the nature of the northern community, where women are only restricted to mere household' chores while their males carry out the purchasing of any household needs.

Equally, the majority (71.5%) of the respondents were married; thus, they are likely to have larger family sizes, which may increase the household food demand for sweet potato consumption in the study area. This result corroborates with the findings of Ezechi (2020), who pointed out that the demand for food consumption among married persons was higher than other forms of marital organisation.

Similarly, respondents with a household size below 5 persons in the study area accounted for 86.9%. Implying a relatively small household size among the respondents. However, respondents with large household sizes may have a high demand for sweet potato consumption. This finding corroborates with the result of Mwangagi (2021), who reported that the majority (71.9%) of the respondents have a household size of 1-5 people, which could be used as family labour in farming activities.

Table 2 further reveals that the majority (82.3%) of the respondents had a formal type of education involving attending primary, secondary and tertiary institutions, with an average number of years spent in school being 7 years. Given the high level of literacy, it is expected that information on benefits associated with consuming substitute food such as sweet potato in their diet may be easily understood, and this may increase the demand for sweet potato among the respondents. This finding agrees with Visalakshi et al. (2021), who reported that the majority of the respondents (68.5%) had a formal type of education, with few of the respondents with no formal type of education.

The table further reveals that all of the respondents (100.0%) source capital for their food purchases from personal savings to meet the household food demand in the study area. Implying that the farmers in the study area depend solely on personal savings for feeding rather than relying on other sources of credit. This agrees with the findings of Wanjala et al. (2021), who revealed that the majority of the respondents sourced funds for farming purposes from the personal savings gotten from their businesses.

The result in Table 2 also shows that more than half of the respondents in the study area (58.5%) indicate farming as their primary occupation. This is because farming is the major livelihood of the rural dwellers. However, 62.3% of the respondents show trading as their secondary occupation. This variation is due to the fact that farming is the major livelihood activity of the rural dweller, while trading was indicated as the major secondary occupation due to the need for selling the agricultural products among the farming households. This study agrees with the research of Mwangagi (2021), which showed that the majority (53.8) of the respondents indicated farming as their major occupation in the study area.

The result in Table 4.2 further reveals that the majority, 62.3%, of the respondents had a distance of less than 2km from the source of production input, with an average mean of 1.2km. This is due to the fact that the rural farmers settle their residence close to their farmlands. This is in line with the results of Ezechi (2020), which show that the average mean distance of the respondents from their source of production input is 2.5 km.

3.2. The income and expenditure level of respondents

The result in Table 3 indicated that the majority of the respondents in the study acquired a monthly income ranging from ₦60,000 to ₦90,000, with an average of ₦65,853.85 monthly. This implies that the respondents have a considerable source of income that they can rely on for their basic needs. This is in line with the work of Ezechi (2020), which showed that the average monthly income of the respondents in the study area was ₦95,000.

The result in Table 3 also shows that the majority (80.8%) of the respondents in the study area spent ₦1,000 to ₦2,000 on sweet potatoes, with a mean of ₦1,091.15. This is due to the fact that rural dwellers spend their money on cheap and basic food that they can afford.

The result in Table 3 also shows the amount spent on food items and substitutes among the consumers in the study area, in which the majority, 54.6% of the respondents, indicated that they spent not less than ₦30,000 on food items monthly, with an average of ₦9,986.22. However, more than half (55.4%) of the respondents also show a range of ₦3000-₦6000 spent on substitute crops to supplement the households food diet, with an average of ₦1,804.36 on a monthly basis among the consumers in the study area. This substantiates the work of Alabi et al. (2020), who reveal that the average amount spent on food items by the respondents was ₦11,500 monthly.

3.3 The factors affecting the demand for sweet potato by respondents

A multiple regression model was used to analyse the factors affecting the demand for sweet potatoes by the

respondents in the study area. The multiple regression result is presented under four functional forms: linear, semi-log, double-log and exponential. However, the linear form was chosen as the lead equation for discussion due to its strong analytical techniques and significant variables.

The result from Table 4 shows that the linear functional form has an R^2 of 0.4639, implying that about 46% of variations that occur in the model were explained by the independent variables included in the models. while the remaining (54%) were due to error in measurement of some variables or omission of important explanatory variables. The Prob > F is significant at the 1% level of probability. This implies the model is fit for the objectives.

The finding reveals that the coefficient of the level of education of the respondents is positive and significant at the 1% level of probability. This implies that as the respondent's educational attainment increases, the level of demand for sweet potato also increases. This might be as a result of education being a function of exposure of the respondents, which also enables the consumers to easily understand the use and benefit of consuming sweet potatoes in their daily diet in the study area. This agrees with Alabi et al. (2020), which showed that the level of education influences farmers' decisions to use a given technology or innovations introduced to them.

The result further reveals the coefficient of income of the consumers was positively significant at the 1% level of probability. Implying that an increase in the income of the respondents will lead to an increase in the demand for sweet potatoes among the consumers. This could be attributed to the fact that an increase in the respondents' income increases their purchasing power, which in turn leads to a higher demand for sweet potatoes among the consumers. This agrees with the findings of Ismail and Abu-Bakar (2012), which showed that the income of the respondents leads to high demand for food consumption. The result also reveals that the coefficient of the price of substitutes was positively significant at the 1% level of probability. Implying that an increase in the price of the substitute's crops in the markets will lead to an increase in the demand for sweet potatoes among the consumers. This could be attributed to the respondents' preference for sweet potatoes over substitute crops due to the high cost of the latter. This agrees with the findings of Ezechi (2020), which showed that an increase in the price of

substitute crops leads to a high demand of the preferred food crop. However, the coefficient of taste preferences of the sweet potato was positively significant at the 5% level of probability. Indicating that the higher the consumers have a good taste preference for sweet potatoes, the higher the demand for sweet potatoes among the consumers in the study area. This substantiates the result of Alabi et al. (2020), who indicated that the tastes and preferences of the respondents influence the demand for such products in the study area.

3.4 Constraints faced by respondents

Table 5 shows the constraints faced by the consumers in the study area, which include difficulty to store for a long time (WM=2.78), perishability of the product (WM=2.74), high calories of the product (WM=2.40) and price fluctuation (WM=2.32), which were ranked among the top four (4) major constraints in the study area, respectively. the challenges faced by consumers in the demand for sweet potatoes in the study area. Due to the short durability of sweet potatoes, which cannot be stored for a longer period of time, tend to affect their demand from the market by many consumers, especially those without adequate storage facilities in place to preserve them. Perishability of the product was ranked second with a mean of (X=2.74) among the constraints faced with the demand for sweet potatoes by the consumers in the study area. This implies that the perishable nature of sweet potatoes limits the market demand for the product, as the consumers will not be willing to buy more to avoid post-storage losses due to its perishability.

High calories of the product were ranked third with a mean of (X=2.40) among the constraints associated with the demand for sweet potatoes by consumers in the study. Due to the nutritional content of sweet potatoes, in which a high level of calories was involved, some consumers who are in check of their health status tend not to demand sweet potatoes, which reduced the market demand for the product.

Furthermore, price fluctuation was ranked fourth with a mean of (X=2.32) among the major constraints associated with the demand for sweet potatoes by the

consumers in the study area, indicating that due to the fluctuation in the price of sweet potatoes, it affects the market demand, as there will be high demand when the price is relatively low and low demand when the price is high among the consumers in the study area. This is in line with the research of Alabi et al. (2020), which showed that perishability of the product, price fluctuation and seasonality were the major constraints associated with the demand for sweet potatoes in the study area.

4.0 RESULTS

Table 2: Socio-economic characteristics of the Respondents (n=130)

Variables	Frequency	Percentage (%)	Mean
Age(years)			
21-30years	25	19.2	42year
31-40years	34	26.2	
41-50years	39	30.0	
51-60years	25	19.2	
above 60	7	5.4	
Gender			
Male	100	76.9	
Female	30	23.1	
Marital status			
Married	93	71.5	
Single	6	4.6	
Divorce	9	6.9	
Widow	15	11.5	
Household size			
5 and below	113	86.9	2
6-10people	13	10.0	
above 10	4	3.1	
Educational Level			
Non formal	23	17.7	
Primary	39	30.0	
Secondary	36	27.7	
Tertiary	32	24.6	
Source of capital			
Self-owned	130	100.0	
Otherwise	0	0	
Primary occupation			
Farming	76	58.5	
Civil servant	26	20.0	
Trading	28	21.5	
Secondary occupation			
Farming	25	19.2	
Civil servant	24	18.5	
Trading	81	62.3	

Source: field survey, 2022

Table 3: The income and expenditure level of respondents

Variables	frequency	Percentage	Mean
Monthly income			
1-30,000	18	13.8	₦65853.85
30,001-60,000	56	43.1	
60,001-90,000	25	19.2	
90,001-120,000	24	18.5	
Above 120,000	7	5.4	
Money spent on food			
1-30,000	71	54.6	₦9986.22
30,001-60,000	57	43.8	
60,001-90,000	2	1.5	
Money spent on sweet potatoes			
1-1,000	66	50.8	₦ 1091.15
1,000 – 2,000	39	30.3	
2,000-3,000	9	6.9	
Above 3,000	3	2.3	
Money spent on substitutes crop			
1-3000	13	10.0	₦1804.36
3,001-6,000	72	55.4	
6,001-9,000	41	31.5	
Above 9,000	4	3.1	

Field survey, 2022

Table 4: Multiple regression results o factors affecting the demand for sweet potato

Variables	Linear	Semi-log	Double-log	Exponential
Age	-13.15 (-0.20)	0.0011(0.57)	-2549.19(-0.94)	-0.0185(-0.23)
Education	2.810 (3.06***)	8.07e-5(2.85***)	5134.6(3.39***)	0.1352(3.02***)
Household size	203.9 (0.65)	0.0125(1.29)	2722.8(1.80*)	0.1215(2.71***)
Gender	347.23 (0.45)	0.0086(0.36)	748.28(0.50)	0.0198(0.45)
Nearness to market	6.825 (0.02)	5.50e-3(0.42)	618.3(0.59)	0.0286(0.92)
Income	0.069(3.09***)	2.04e-06(2.96***)	2448.9(1.70*)	0.0741(1.75*)
Price of substitutes	2.355 (5.83***)	7.29e-5(5.86***)	11088.74(5.22***)	0.3615(5.75***)
Frequency of purchase	332.63(1.18)	0.0073(0.84)	38163.4(1.38)	0.8589(1.05)
Taste preference	5299.86(2.12**)	0.122(1.59)	-841.15(-0.57)	-0.0259(-0.60)
Price of sweet potato	-553.68(-0.70)	-0.0098(-0.40)	406.13(0.18)	0.0321(0.49)
Constant	-22967.38(-0.82)	8.826(10.17***)	-296641.4(-2.29***)	1.3813(0.36)
Number	130	130	130	130
F(10, 119)	10.30	10.07	8.21	9.69
Prob > F	0.000***	0.0000***	0.0000***	0.0000***
R-squared	0.4639	0.4583	0.4082	0.4487
Adj R-squared	0.4188	0.4128	0.3584	0.4024

Source: field survey, 2022

Table 5: Constraints associated with sweet potato demand

Variables	Very Severe	Severe	Not severe	Mean	Rank
Difficult to store for a long time	103(79.2)	25(19.2)	2(1.5)	2.78	1st
Perishability of the product	101(77.7)	24(18.5)	5(3.8)	2.74	2nd
High calories of the product	78(60.0)	26(20.0)	26(20.0)	2.40	3rd
Price fluctuation	60(46.2)	52(40.0)	18(13.8)	2.32	4th
Seasonality of the product	61(46.9)	50(38.5)	19(14.6)	2.32	4th
Inconsistent size	61(46.9)	47(36.2)	22(16.9)	2.30	6th
High prices of the product	53(40.8)	31(23.8)	46(35.4)	2.05	7th
Shape of the product	4(3.1)	18(13.8)	108(83.1)	1.20	8th
Color of the product	0(0)	24(18.5)	106(81.5)	1.18	9th

Source: Field Survey,

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