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Consumers' Willingness to Pay for Cassava Flour Inclusion in Bread, a Case Study of Lagos State, Nigeria

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Abstract

The study was conducted to address the issue of consumers' willingness to pay for inclusion of cassava flour in bread in Lagos State. The data were collected randomly from a sample of 300 respondents in the state through the use of a well structured questionnaire. The contingent valuation method was adopted to estimate both the mean willingness to pay of consumers and the factors that affect their willingness to pay and these were analyzed using the bivariate probit model. The most significant model was the 10percent cassava flour inclusion as it has the highest number of significant variables (eight) followed by 20percent cassava flour inclusion with seven significant variables and 30 and 40percent cassava flour inclusion with six significant variables each. The factors that influenced consumers' willingness to pay for CCW bread were the respondent's age, gender, respondents' awareness, married respondents, respondents with head position,and bread share which is the proportion of respondents income spent on bread to total income. The mean willingness to pay for bread with an inclusion of cassava flour at 10, 20, 30, and 40percent cassava flour inclusion were ₦172.70, ₦165.00, ₦154.07, and ₦142.78 respectively for initial bid while the mean willingness-to-pay at 10, 20, 30, and 40percent cassava flour inclusion were ₦180.20, ₦150.41, ₦143.35, and ₦127.36 respectively for subsequent bid. Arising from the result of this study, birth control policies were recommended among respondents in the study area.

Keywords: bivarate probit model, composite cassava wheat bread, contingent valuation, willingness to pay

1. Introduction

In most countries of the world, in recent years, partly as a result of structural adjustment policies and pressures from multilateral financial institutions, various governments have increasingly focused on identifying other food components that can be added as a component in the bread making process. The rising cost of wheat importation for the production of bread, a well-established and accepted food product relished by the general public, has been a matter of great concern to the Nigerian government in recent times. This has led to the increased interest in cassava flour which has been identified as a close, cost-effective substitute to wheat flour in bread production.

Willingness to pay measures the resources individuals are willing and able to give up (Golan & Kuchler, 1999). Also, WTP is the maximum amount of money an individual is willing to pay for a commodity; therefore, WTP is an indicator of the value of the commodity to that individual. Willingness to pay measures is considered useful for several reasons. First, they can directly inform policy makers by providing information about how much people value some goods or services and can thus inform the pricing of these goods or services (Hanley *et al.,* 2003). Second, WTP measures can be important inputs in economic evaluations such as cost benefit analyses (Loomes, 2001; Oliver et al., 2002; Negrín et al., 2008). Third, WTP measures can be a convenient tool to make relative comparisons and rankings of the desirability of goods and services. Alternatively, WTP measures can be derived from discrete choice models estimated using either revealed preference data or data from discrete choice experiments (DCEs). In these cases, the WTP for an alternative attribute can be calculated as the ratio of the attribute coefficient to the price coefficient (Train, 2003).

Responses from people who report a high level of certainty about their willingness to pay exhibit significant anomalies that increases as uncertainty increases (Watson & Ryan, 2006).

Nigeria is rarely mentioned when it comes to cassava export even though it is the world's largest producer of

cassava. This is because most of the staples produced in the country do not reach the global market due to the very poor infrastructure in Nigeria. Post harvest losses of staples are extremely high in Nigeria (IITA, 2010), worsened by poor post harvest, handling and marketing strategies. The report from International Institute of Tropical Agriculture IITA, however indicate that Nigeria can produce very good bread from a combination of 30% cassava flour and 70% wheat flour. This however depends on sustained willingness to pay for composite cassava wheat (CCW) Bread by consumers. Examining the consumers' perception and willingness to pay for CCW bread in Lagos State is therefore inevitable. The study therefore seeks to provide answers to the following research questions generated.

i. What are the factors that influence consumers' willingness to pay for bread with an inclusion of cassava flour?

ii. What is the mean willingness to pay for bread with an inclusion of cassava flour?

The consumer's WTP for a good is a fundamentally behavioural concept. The behaviour in question is that of buying (or selling) a good. How much one is willing to pay (or accept) for a good at a particular point in time will depend on a variety of factors, including of course, the expected intrinsic value.

In general, the willingness to pay a price premium decreases as the price premium increases, consistent with the law of demand. In consumer behavior theory, consumers make their own decisions to balance the marginal health utility and marginal price of one unit of quality-food product, a simple framework was used to analyze consumer behavior towards food products, which includes the willingness to pay a price premium. Consumers' willingness to pay (WTP) is a key concept in the management of sustainability because it is a prerequisite for producers in organizations. There are different types of WTP that materialize differently in different circumstances and influence the consumers' decision-making process.

WTP is an important concept for the literature that approaches sustainability from an instrumental stakeholder theory perspective. It has its roots in economics, where willingness to pay is defined as the maximum amount of money that an individual is willing to sacrifice to obtain a good or service (Freeman, 2003).

2. Review of Empirical Studies on Consumers' Willingness to Pay for Food Products

Grassi (2010), worked on "Public and Private Provision under Asymmetric Information: Ability to Pay and Willingness to Pay". He modeled the interaction between the public sector and the market and analyzed whether a mixed system of provision helps the public sector with the problem of affordability. He found out that willingness to pay was independent on the budget constraint, and then on ability to pay, Consumers with high willingness to pay may not afford the good at a given price, Consumers cannot borrow money if needed, The market allocation is inefficient and that the public sector has a budget, but it is insufficient to supply all consumers for free. It observes consumers' wealth and implements a policy to maximize the sum of consumers' utilities subject to the wealth constraints. He considered two optimal policies: rationing and subsidization. First it studied the public supplier as the sole provider of the good. Any rationing policy that exhausts the budget is optimal. The optimal subsidy scheme requires cross subsidization: rich consumers pay a price greater than marginal cost, and some poor consumers pay less than marginal cost. The budget and the revenue collected from rich consumers funds the subsidies for poor consumers. He then characterized the equilibrium of a simultaneous moves game where the public sector interacts with a firm in the provision of the good.

Motivated by the far-reaching benefits of the new cassava policy on the substitution of wheat flour with cassava flour in bread production to the economy, a logistic regression model was employed to examine households' perception and willingness to pay for bread with cassava flour inclusion in Osogbo Metropolis, Osun State, Nigeria. Findings suggest that bakery owners adopting the use of cassava flour in bread production pay careful attention to the taste, packaging, size, colour and price of the bread since these variables affect the buying decisions of the consumers. While consumers' willingness to pay a premium varied with degrees of cassava flour inclusion, households' willingness to pay showed a negative relationship with the premium price and a positive, significant relationship with household income and share of bread in total household food expenditure. Thus, proper attention should be given to price stabilization of bread with cassava flour inclusion as well as the design of empowerment programmes targeted at increasing household income.

3. Materials and Methods

3.1 Study Area

The study was carried out in Lagos State Nigeria. Lagos state is in the southwest geopolitical zone. It falls on latitude 6.523° North and longitude 3.54° West. The highest maximum temperature ever recorded in Lagos was 37.3 °C (99.1° F) and the minimum 13.9 °C (57.0° F) (Lagos Meteorological Organization, 2012). The main

source of livelihood of people living in Lagos is income from private establishments in the state. Most commercial and financial business is carried out in the central business district situated on the island. Lagos has one of the highest standards of living as compared to other cities in Nigeria as well as Africa and it is one of the fastest growing cities in the world, experiencing a population increase of about 275,000 persons per annum (Rasaki, 2012). The state was chosen because it is Nigeria's economic and commercial capital. Primary data was utilized for this study. The primary data was obtained through the use of well structured questionnaire. The questionnaire was pretested to remove any ambiguity. Primary data was collected from the consumer households in the state. The study employed a two stage sampling procedure. At the first stage, random sampling of three (3) LGAs was done, whereby one local government area in Lagos Island and two local governments in Lagos main land were selected. In the second stage eighty respondents were randomly selected in Lagos Island local government area, one hundred respondents were randomly selected from Ikeja LGA while one hundred and twenty were selected from Alimosho LGA on the basis of sampling proportionate to size. This leaves the total number of respondents selected for this study at three hundred.

3.2 Methods of Data Analysis

The analytical techniques adopted in this study include descriptive statistics such as tables, percentages and frequencies to analyze the socio-economic characteristics of consumers with respect to their preference and willingness to pay pattern for cassava inclusion in bread in the study area. The consumers' preference pattern, proxied by their willingness to pay will be broken down by Bivariate Probit Model.

Contingent valuation method was used to generate choice pattern and the responses were later analyzed using Bivariate Probit Model, which was used to determine the factors that influence consumers' willingness to pay for cassava inclusion in bread. In estimating the mean willingness to pay of consumers and potential consumers of Composite Cassava Wheat Bread, a double-bounded contingent valuation model was used in which the respondents were asked a series of questions that progressively narrowed down to their willingness to pay. This method has been shown to generate more efficient estimates than those based on a single question or those that ask open-ended question about willingness to pay (Watson & Ryan, 2006).

The probit model *r* category is built from a latent regression in the same manner as the binomial probit model. We begin with $y^*_i = \boldsymbol{\beta}^T \mathbf{x}_i + \boldsymbol{\varepsilon}_i$ where $\mathbf{x}$ is a vector of predictor variable for the *i* th observation and $\boldsymbol{\beta}^*$ is the unknown parameter. As usual, y^* is unobserved variable, that follow as: (Greene, 2005).

$$y = 0 \text{ if } \gamma_0 < y^* \leq \gamma_1$$
$$y = 1 \text{ if } \gamma_1 < y^* \leq \gamma_2$$
$$\vdots$$
$$y = r - 1 \text{ if } \gamma_{r-1} < y^* \leq \gamma_r$$

The probability for each observed response has *r* category, i.e.:

$$P(y = 0) = P(\gamma_0 < y^* \leq \gamma_1) = \Phi(\gamma_1 - \boldsymbol{\beta}^T \mathbf{x}) - \Phi(\gamma_0 - \boldsymbol{\beta}^T \mathbf{x})$$
$$P(y = 1) = P(\gamma_1 < y^* \leq \gamma_2) = \Phi(\gamma_2 - \boldsymbol{\beta}^T \mathbf{x}) - \Phi(\gamma_1 - \boldsymbol{\beta}^T \mathbf{x})$$
$$\vdots$$
$$P(y = r\text{-}1) = P(\gamma_{r-1} < y^* \leq \gamma_r) = \Phi(\gamma_1 - \boldsymbol{\beta}^T \mathbf{x}) - \Phi(\gamma_{r-1} - \boldsymbol{\beta}^T \mathbf{x})$$

Bivariate probit model (*r* x *c*) is a probit model which involves two response variables, i.e.

$y_1^* = \boldsymbol{\beta}^T_1 \mathbf{x} + \boldsymbol{\varepsilon}_1$ and $y_2^* = \boldsymbol{\beta}^T_2 \mathbf{x} + \boldsymbol{\varepsilon}_2$. The first variable has *r* category that is

$$y_1 = 0 = \text{if } \gamma_0 < y_1^* \leq \gamma_1$$
$$y_1 = 1 = \text{if } \gamma_1 < y_1^* \leq \gamma_2$$
$$\vdots$$

$$y = \text{r-1} = \text{if } \gamma_{\text{r-1}} < y_1^* \leq \gamma_{\text{r}}$$

Whereas, the second has *c* category, that is

$$y_2 = 0 \text{ if } \delta_0 < y_2^* \leq \delta_1$$

$$y_2 = 1 \text{ if } \delta_1 < y_2^* \leq \delta_2$$

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$$y_3 = \text{c-1 if } \delta_{\text{c-1}} < y_2^* \leq \delta_{\text{c}}$$

Variables (y_1^*, y_2^*) that satisfy normal bivariate distribution can be written as $(y_2^* y_2^*) \sim N(\boldsymbol{\mu},\sum)$.

Bivariate normal density function (y_1^*, y_2^*) is:

$$f(y_1^*,y_2^*) = \frac{1}{2\pi|\sum|^{1/2}} exp\left[-\frac{1}{2}\begin{pmatrix} y^*_1 & -\boldsymbol{\beta}^T_1 \mathbf{x} \\ y^*_2 & -\boldsymbol{\beta}^T_2 \mathbf{x}\end{pmatrix} \sum{}^{-1} \begin{pmatrix} y^*_1 & -\boldsymbol{\beta}^T_1 \mathbf{x} \\ y^*_2 & -\boldsymbol{\beta}^T_2 \mathbf{x}\end{pmatrix}\right]$$

The probability of bivariate normal density function (y_1^*, y_2^*) with thresholds γ and δ is as follows:

$$P(y_1^*,<\gamma y_2^* \leq \delta) = \int_{-\infty}^{\gamma} 1 \int_{-\infty}^{\delta} 1 \; f(y_1^*, y_2^*)\, dy_1^*, dy_2^*$$

The average, true willingness-to-pay value ($\mu TWTP$) is calculated in the following manner (Haab & McConnell, 2002): where β_0 is the regression constant value, and $\beta 1$ the regression coefficient value for the proposed willingness-to-pay value in the bivariate probit regression model. The explanatory variables are the initial (*BID1*), and the follow-up willingness-to-pay values (*BID2*) that were proposed to respondents in the survey.

In the bivariate probit regression model, dependent variables represent the respondent's answers to the initial (*RESP1*) and the follow-up willingness-to-pay value (*RESP2*). These are binary variables that take the value 0 if the respondent accepts the proposed value and 1 otherwise.

i.e. resp 1 (*r*) = Consumers' willingness to pay for bread with cassava flour inclusion (willing to pay =1, 0 = otherwise)

resp 2 (*c*) = Consumers' willingness to pay for bread with cassava flour inclusion (willing to pay =1, 0 = otherwise) *r* x *c*)

The following can be classified as the determinants of willingness-to-pay (explanatory variables):

$x_{1=}$ age (*y*ears);

$x_{2=}$ sex (female=1, 0 = otherwise);

$x_{3=}$ household size (number);

$x_{4=}$ Tertiary Education (yes=1, 0=otherwise);

$x_{5=}$ Respondent's monthly income (*Naira*);

$x_{6=}$ Awareness of cassava bread (aware=1, 0= otherwise); and

$x_{7=}$ Marital Status (married=1, 0= otherwise)

$x_{8=}$ Household head position (head position=1, 0= otherwise)

$x_{9=}$ dependency ratio (dependant=1, 0= otherwise)

$x_{10=}$perception of respondents to cassava bread

$x_{11=}$ Share of Bread in total household food expenditure

$\rho_{i=}$ Error

For objective 2**,** following the result estimates from factors driving WTP using the bivariate Probit model, Krinsky and Robb Procedure (1986) used a bootrap estimate to generate the mean willingness to pay. This study will also follow this methodology.

4. Discussion

Table 1. Socio-economic characteristics of respondents

Variables	Frequency	Percentage
Gender		
Male	154	51.33
Female	146	48.67
Total	300	100.00
Marital Status		
Single	53	17.67
Married	239	79.67
Divorced	1	0.33
Widowed	7	2.33
Total	300	100.00
Household size		
1-2	28	9.33
3-4	74	24.67
5-6	140	46.67
7-8	54	18.00
9-max	4	1.33
Total	300	100
Mean 5.0133		
SD 1.8103		
Monthly Income(₦)		
Min-20000	29	9.67
20001-40000	53	17.67
40001-60000	92	30.67
60001-80000	55	18.33
80001-100000	22	7.33
100001-Max	49	16.33
Total	300	100.00
Mean ₦79,086.17		
SD ₦80,270.43		
Min ₦8,000		
Max ₦500,000		

Source: Field Survey, 2013.

4.1 Bread Consumption Pattern

Table 2 presents the food expenditure, non food expenditure and bread expenditure in relation to the different socioeconomic characteristics. The findings reveal a higher expenditure by the males than the females. From the table, it can be seen that the mean food, non food and bread expenditure for male and female respectively are ₦1711.78, ₦504.06, ₦142.55 and ₦1602.28, ₦480.79 and ₦119.85. The expenditure of food, non-food and bread was highest in the age category of 21-30 years which was ₦2649.23, ₦714.55 and ₦250.34 respectively. The

married people had more expenditure than the singled, widowed or divorced. This was reflected in their mean food, non-food and bread expenditure as ₦3039.67, ₦832.57, ₦287.34 respectively. This means that married people made more expenses than others as is expected. The household heads made the highest expenditure than any other members of the households as their mean expenditure were ₦1908.41, ₦621.31 and ₦139.02 for food, non-food and bread respectively as compared to ₦1279.52, ₦396.14 and ₦94.82 respectively for the mean expenditure of spouses.

Table 2. Distribution of consumer's expenditure based on their socioeconomic characteristics

Socioeconomic Characteristics		Food Expenditure ₦		Non-food Expenditure ₦		Bread Expenditure ₦	
		Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Gender	Male	1711.78	1736.06	504.06	550.22	142.55	235.91
	Female	1602.28	1731.13	480.79	621.47	119.85	147.75
Age Category	21-30	2649.23	3020.07	714.55	981.93	250.34	362.94
	31-40	1481.27	1225.12	442.67	478.84	118.69	131.36
	41-50	1150.38	727.99	378.51	292.25	71.86	57.09
	51-60	1328.39	745.63	387.46	305.50	88.61	71.71
	61 and above	1951.67	1359.02	664.12	492.50	131.72	114.98
Marital Status	Married	3039.67	3305.58	832.57	1131.34	287.34	393.35
	Single	1342.96	904.43	418.40	344.58	96.32	90.27
	Divorced	342.85	321.56	357.14	325.43	28.57	24.53
	Widowed	2161.91	938.17	477.14	118.43	167.62	148.26
Household Position	Child	1892.04	1954.45	541.67	567.19	157.81	253.84
	Spouse	1279.52	837.55	396.14	313.88	94.82	91.46
	Head	1908.41	2688.58	621.31	1180.36	139.02	160.84
	Relative	1104.98	1241.28	545.49	438.64	263.72	342.65
HhSize Category	Minimum-2	818.43	533.18	302.65	223.59	37.82	26.11
	3-4	842.99	431.69	251.09	180.27	73.84	60.45
	5-6	1149.71	535.76	352.45	225.41	86.69	74.56
	7-8	1945.16	1052.59	579.17	446.94	129.46	107.89
	9-max	5137.5	3575.14	1458.93	1306.68	485.54	467.29
Educational Level	Primary	1200.24	825.71	475.52	258.94	120.19	104.54
	Secondary	1670.24	1423.59	507.32	526.87	129.96	200.51
	Tertiary	1590.42	1859.95	464.55	649.47	125.02	183.70
	No Formal Education	3273.81	3616.38	780.65	574.28	290.03	394.89
Religion	Christian	1695.79	1837.96	485.17	611.92	129.89	174.42
	Islam	1563.64	1496.38	477.93	462.53	142.71	262.79
	Tradition	1796.98	1645.62	711.73	814.15	112.42	86.75
	Eckankar	983.33	225.46	302.22	175.16	36.67	3.33

4.2 Factors That Influences Consumers' Willingness to Pay for Bread With an Inclusion of Cassava Flour

Table 3 shows the direct effect of the explanatory variables on consumers' willingness to pay for cassava flour

inclusion in bread. The rho which is the correlation coefficient is 0.947. It shows a strong relationship between the first response and the second response. The probability Chi-square shows that the equation is significant at 1percent.

The result reveals that six out of the eleven variables are statistically significant in response 1 and these are the bid or premium price, age, sex, marital status, head position and bread share. However, in the second response, only four variables are significant and they are bid or premium price, sex, awareness and head position. This result is in agreement with the opinion Adepoju and Oyewole (2013) that factors such as bid or premium price, age, sex, marital status, head position and bread share affect consumers' willingness to pay for cassava flour inclusion in bread significantly. The findings reveal that premium price (bid), marital status and household income exerted significant negative influence on households' willingness to pay for bread with cassava flour inclusion respectively. However, the coefficient of age is positive which is against studies reviewed; (Yusuf et al., 2007). It is significant at 10percent in the first bid, implying that age has a positive impact on consumers willingness to pay for cassava flour inclusion in bread at 10percent inclusion level in the first bid and encourages consumers to make better decisions as regards to willingness to pay for cassava flour in bread. This means that as the age of consumers increases, the more willing they are to pay for the first bid of cassava bread at 10percent cassava flour inclusion level.

Feminine gender is positive and significant at five percent level. This implies that females are more willing to pay for 10 percent cassava flour inclusion than males.

Awareness of cassava bread is positive and significant at 10percent in the second bid. This implies that people who were aware of cassava bread are more willing to pay for 10percent cassava flour inclusion than those who are not.

Respondents who are married have a negative relationship in the first bid only and it is significant at 10percent. This means that married respondents are not WTP for 10 percent cassava flour inclusion.

Being the head of the house is positive and significant at 10percent and 5percent in the first and second bid respectively. This implies that household heads are more willing to pay for 10 percent cassava flour inclusion than non household heads.

Table 3 also shows the direct effect of the explanatory variables on consumers' willingness to pay for 20percent cassava flour inclusion in bread. The rho which is the correlation coefficient is 0.907. It shows a strong relationship between the first response and the second response. The probability Chi-square shows that the equation is significant at 1percent and so the null hypothesis is rejected that the socio-economic variables would not influence consumers' WTP for 10 and 20 percent cassava inclusion.

The result reveals that six out of the eleven variables are statistically significant in response 1 and these are the bid, sex, household size, head position, dependency ratio and bread share. However, in the second response, only three variables are significant and they are the bid, sex, and head position.

Feminine gender is positive and significant at 1percent and five percent level of significance in the first and second bid respectively. This implies that females are also more willing to pay for 20 percent cassava flour inclusion as they are for 10percent cassava flour inclusion than males.

Awareness of cassava bread not significant at 20 percent unlike at 10 percent. This implies that people who were aware of cassava bread are not WTP for 20percent cassava flour inclusion unlike at 10 percent cassava flour inclusion. The married factor has a no significant relationship on WTP to for 20 percent cassava flour inclusion. Being the head of the house is positive and significant at 5percent and 10percent in the first and second bid respectively. This implies that household heads are more willing to pay for 20percent cassava flour inclusion than non household heads as well as for 10percent cassava flour inclusion.

Results also shows that higher household size significantly reduce willingness to pay for 20percent inclusion at 5percent level of significance.

Table 3. Seemingly unrelated bivariate probit model estimates of factors driving WTP for 10% and 20% inclusion of cassava flour in bread

	10%						20%					
	Response 1			Response 2			Response 1			Response 2		
Predictor	**Coefficient**	**Std. Err.**	**P>|z|**	**Coefficient**	**Std. Err.**	**P>|z|**	**Coef.**	**Std. Err.**	**P>|z|**	**Coef.**	**Std. Err.**	**P>|z|**
Bid (₦)	-0.031***	0.004	0.000	-0.039***	0.006	0.000	-0.064***	0.011	0.000	-0.0251***	0.0109	0.021
Age (years)	0.004*	0.007	0.581	0.002	0.008	0.817	0.008	0.008	0.340	0.0017	0.0086	0.844
Sex	0.771**	0.317	0.015	0.647**	0.330	0.050	0.971***	0.338	0.004	0.7658**	0.3458	0.027
Hh size	-0.087	0.068	0.202	-0.028	.071	0.690	-0.154**	0.073	0.036	-0.0911	0.0792	0.250
Years of education	-0.010	.022	0.661	-0.036	.023	0.113	-0.013	0.022	0.552	0.0185	0.0210	0.459
Monthly income	-3.38e-07	1.01e-06	0.738	-1.30e-06	1.13e-06	0.250	-1.47e-07	1.04e-06	0.887	-1.90e-07	1.16e-06	0.869
Awareness	0.069	0.163	0.067	0.293*	0.177	0.097	0.100	0.164	0.541	-0.0600	0.1838	0.744
Married	-0.478*	0.250	0.056	-0.289	0.256	0.259	-0.268	0.250	0.285	-0.1963	0.2685	0.465
Headposition	0.532*	0.322	0.099	0.706**	0.340	0.038	0.690**	0.340	0.042	0.5710*	0.3488	0.096
DepRatio	1.001	0.611	0.101	0.982	0.670	0.143	1.508**	0.634	0.017	1.1369	0.7036	0.106
Perception	-0.217	0.215	0.312	-0.194	0.229	0.399	-0.156	0.215	0.468	-0.1444	0.2388	0.545
Breadshare	-2.606*	1.553	0.093	-2.757	1.852	0.137	-3.359**	1.650	0.04	-1.4027	1.8236	0.442
Constant	5.594***	1.194	0.000	7.119***	1.401	0.000	10.333***	1.884	0.000	3.2671	2.1377	0.126
Rho	0.947	0.030					0.907	0.044				
Likelihood-ratio test of rho=0: $chi^2 = 0.0000$			$chi^2(1) = 118.557$ Prob>				Likelihood-ratio test of rho=0: $chi^2 = 0.0000$		$chi^2(1) = 85.314$ Prob> chi^2			
Number of obs = 300							Number of obs = 300					
Log likelihood = -254.52971							Log likelihood = -256.084					
Wald chi^2 (24) = 77.37							Wald chi^2(24) = 61.61					
Prob > chi^2 = 0.0000							Prob> chi^2 = 0.0000					

Note: ***=significant at 1 percent, **=significant at 5 percent, *=significant at 10 percent,

Bid 1=₦160, Bid 2= ₦180 (10% & 20%).

Table 4 shows the direct effect of the explanatory variables on consumers' willingness to pay for cassava flour inclusion in bread. The rho which is the correlation coefficient is 0.902. It shows a strong relationship between the first response and the second response. The probability Chi-square shows that the equation is significant at 1percent. The result reveals that five out of the eleven variables are statistically significant in response 1 and these are the bid, sex, married, head position and dependency ratio. However, in the second response, only three variables are significant and they are bid, sex and head position. Feminine gender is positive and significant at five percent level of significance in the first and second bids. This implies that females are also more willing to pay for 30 percent cassava flour inclusion than males as well as they are for 20 and 10 percent cassava flour inclusion.

Awareness of cassava bread not significant at 30 and 20 percent unlike at 10 percent cassava flour inclusion. This implies that people who were aware of cassava bread are not willing to pay for both 30 and 20percent cassava flour inclusion unlike at 10 percent cassava flour inclusion. The married factor has a negative relationship on willing to pay and it is significant at five percent level of significance in the first bid. It implies that married respondents are less willing to pay for 30 percent cassava flour inclusion in the first bid. Being the head of the house is positive and significant at 5percent in the first and second bids. This implies that household heads are more willing to pay for 30, 20 and 10percent cassava flour inclusion than non household heads.

Table 4. Seemingly unrelated bivariate probit model estimates of factors driving WTP for 30% & 40% Inclusion of cassava flour in bread

Prediction	Coef.	Std.Err	P > |z|	Coef.	Std.Err	P > |z|	Coef.	Std.Err	P > |z|	Coef.	Std.Err	P > |z|
	30%						40%					
	Response 1			Response 2			Response 1			Response 2		
Bid 1	-0.139***	0.016	0.000	-0.042***	0.010	0.000	-0.122***	0.015	0.000	-0.045***	-0.093	0.000
Age	0.012	0.009	0.158	0.009	0.009	0.294	0.0001	0.009	0.989	-0.009	0.0172	0.428
Sex	0.971**	0.376	0.010	1.066**	0.407	0.009	0.849**	0.350	0.015	0.937*	1.536	0.047
Hhs	-0.093	0.073	0.205	-0.059	0.079	0.456	-0.120	0.076	0.118	-0.075	0.0302	0.421
years of edu	-.006	0.025	0.822	0.014	0.027	0.605	0.000	0.025	0.993	0.040	0.048	0.258
monthlyinc~e	-1.86e-07	1.21e-06	0.877	-6.05e-07	1.27e-06	0.635	-7.09e-07	1.16e-06	0.541	7.62e-07	1.56e-06	0.559
awarenes_c~d	0.260	0.185	0.158	0.075	0.201	0.709	0.264	0.182	0.146	0.380	0.621	0.114
Married	-0.721**	0.288	0.012	-0.202	0.294	0.491	-0.640**	0.278	0.021	0.109	-0.094	0.768
headposit	0.838**	0.384	0.029	1.028**	0.415	0.013	0.656*	0.360	0.068	0.745	1.361	0.123
depRatio	1.299*	0.719	0.071	1.251	0.785	0.111	1.533**	0.713	0.032	1.370	2.931	0.138
perception	-0.175	0.242	0.471	0.039	0.264	0.883	-0.281	0.243	0.248	-0.552*	0.195	0.079
breadshare	-2.566	1.755	0.144	-0.692	1.970	0.725	-3.499	0.114	0.258	-3.035	0.116	0.296
Constant	2.931***	2.590	0.000	4.212**	1.904	0.027	17.834***	2.393	0.000	5.456**	22.523	0.010
Rho	0.9021	0.0704					0.892	0.096				
Likelihood-ratio test of rho=0: $chi^2(1) = 50.7848$ Prob> $chi^2 = 0.0000$							Likelihood-ratio test of rho=0: chi2(1) = 35.915 Prob> $chi^2 = 0.000$					
Number of obs = 300							Number of obs = 300					
Log likelihood = -201.90137							Log likelihood = -186.174					
Wald $chi^2(24) = 99.83$							Wald $chi^2(24) = 91.99$					
Prob > $chi^2 = 0.0000$							Prob> $chi^2 = 0.0000$					

Note: ***=significant at 1 percent, **=significant at 5 percent, *=significant at 10 percent,

Bid 1=₦150, Bid 2= ₦160 (30%)

Bid 1=₦140, Bid 2= ₦150 (40%).

Table 4 also shows the direct effect of the explanatory variables on consumers' willingness to pay for 40% cassava flour inclusion in bread. The rho which is the correlation coefficient is 0.892. It shows a strong relationship between the first response and the second response. It also shows that as the level of cassava flour is increasing in bread, the rho value is reducing but it is still within the range of 0.7 to 1.0 which shows a strong relationship. The probability Chi-square shows that the equation is significant at 1percent. The result reveals that five out of the eleven variables are statistically significant in response 1 and these are bid, age, sex, married, dependency ratio and head position. However, in the second response, only three variables are significant and they are bid, sex and perception.

Feminine gender is positive and significant at five percent level of significance in the first bid and at 10 percent level of significance in the second bids. This implies that females are also more willing to pay for 40 percent cassava flour inclusion than males as well as they are for 30, 20 and 10 percent cassava flour inclusion.

Awareness of cassava bread not significant at 40, 30 and 20 percent unlike at 10percent cassava flour inclusion. This implies that people who were aware of cassava bread are not willing to pay for 40, 30 and 20percent cassava flour inclusion unlike at 10 percent cassava flour inclusion.

The married factor has a negative relationship on willingness to pay and it is significant at five percent level of significance in the first bid. It implies that married respondents are less WTP for 40 percent cassava flour

inclusion in the first bid as well as for 30 and 20percent cassava flour inclusion. However, at 10percent cassava flour inclusion, married people are more willing to pay for cassava flour inclusion than the unmarried.

Being the head of the house is positive and significant at 10percent in the first bid. This implies that household heads are more WTP for 40percent cassava flour inclusion as well as 30, 20 and 10percent cassava flour inclusion than non household heads.

Dependants also had a positive relationship at 5percent level of significance at 40percent level of cassava flour inclusion. This shows that dependants also have a positive impact on willingness to pay for cassava bread at 40percent cassava flour inclusions.

Respondent's perception is negative and significant as 10percent level of significance. This shows that their perceptions have a negative impact on willingness to pay for cassava bread at 40percent cassava flour inclusions.

The most significant model is the 10percent cassava flour inclusion. This is because it has the highest number of significant variables (ten) followed by 20percent cassava flour inclusion with nine significant variables and 30 and 40 percent cassava flour inclusion with eight significant variables each.

4.3 Estimating Consumers' Mean Willingness to Pay for Cassava Flour Inclusion in Bread

In estimating the consumers' mean willingness to pay, the bivariate probit model was used. The tables below reveal the consumers' willingness to pay and the mean willingness to pay for cassava-wheat bread in the study area. From literatures reviewed, estimates of implicit prices are made on 'ceteris paribus' basis, that is, they are estimates of the Willingness to Pay (WTP) of respondents and mean WTP for an increase in the attribute of concern, given that everything is held constant i.e. all other factors are constant (Bennett & Blamey, 2001).

According to Table 5, the average initial values of willingness-to-pay at 10percent cassava flour inclusion is ₦172.70 with the average highest value of willingness-to-pay being ₦177.61 while the average lowest value of willingness-to-pay is ₦166.37. Also, the average subsequent value (at second bid) of willingness-to-pay at 10percent cassava flour inclusion is ₦180.20, with the average highest value of willingness-to-pay being ₦185.34 and the average lowest value of willingness-to-pay being ₦171.78.

Table 5. Krinsky and Robb (95 %) confidence interval for WTP measures (Nb of reps: 2000 and Equation)

	10% inclusion					20% inclusion				
MEASURE Resp 1	WTP	LB	UB	ASL*	CI/MEAN	WTP	LB	UB	ASL*	CI/MEAN
MEAN/MEDIAN	172.70	166.37	177.61	0.0000	0.07	165.00	161.40	167.50	0.0000	0.04
MEASURE Resp 2	WTP	LB	UB	ASL*	CI/MEAN	WTP	LB	UB	ASL*	CI/MEAN
MEAN/MEDIAN	180.20	171.78	185.34	0.0000	0.08	150.41	130.17	170.65	0.0185	1.03

*: Achieved Significance Level for testing H0: WTP<=0 vs. H1: WTP>0

LB: Lower bound; UB: Upper bound.

Also, according to Table 5, the average initial values of willingness-to-pay at 20percent cassava flour inclusion is ₦165.00 with the average highest value of willingness-to-pay being ₦167.50 while the average lowest value of willingness-to-pay is ₦161.40. Also, the average subsequent value (at second bid) of willingness-to-pay at 20percent cassava flour inclusion is ₦150.41, respectively with the average highest value of willingness-to-pay being ₦170.65 respectively and the average lowest value of willingness-to-pay being ₦130.17.

Similarly, according to Table 6 the average initial values of willingness-to-pay at 30percent cassava flour inclusion is ₦154.07 with the average highest value of willingness-to-pay being ₦155.39 while the average lowest value of willingness-to-pay is ₦152.54. Also, the average subsequent value (at second bid) of willingness-to-pay at 30percent cassava flour inclusion is ₦143.35 respectively with the average highest value of willingness-to-pay being ₦153.05 and the average lowest value of willingness-to-pay being ₦117.90.

Table 6. Krinsky and Robb (95 %) Confidence Interval for WTP measures (Nb of reps: 2000 and Equation)

	30% inclusion					30% inclusion				
MEASURE Resp 1	WTP	LB	UB	ASL*	CI/MEAN	WTP	LB	UB	ASL*	CI/MEAN
MEAN/MEDIAN	154.07	152.54	155.39	0.0000	0.02	142.78	140.74	144.31	0.0000	0.03
MEASURE Resp 2	WTP	LB	UB	ASL*	CI/MEAN	WTP	LB	UB	ASL*	CI/MEAN
MEAN/MEDIAN	143.35	117.90	153.05	0.0005	0.25	127.36	88.38	139.40	0.0025	0.40

*: Achieved Significance Level for testing H0: WTP<=0 vs. H1: WTP>0.

LB: Lower bound; UB: Upper bound.

Finally, in Table 6, the average initial values of willingness-to-pay at 40percent cassava flour inclusion is ₦142.78 respectively with the average highest value of willingness-to-pay being ₦144.31 while the average lowest value of willingness-to-pay is ₦140.74. Also, the average subsequent value (at second bid) of willingness-to-pay at 40percent cassava flour inclusion is ₦127.36 respectively with the average highest value of willingness-to-pay being ₦139.40 and the average lowest value of willingness-to-pay being ₦88.38.

The respondents' average net monthly income is ₦79,086.17 and average household size is 5 members. A significant reduction in the average maximum willingness-to-pay value is noticed as the level of cassava flour inclusion increases from 10percent through 40percent which reduces by 18.7percent in the first bid i.e. from ₦177.61 to ₦144.31, and reduces by 24.8percent in the second bid i.e. from ₦185.34 to ₦139.40.

Therefore, the consumers are willing to pay more for a lower level of cassava flour inclusion in bread. i.e. ₦172.70 for 10% level of cassava flour inclusion, ₦165.00 for 20% level of cassava flour inclusion , ₦154.07 for 30% level of cassava flour inclusion and ₦142.78 for 40% level of cassava flour inclusion for the size of conventional bread whose mean price is ₦200.

5. Conclusion and Recommendation

According to the results of the survey, respondents' decisions on willingness to pay for cassava flour inclusion in bread were significantly affected by sex, marital status, household size, head position, dependency ratio and bread share, depending on the level of cassava flour inclusion in the bread. Finally, the adjusted, average individual value of willingness-to-pay was used to calculate the aggregate willingness-to-pay. A significant reduction in the average maximum willingness-to-pay value is noticed as the level of cassava flour inclusion increases. Therefore, based on the findings of this survey, it is recommended that family planning policy should be promoted among households in the study area since findings shows that higher family size reduces willingness to pay for cassava inclusion in bread.

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