INFLUENCE OF HOUSEHOLD CONSUMPTION DECISION ON AGRICULTURAL PRODUCTION: EVIDENCE FROM LITERATURE

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ABSTRACT

Consumer decision is known to affect agricultural production in the sense that demand for (agricultural/agro-allied) products stimulate agricultural production. This paper use part of a larger study in assessing the factors determining consumer demand decisions on small and medium scale firms' cocoa beverages (SMECB) and the effect of improved SMECB characteristics on its demand level. Structured questionnaire was used in the study (in a multi-stage sampling technique) to collect data from 2,000 households in selected cities from ten States of Nigeria. Information sourced were on households' socio-economic parameters, prices and quantities of household commodities, as well as SMECB attributes. The analytical techniques used were descriptive statistics and multivariate Probit model. On the average, male-headed households demanded 231.3g and female-headed households demanded 201.4g of SMECB monthly. Factors that significantly influenced the probability of respondents' consumption decision on SMECB were region ($p<0.05$); SMECB attributes, educational status and age ($p<0.01$); price of tea beverage and year of residency ($p<0.1$). Increased SMECB consumption in Nigeria could be enhanced through product development, thereby increasing domestic consumption of cocoa and investment in the Nigerian cocoa sub-sector.*

Keywords: cocoa, beverages, demand, farmers, SMEs.

INTRODUCTION

The importance of cocoa as a prominent commodity crop and its economic significance in Nigerian economy, before and after independence as well as the discovery of crude oil cannot be over-emphasised. Since the introduction of cocoa into Nigeria in 1874, production and marketing activities in the cocoa industry have continued unabated. This is because it has since been an important foreign exchange earner (second largest after crude oil) for the country (Table 1). The crop accounts for not less than 24% of agricultural export earnings and 0.6% of total export earnings between 1960 and 2004 as well as recent times (CBN, 2013; NBS, 2013; CAN, 2014); thereby contributing tremendously to infrastructure development in Nigeria. However, (production and

marketing) activities in the cocoa sub-sector have been fluctuating over the years. Estimates revealed that Nigerian cocoa estate which was nearly 400,000ha (Adesimi and Ladipo, 1977) between 1930 and 1945 has not exceeded 600,000ha – 700,000 ha in recent times (FAO, 2014).

Furthermore, Nigerian cocoa output that was reportedly the second largest in the world in the early 1970s (Gill and Duffus, 1981; FAO, 2005) declined since the early 1980s (Table 2). Investigations have attributed the travails of the Nigerian cocoa industry to the price paid to farmers (Ojo, 2003; Oluyole *et al*, 2011), old age of farmers and cocoa trees (Adesimi and Ladipo, 1977; Debenham, 1999; Oluyole *et al*, 2011), land degradation, land tenure system, and competition with food crops (Adegboye, 1974; Fabiyi, 1977; Oduwole, 2000; and Ojo, 2003; CAN, 2014), and inadequacy/adulteration of inputs (Oduwole, 2000; Sanusi and Obatolu, 2005; CAN, 2014).

Steps taken to solve the problem include the introduction of trade liberalisation (in 1986) consequent upon structural adjustment policy (SAP), rehabilitation of abandoned plots and establishment of new plantings (Sanusi and Oluyole, 2005; Oluyole *et al*, 2011). These efforts have not really improved the lot of the Nigerian cocoa. Hence, other avenues of reversing this unfortunate trend and achieving sustainability of production include utilisation through encouraging bean processing (to add value) in (origin countries including) Nigeria, finding new market for cocoa and promoting its consumption (CPA, 1999; CAN, 2014). However, there is low level of cocoa processing in Nigeria (Table 2) and only a very small proportion of cocoa (mainly in form of instant beverages) is consumed in Nigeria (Sanni, 2003; FAO, 2004; FAS, 2005; CAN, 2014; Kehinde, 2015).

The major (cocoa) beverage producers in Nigeria are the multinational companies who employ sophisticated technology, making the product quite expensive and less affordable by an average Nigerian household. In contrast, small and medium scale firms' cocoa beverages (SMECB) have low unit cost when compared to other beverage types (Sanusi, 2003). The foregoing and the fact that beverages (particularly cocoa, coffee and tea beverages) are one of the least affordable non-staple foods by Nigerians (Maziya-Dixon et al, 2004) make this study imperative. Therefore, the objective of this study is to investigate the key determinants of SMECB consumption.

Table 1: Value of export of Nigeria cocoa beans (₦ Million)

Period	*A*	*B*	*C*	*(C/A)100*	*(C/B)100*
1960 – 1964	1,831.72	293.88	70.70	3.86	24.06
1965 – 1969	2,646.74	270.58	118.86	4.49	43.93
1970 – 1974	11,663.32	248.26	157.42	1.35	63.41
1975 – 1979	35,682.46	375.42	336.74	0.94	89.69
1980 – 1984	41,736.33	287.44	261.10	0.63	90.84
1985 – 1989	47,707.80	2,669.84	1,794.58	2.07	67.22
1990 – 1994	341,554.77	6,069.52	4,219.18	1.24	69.51
1995 – 1999	468,974.73	6,539.17	3,820.95	0.81	58.43
2000 – 2004	597,390.58	17,950.98	7,520.45	1.26	41.89

NB:- A = Total Export Earnings (N), B = Major Agric. Export Earnings (N), C = Cocoa Beans Export Earnings (N)

Source: CBN (1997, 1998, 2001, and 2004); FOS (1990, 1993, 1997 and 2005)

RESEARCH METHODOLOGY

The study was conducted in selected cities in Nigeria. Nigeria has a landmass of 928,361 square Km (800 km of coastline inclusive) with a population of about 177,475,986 people made up of several ethnic groups (FOS, 1991; 1993; 1995; 1997; 1999; IBRD, 2001; CBN, 2004; Knoema, 2014). The country lies between longitudes 3^0 and 14^I and latitudes 4^0 and 14^I.

Multi-stage sampling technique was adopted in collecting data from selected cities in ten States namely Abia, Edo, Delta, Kaduna, Kwara, Lagos, Niger, Ondo, Osun, and Oyo. In the first stage, four out of the six geo-political zones in Nigeria were randomly selected (South-east, South-south, North-central and South-west). In stage two, the capital cities of the selected States were purposively sampled. In the third stage, two urban Local Government Areas (LGA) were randomly sampled per selected city. In the fourth stage, one hundred households from the list of registered Community Development Associations (CDAs) were randomly sampled per selected LGA, making a total of 2000 households, through questionnaire administration.

However, 1413 questionnaires were analysed while others were rejected due to serious inconsistencies in responses or missing information. Information collected include household income, household demographic and socio-economic characteristics; household expenditure on SMECB and other food items; as well as SMECB attributes.

Descriptive statistics and Probit model were used in analysing the data generated. The Probit model was estimated in three different forms Decomposed Quality Score Model (DQM), Total Quality Score Model (TQM) and Overall Quality Score Model (OQM). The actual model used for

discussing the regression result was selected using the technique[1] suggested by Falusi (1975); Rahji (1999); and Selvanathan (1991) which was adapted by Oduwole (2004).

The Probit model can be expressed as:

$C_d = \vartheta V_i + \varepsilon_i$ ……. (1)

where:

ϑ = *vector of unknown coefficients;*

C_d = *variable that indexes the demand for SMECB (existing in the form AC* i.e. $C_d = C^*$ if $A = 1$ and $C_d = 0$ if $A = 0$);*

V_i = *vector of explanatory variables;*

ε_i = *stochastic error term.*

The explanatory variables (V_i) included in the Probit model are:-

RGN = region of respondent (D = 1 if South, D = 0 if North-central);

TMI = total monthly (household) income (₦);

FDER = food expenditure ratio (i. e. the ratio of food to non-food expenditure);

PSCB = price of SMECB (₦);

PLCB = price (₦) of tinned beverage (TCCB) and sachet cocoa beverage (SCCB)[2].

PCFB = price (₦) of tinned coffee beverage (TCFB) and sachet coffee beverage (SCFB)[2].

PTB = average price (₦) of tea beverage (TBV)[2];

PEXP = increased SMECB demand with own-price reduction (D = 1 if yes, otherwise D = 0);

INEXP = increased SMECB demand with increased income (D = 1 if yes, otherwise D = 0);

HHZ = Household size;

AGE = age of household head (in years);

MST = marital status of household head (D = 1 if married, otherwise D = 0);

GDR = gender of respondent household head (D = 1 if male; D = 0 if female);

YSS = years spent schooling by household head (as a proxy for educational status);

FDC = food-stuff decision maker (D = 1 if household head, otherwise D = 0);

QSR = index of SMECB quality rating for nine SMECB characteristic[2];

OSR = index of SMECB quality rating[2];

MHSR = index of SMECB quality rating for SMECB hedonic characteristics[2];

APSR = index of SMECB quality rating for SMECB appearance characteristics[2];

MKSR = index of SMECB quality rating for SMECB market characteristics[2];

CSR = index of SMECB/TCCB and SMECB/SCCB preference rating[2];

CD = cognitive dissonance (D = 1 if present, otherwise D = 0)[2].

Based on the test statistics (ϵ) enumerated in equation (a6i)[3], the decision for model selection was taken as follows:

DQM – OQM $\rightarrow \epsilon = 24.4569$

$X^2_{2,\ 0.05,\ 2\text{-tail}} = 7.378$

$\Rightarrow \varepsilon > X^2_{2,\ 0.05,\ 2\text{-tail}}$

Hence, the null hypothesis could not be accepted, i.e. the excluded variables in OQM were significant.

Also, DQM – TQM $\rightarrow \epsilon = 239.8680$

$X^2_{2,\ 0.05,\ 2\text{-tail}} = 7.378$

$\Rightarrow \varepsilon > X^2_{2,\ 0.05,\ 2\text{-tail}}$

[1] See appendix.

Hence, the null hypothesis could not be accepted, i.e. the excluded variables in TQM were significant.

Consequently, the DQM model was adopted as the most appropriate model for analysis.

The elasticity of the probability of SMECB consumption with respect to the explanatory variables was computed using the formula stated below:-

$E_i = (1 - P)\vartheta_i V_i$ ---------- (2)[4]

where:

E_i = elasticity of probability;

P = z-value;

ϑ_i and V_i as previously defined.

RESULTS AND DISCUSSIONS

Respondents who demanded for SMECB (734 i.e. 51.95%) were almost proportional to those who did not (679 i.e. 48.05%). Hence, SMECB can be said to have relevance in the budget of half of Nigerian households.

Items that are non-food accounted for a greater percentage of respondents' expenditure (expenditure on school kids – 33.6% and expenditure on non-food e.g. clothing – 19.6%) while cocoa value added products (CVP) accounted for lower proportions in household total budget as well as food budget. However, instant beverages were found to be the most popular form of cocoa consumption in Nigeria. Large-scale firms cocoa beverage accounted for 0.7% of total household expenditure and 1.5% of household food expenditure while SMECB accounted for 0.6% of household total budget and 1.3% of household food budget; the highest values for any single CVP (Table 3).

Table 4 showed that respondents with no (formal) education had the lowest SMECB demand (of 3.83%). Hence, SMECB quantity demanded increased with increase in the educational level of household head.

Table 2: Growth rate of Nigerian cocoa beans production and export (MT)

Period	*Production (A)*	*% Growth*	*Export (B)*	*% Growth*	*Grinding (C)*	*% Growth*	*(B/A)%*	*(C/A)%*
1900 – 1909	*NA*	-	0.50	-	-	-	*NA*	-
1910 – 1919	NA	-	6.84	1268.00	-	-	NA	-
1920 – 1929	NA	-	32.62	376.90	-	-	NA	-
1930 – 1939	80.40	-	74.78	129.25	-	-	93.01	-
1940 – 1949	90.40	12.44	91.95	23.00	-	-	101.71	-
1950 – 1959	112.10	24.00	108.80	18.33	-	-	97.06	-
1960 – 1969	205.78	83.57	202.94	86.53	-	-	98.62	-
1970 – 1979	221.30	7.54	200.73	-1.09	21.65	5.89	90.70	9.78
1980 – 1989	117.25	-47.02	114.51	-42.95	19.30	-1.62	97.66	16.46
1990 – 1999	148.20	26.39	136.64	19.33	11.60	-5.59	92.19	7.83
2000 - 2004	175.00	18.08	140.00	2.46	13.96	8.22	80.00	7.98

Source: CBN (1997, 1998, 2001, and 2004); FAO (1985, 1990, 1993, and 1997); FOS (1980 - 999); Government Gazettes (Various Issues); NCB (1975, 1979, and 1983) Gill and Duffus (1990 – 1999); EDFMAN (1995 – 2004).

Table 3: Share of expenditure items in total household expenditure

Item	**Expenditure**	**% in TE**	**% in FE**
Bread	388.71 (12.75)	7.34	15.69
Cereals/Pulses	258.16 (4.77)	4.87	10.42
Edible Oil	137.07 (2.79)	2.59	5.53
Milk	302.59 (7.11)	2.72	12.21
Tubers	257.84 (4.35)	4.87	10.41
Meat/Fish	513.73 (10.70)	9.70	20.73
Eggs	114.78 (3.90)	2.17	4.63
Fruit/Vegetable	263.97 (8.45)	4.99	10.65
Other Food	92.47 (4.81)	1.75	3.73
School Kids	1779.82 (59.92)	33.62	-
Other Non-food	1037.05 (35.27)	19.59	-
Cocoa Beverage (LCB)	37.60 (2.98)	0.71	1.52
Coffee Beverage	13.65 (0.04)	0.26	0.5510
Tea Beverage	12.02 (0.05)	0.23	0.4850
Chocolate	10.67 (0.53)	0.20	0.4304
Chocolate Bread Spread	9.74 (0.45)	0.18	0.3932
Cocoa Bread	13.93 (0.29)	0.26	0.5623
Cocoa Butter Cosmetics	17.57 (1.13)	0.33	0.7093
SCB	541.72 (0.06)	0.63	1.3405
Total Food Expenditure (TFE)	***2477.72***	-	-
Total Expenditure	***5294.60***	-	-

Note:- LCB – Large Scale Firms' Cocoa Beverage, SCB – Small/Medium Scale Firms' Cocoa Beverage.

Figures in parenthesis are standard deviations.

Source: Field Survey, 2003.

Table 4: SMECB demand by respondents' socio-economic characteristics

Socio-economic Characteristics	Frequency	Percentage	*Qty (g)	Qty (g)	Percentage
Educational Status					
None	23	3.13	661.74 (17.02)	15,220	30.82
Primary	56	7.63	474.29 (2.14)	26,560	22.09
Secondary	138	18. 80	440.33 (0.83)	60,765	20.51
Tertiary	517	70.44	570.74 (21.58)	295,075	26.58
Total	***734***	***100.00***	***541.72***	***397,620***	***100.00***
Marital Status					
Married	367	50. 00	662.08 (17.38)	242,985	61.11
Single	365	49. 73	423.41 (14.05)	154,545	38.87
Widowed	2	0.27	45.00 (5.66)	90	0.02
Total	***734***	***100.00***	***541.72***	***397,620***	***100.00***
Age Group (Years)					
<40	551	75.07	528.57 (13.84)	291,244.13	73.25
41 – 55	140	19.07	451.00 (10.93)	63,139.38	15.88
56 – 70	28	3.81	819.57 (25.16)	22,947.87	5.77
>70	15	2.04	1352.57 (21.30)	20,288.62	5.10
Total	***734***	***100.00***	***541.72***	***397,620***	***100.00***
Gender					
Male	402	54.77	577.52 (10.57)	232,165	58.39
Female	332	45.23	498.36 (8.49)	165,455	41.61
Total	***734***	***100.00***	***541.72***	***397,620***	***100.00***
Household Size Distribution					
<5	430	58.58	527.75 (7.20)	226,933	57.07
6 – 10	259	35.29	468.40 (3.89)	121,315	30.51
11 – 15	30	4.09	1,196.74 (28.71)	35,902.34	9.03
16 – 20	11	1.50	783.88 (8.14)	8,622.66	2.17
>21	4	0.54	1,211.75 (6.06)	4,847	1.22
Total	***734***	***100.00***	***541.72***	***397,620***	***100.00***
Food Decision Maker					
Spouse	252	34.33	597.32 (3.27)	150,525	37.86
Self	441	60.08	518.90 (5.64)	228,835	57.55
Other Household Adults	22	3.00	282.73 (13.26)	6,220	1.56
Adult Children	4	0.54	227.50 (2.71)	910	0.23
Multiple Decision Makers	15	2.04	742.00 (2.20)	11,130	2.80
Total	***734***	***100.00***	***541.72***	***397,620***	***100.00***

NB:- *Qty→Mean Quantity, Qty →Actual Quantity; Figures in parenthesis are standard deviations.

Source: Field Survey, 2003.

Respondents who were married had a higher proportion of SMECB demand (72.20%) than those who were single or widowed (Table 4). Also, from Table 4, households with head aged above 70, 56 – 70, 41 – 55 and (not more than) 40 years had increasing proportion of SMECB demand in ascending order (5.10%, 5.77%, 15.88% and 73.25% respectively). This implies that households having young household heads demanded more SMECB. Furthermore, male-headed households had a slightly higher proportion (58.39%) of SMECB demand than female-headed households (41.61%). Table 4 showed that households having not more than five people had the highest proportion of SMECB demand

(about 57%). Hence, large size is a disincentive to household SMECB demand. Equally households with household head as the food decision maker had the highest proportion of SMECB demand (57.55%).

The DQM model (Table 5) revealed that the age and educational status of respondent were (negative) significant factors ($p < 0.01$) of the probability of demand for SMECB. SMECB – age and SMECB – education status elasticities were -0.009 and -0.004 meaning that the higher the age increases and education status, the lower the probability of respondent demanding for SMECB.

From Table 5; the price of TBV, region of respondent, the variable of comparison of SMECB to TCCB and SCCB, household head as food decision maker, hedonic score index and market score index were (positive) significant determinants of the probability of a respondent household demand for SMECB ($p < 0.1$, $p < 0.05$, $p < 0.01$, $p < 0.01$, $p < 0.01$, and $p < 0.01$ respectively).

SMECB – TBV, SMECB – SCCB/TCCB comparison, SMECB – food decision maker, SMECB – hedonic characteristics and SMECB – market characteristics elasticities were 0.01, 0.66, 0.003, 0.97 and 1.34. This means that there would be less than proportionate increase in the probability of a respondent demanding for SMECB with increases in TBV price, higher perceived comparison of SMECB to TCCB and SMECB to SCCB as well as household head manly determining food purchases. Furthermore, the probability of a respondent demanding for SMECB would be almost proportionate at high respondent's hedonic characteristic perception level while as market characteristics improve, the probability of a respondent demanding for SMECB would be more than proportionate.

The probability of a respondent being a consumer (of SMECB) was predicted as 0.2% and the accuracy of the prediction was tested and found to be 92% for the overall sample estimates. SMECB characteristics were simulated to improve by 0.3, 0.4 and 0.5 units (Table 6). Improving SMECB characteristics (i.e. hedonic parameters, market parameters, and comparative ratings) simultaneously by 0.3, 0.4 and 0.5 units (Table 6) increased the number of consumers.

The increment (in the number of consumers) translates to an increase in cocoa beans needed for SMECB production by 17.94, 37.59, and 54.03 tonnes per month (215.28, 451.04, and 648.31 tonnes per annum) respectively (Table 7, Table 8, and Table 9). When only one of the parameters was improved by 0.3, 0.4 and 0.5 units, there was a reduction in the number of consumers and consequently, a reduction of cocoa beans needed for SMECB production (Table 7, Table 8, and Table 9). Also, when the parameters were improved pair wise by 0.3, 0.4 and 0.5 units, there was a reduction in the number of consumers which implies a reduction of cocoa beans needed for SMECB production (Table 7, Table 8, and Table 9).

Table 5: Determinants of household demand for SMECB

Variable	Coefficient	Standard Error
Constant	2.78	810.45
RGN	-0.024**	0.010
TMI	0.0000033	0.000003
FDER	0.00006	0.00042
PSCB	5.276	33.101
PLCB	0.04	0.045
PCFB	-0.02	0.014
PTB	0.137*	0.081
PEXP	-8.47	13233.5
INEXP	-8.51	14965.6
HHZ	-0.0009	0.0013
AGE	-0.022***	0.006
MST	0.054	0.155
GDR	0.172	0.125
YSS	-0.046***	0.015
FDC	0.0032**	0.0030
MHSR	1.923***	0.0002
APSR	0.147	0.301
MKSR	2.671***	<0.0001
CSR	1.756**	0.012
CD	0.20	0.15
Loglikelihood	-265.6015	-

***Significant at 1% **Significant at 5% *Significant at 10%.

Table 6: Simulated changes in the number of SMECB consumers

Parameter	Estimate	Mean Values	Simulated Unit Changes		
			0.3	0.4	0.5
MHSR	1.9267	0.5047	0.66	0.71	0.76
MKSR	2.6913	0.4997	0.65	0.69	0.75
CSR	1.7768	0.3701	0.48	0.52	0.56

Source: Field Survey, 2003.

Table 7: Change in SMECB and cocoa beans (0.3 at Unit Change in Quality Perception)

Stimulated Variables	Change in Number of Consumers	Change in Quantity of SMECB Consumed (kg)	Required Cocoa Beans (tonnes)
MHSR	-719	-389,432	-92.72
MKSR	-685	-371,291	-88.40
CSR	-729	-395,020	-94.05
MHSR & MKSR	-323	-174,723	-41.60
MHSR & CSR	-630	-341,362	-81.28
MKSR & CSR	-496	-268,644	-63.96
MHSR, MKSR, & CSR	139	75,349	17.94

Table 8: Change in SMECB and cocoa beans (at 0.4 Unit Change in Quality Perception)

Stimulated Variables	Change in Number of Consumers	Change in Quantity of SMECB Consumed (kg)	Required Cocoa Beans (tonnes)
MHSR	-714	-386,983	-93.14
MKSR	-668	-362,029	-86.20
CSR	-728	-394,561	-93.94
MHSR & MKSR	-205	-110,961	-26.42
MHSR & CSR	-592	-320,848	-76.39
MKSR & CSR	-418	-226,468	-53 92
MHSR, MKSR, & CSR	291	157,865	37.59

Table 9: Change in SMECB and cocoa beans (at 0.5 Unit Change in Quality Perception)

Stimulated Variables	Change in Number of Consumers	Change in Quantity of SMECB Consumed (kg)	Required Cocoa Beans (tonnes)
MHSR	-709	-384,304	-91.50
MKSR	-648	-351,236	-83.63
CSR	-727	-393,872	-93.78
MHSR & MKSR	-78	-42,377	-155.23
MHSR & CSR	-548	-297,042	-10.09
MKSR & CSR	-327	-177,402	-70.74
MHSR, MKSR, & CSR	419	226,909	54.03

CONCLUSION

This study has shown that factors like tastes, preferences, and (particularly) product attributes are germane to consumer behaviour and demand analysis. Therefore, these should be incorporated when predicting changes in SMECB demand arising from changes in the factors influencing demand for SMECB. From the result of the study, it is clear that an improvement in the quality parameters (alongside other parameters) of the beverages will contribute in no small measure to increased domestic cocoa consumption in Nigeria. This will ultimately imply an increase in resources (both foreign and domestic) investment in the Nigerian cocoa sub-sector. This becomes justifiable given the fact that Nigeria's trade, particularly the foreign trade subsector has been dominated by primary commodities (Adedokun, 2012), since Export help in increasing the level of aggregate economic activities through its multipliers effects on the level of national income being a catalyst necessary for the overall development of an economy (Abou-Stait, 2005; Abogan *et al*., 2014).

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APPENDIX

A. Definitions

1. *Beverage*: a name given to various drinks (William et al, 1974). Wellman (1961) divided beverages into: "thirst quenchers" e.g. soft drinks such as lemonade and small cidar; stimulants e.g. coffee and tea beverages and nutritious/energy beverages e.g. cocoa beverage.

2. *Small and Medium Scale Enterprises (SMEs)*: there is no single, uniformly acceptable, definition of a small firm (Storey, 1994). However, Kayanula and Quartey (2000) opined that researchers would have to use definitions more appropriate to their study for small firms. Hence, UNIDO's definition for SMEs for developing countries (Elaian, 1996) was adopted in this study. Therefore, with reference to (year 2002) prey-survey data, the number of employees in the (cocoa) beverage-manufacturing SMEs was used to categorise them as small/medium scale firms.

3. *Tinned Cocoa Beverage (TCCB) and Sachet Cocoa Beverage (SCCB) or Large Scale Firms' Cocoa Beverage (LECB)*: cocoa-based beverages produced by beverage manufacturing (multinational) firms. Common brands include Milo, Bournvita, Ovaltine, and Pronto. TCCB types of beverages are usually packaged in tin cans in varying quantities e.g. 225g, 400g, 450g, 900g, and 1000g while SCCB are usually packaged in sachets and paper boxes in varying quantities e.g. 10g, 30g, and 100g.

4. *Small and Medium Scale Firms' Cocoa Beverage (SMECB)*: cocoa-based beverages produced by beverage manufacturing SMEs. Common brands include Olavita, Sakavita, Nicevita, and Sucovita. These beverages are usually packaged in transparent sachets in varying quantities e.g. 10g, 20g, and 30g.

5. *Tinned Coffee Beverage (TCFB) and Sachet Coffee Beverage (SCFB)*: coffee-based beverages produced by beverage manufacturing (multinational) firms. The commonest brand is Nescafe. TCFB types of beverages are usually packaged in tin cans in varying quantities e.g. 25g, 50g, and 100g while SCFB are usually packaged in sachets in varying quantities e.g. 20g, 5g, and 10g.

6. *Tea Beverage (TBV)*: tea-based beverages produced by beverage manufacturing (usually, multinational) firms. Common brands include Lipton, Homecup tea, Highland tea, Just tea and Top tea. These types of beverages are usually packaged in paper boxes in standard quantity of 50g.

7. *Cognitive dissonance*: the theory of cognitive dissonance pertains to the process of dealing with disequilibria between two pieces of knowledge (Burk, 1978). The amount of dissonance varies with changes in the positive and negative attributes of both the selected and rejected alternatives and with the degrees of commitment and volition involved with the

choice. It has been shown that this theory has considerable importance for formation and stabilisation of tastes and preferences as well as for opinions and attitudes.

8. *Origin countries*: refers to countries where cocoa is being cultivated.

9. *Value adding*: a process by which a commodity undergoes various treatments to turn it into a more refined, acceptable, attractive and utilisable product for the final consumer.

B. Derivations

a. Computation of Quality Scores

1. Ten quality parameters (characteristics) were identified for ratings by consumers and these are:- i. tastes, ii. sweetness, iii. flavour, iv. colour, v. solubility, vi. texture, vii. availability,

viii. packaging, ix. Price, and x. overall quality

2. Parameters i. to iii. were categorized as ***Hedonic Characteristics***; iv. to vi. were categorized as ***Appearance Characteristics***; and vii. to ix. were categorized as ***Market Characteristics***.

3. Each parameter was given weighted rating options on a three (3)-point scale as follows:

Poor - 1, Fair - 2, and Good - 3.

4. Scores were then computed for the quality categories with the formula below:

$$\mathfrak{R} = \sum_{i=1}^{n} \frac{R_i}{T} \quad \text{..... (a4)}$$

where:

$\mathfrak{R}$ *= quality score (index);*

R_i *= weight of rating;*

T *= total rating weight obtainable from characteristic classification;*

5. Therefore, the quality score categories were computed as enumerated below:-

i. Total quality score = $\sum_{i=1}^{9} \frac{R_i}{T}$ - it is from this index the TQM model was derived.

ii. Overall quality score = $\sum_{i=1}^{1} \frac{R_i}{T}$ - it is from this index the OQM model was derived.

iii. Grouped quality score = $\sum_{i=1}^{3} \frac{R_i}{T}$:

- when grouped qualities are hedonic parameters:- index is hedonic score index.
- when grouped qualities are appearance parameters:- index is appearance score index.
- when grouped qualities are market parameters:- index is market score index.

It is from these indices the DQM model was derived.

6. Three models were obtained with equation 1 (i.e. restricted and unrestricted models). The three models were termed:-

i. DQM: Decomposed Quality Score Model → the model containing the three-quality sub-grouping i.e. Hedonic Score index, Appearance Score index, and Market Score index.

ii. TQM: Total Quality Score Model → the model that combined all the (9) characteristics ratings in the three sub-groups of DQM.

iii. OQM: Overall Quality Score Model: → the model having the rating for overall SMECB quality (only).

In deciding on the most efficient model out of the three models estimated, a (loglikelihood ratio) test statistics (ϵ) was used.

$\Rightarrow \epsilon = -2(L_U - L_H)$ ……... (a6i)

where:

ϵ = computed (efficiency) statistics;

L_U = lower log likelihood estimate;

L_H = upper log likelihood estimate.

ϵ is tested at df = $g_1 - g_2$ …… (a6ii)

where:

df = degree of freedom;

g_1 = the number of variables in the first model;

g_2 = the number of variables in the second model.

The hypotheses tested are stated as:

Null hypothesis: excluded variables have zero coefficients.

$H_o: \lambda_i = \lambda_j = 0$ ……... (a6iii)

Alternative hypothesis: excluded variables have coefficients different from zero.

$H_a: \lambda_i \neq \lambda_j \neq 0$ ……... (a6iv)

Under the null hypothesis, ϵ has an asymptotic X^2 (df) distribution.

b. Derivation of the Elasticity Equation for Probit Model

$P = [1 + e^{-(\sum_{i=1}^{n} b_i x_i + b_0)}]^{-1}$ …… (b1)

$\Rightarrow P + Pe^{-(\sum_{i=1}^{n} b_i x_i + b_0)} = 1$ ……..… (b2)

$\Rightarrow 1 - P = Pe^{-(\sum_{i=1}^{n} b_i x_i + b_0)}$ …….. (b3)

$\Rightarrow \frac{1-P}{P} = e^{-(\sum_{i=1}^{n} b_i x_i + b_0)}$ …..... (b4)

$\Rightarrow \ln(1 - P) - \ln P = -(\sum_{i=1}^{n} b_i X_i + b_o)$ ... (b5)

$\Rightarrow \frac{d}{dx_i}[\ln(1 - P) - \ln P] = -\frac{d}{dx}(\sum_{i=1}^{n} b_i X_i + b_o)$ …….. (b6)

$\Rightarrow -[\frac{d}{dx}(1 - P)^{-1} - \frac{d}{dx}(P)^{-1}] = -\frac{d}{dx}(\sum_{i=1}^{n} b_i X_i + b_o)$ ……..... (b7)

$\Rightarrow \frac{d}{dx}[(1 - P)^{-1} + (P)^{-1}] = \frac{d}{dx}(\sum_{i=1}^{n} b_i X_i + b_o)$ ……..... (b8)

$\Rightarrow \frac{d}{dx_i}[(P + 1 - P)\{1 - P(P)\}^{-1}] = \frac{d}{dx}(\sum_{i=1}^{n} b_i X_i + b_o)$ …..... (b9)

$\Rightarrow \frac{d}{dx_i}[(P(1 - P)^{-1}] = b_i$ (i = 1, 2, ----- n)..... (b10)

$\Rightarrow \frac{d}{dx_i} = b_i P(1 - P)$……..... (b11)

$\Rightarrow E_i = \frac{d}{dx_i} \bullet \frac{X_i}{P} = b_i(1 - P)X_i$ = elasticity……..... (b12)

∴Elasticity (E_i) = $(1 - P)b_i X_i$ for i = 1, 2, ...n

c. Calculation of Probability

1. The predicted probability was calculated using the coefficient derived from equation (1).

2. An index (τ) was first calculated given as:

$$\tau = \vartheta_0 + \vartheta_1 V_1 + \vartheta_2 V_2 + \ldots\ldots + \vartheta_n V_n \ldots\ldots\ldots \text{(c2i)}$$

The corresponding value (ω), to τ, from the area under the normal probability curve taken

from the "Z" table was used in computing the chances of a respondent being a consumer.

This is given by –

$$C_p = N(\omega) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(c2ii)}$$

where:

C_p *= predicted consumer;*

N = sample size;

ω = as defined before.

3. Furthermore, the accuracy of the predicted probability was tested as follows:

$$\alpha = \frac{\tau}{\iota} \ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(c3iii)}$$

where:

α = accuracy index;

τ = as previously defined;

ι = loglikelihood estimate of equation (1).

The area under "Z" (δ) corresponding to α was extracted.

4. Average value (υ) of hedonic, market characteristics score and comparative rating score, taken as consumption decision threshold, was used in computing prediction accuracy level:

$$\kappa = \frac{\upsilon}{\partial} \ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(c4iv)}$$

where:

κ = accuracy level;

υ and δ= as defined previously.

5. The change in number of consumers was computed as follows:

$$C_c = C_p - C_s \ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(c5v)}$$

where:

C_c *= change in the number of consumers;*

C_s *= predicted consumers simulated from changes in quality parameters;*

C_p *= as defined before.*

6. The change in SMECB was computed as:

$$S = C_c(Q) \ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(c6vi)}$$

where: S = change in SMECB quantity;

C_c *= as defined previously;*

Q = average quantity of SMECB demanded by SMECB consumers (g).

7. The change in cocoa beans (O) required was computed as follows:

$$O = \frac{W}{0.42} \ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(c7vii)}$$

where: O = cocoa beans;

W = S (0.1) = cocoa powder

S is as previously defined.