Evaluation of Supply Chain Management Effects on Consumer Preference for Cowpea Quality Features and Price Trend in Niger State

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***Abstract*- The concerns of dwindling food supply and over dependence on imported foods in Nigeria, especially in the face of dwindling foreign exchange, has prompted attention of experts on how to improve production and marketing of home-grown local food crops. The study assessed the quality characteristics and price preferences of consumers of Cowpea in the Niger State, Nigeria. The study adopted the survey design using quantitative research strategy. Primary data was collected from 600 famers over a 30-month period through the instrumentality of questionnaire. Hedonic price model was used to estimate the relationship between price and cowpea characteristics, and the Ordinary Least Square (OLS) analytical technique to investigate the impact of intrinsic characteristics on price in five varieties of cowpea. The regression analysis revealed that the respective value of R^2 for Chanchaga markets is 0.72 and Bida markets is 0.77 which means that 72% and 77% of changes in the price of cowpea is explained by the changes in quality characteristics of cowpea in each market. The results indicated that consumer valued high protein content, sucrose content and dry matter content as the most important attributes as such they attracted higher prices. The study recommends among others that increase in protein content would make cowpea more attractive for the food industry and will have a positive impact on consumers' nutritional health.**

***Keywords*-** *Cowpea, supply chain management, Hedonic model, Intrinsic attributes, Consumer's preferences.*

1. Background to the Study

The bane of Nigeria and indeed most African countries is over reliance in extractive industry for its revenue. These revenues are in turn used to massively import foods that otherwise should have been produced locally. The implication is that local productions of most cash and food crops have remained largely subsistence and most farmers barely struggling to make ends meet. Recent economic developments in Nigeria is however, generating a rethink of this profligate import oriented strategy. First is the sharp drop in oil prices in the last two years which invariably led to decline in oil revenue. The implication was less availability of, and high cost of foreign exchange for continued imports of food for local consumption. Second, over dependence on oil income has inflicted a situation of jobless growth on the fragile state of the Nigerian economy. This exacerbated the already bad unemployment situation in the country. Third is the alarm the United Nations in its recent report that Nigeria will be one of the five nations that is faced with starvation in 2025. The above scenario has led to a renewed attention and resort to agriculture and agro-allied activities as a remedial to this gloomy economic situation. One of the crops that are critical to the food and income status of the rural farmer is Cowpea (Vignaunguiculata*).* Cowpea *(*also known as L. Walp) commonly referred to as black eyed peas in the US [1], is an important indigenous legume of the tropics and sub tropics and it is a vital source of nutrition in West African sub-region . Cowpea is one of the food items that fill the hunger gap in the intervention period between planting and harvesting seasons of most other staple crops in Nigeria a [2]. As a food crop, cowpea is a veritable source of cheap protein (contains about 25% protein) for the ever-

growing population of both rural and urban dwellers whose other staple foods are largely deficient in protein, vitamins and minerals. The importance of production varies by agro-ecological zone within producing countries. The nutritional profile of cowpea grain, according to [3], is similar to that of other pulses; and cowpea as stated in this report has relatively low calorie and full protein content that is about two to four times greater than cereal and tuber crops. It is very palatable, highly nutritious and relatively free of metabolites or other toxins. Research findings suggest that the cowpea is richer in amino acids, lysine and tryptophan when compared to other cereal grains [4,5]. Cowpea being a legume is nitrogen-fixing [6] and given its ability to tolerate shade, as noted in [7] fits perfectly in the traditional inter-cropping systems that are common in Africa. Available statistics by Food and Agriculture Organisation of the United Nations [8], reveals that cowpeas are mainly cultivated in African Region, especially in Niger and Nigeria which are responsible for 66% of the world cowpea output. . There are other key producers of cowpeas in the Sahel region such as Burkina Faso, Ghana, Senegal and Mali. Interestingly, Nigeria is a net-importer of cowpeas especially from its immediate neighbours, namely Niger, Cameroon and Chad [8].Nigeria is the largest cowpea producer accounting for about 44 % of the total and also the largest consumer of cowpea in the world, while Brazil (which produces 10 % of global stock on 1.144 million hectares of land annually)is the largest from the Americas [9,10]. With the estimated average productivity yield of 483kg/hectare, cowpea production still trails 50% below its estimated potential in West Africa [3]. Paradoxically, Nigeria is the greatest importer of cowpea and Niger is the largest exporter [11] In spite of the huge potential of cowpea as a source of local food supplement and cash crops, there is limited information about consumer desired attributes of cowpeas in Africa [12]. This is explained in part due to the fact that most studies [13-18] focused more on production or technology adoption aspects. Further explanation is that marketing research lays disproportionately more emphasis on export crops likegroundnut, coffee, cotton and cocoa than on locally consumed staples like cereals [19]. This absence of data on consumer preferences to the various attributes of cowpea further complicates the demand and supply dynamics of the product. It makes it difficult for farmers and other middlemen in the value chain to ascertain the type of cowpea mostly demanded so that production activities will fully reflect such realities. Consequently, farmers face difficulty in selling the production surplus at profitable market prices of some species of cowpea [2]. It is against this background that this study sought to ascertain how buyers value the different cowpea qualities and the intrinsic characteristics of what they look out for in their buying behavior. It is expected that the finding of this study will help farmers and other middlemen in the value chain to accurately understand the demand preferences and requirement and thus align production activities to reflect such demand characteristics. To achieve the goal of this study, this paper will be guided by two key research questions:

What are consumer preferences for intrinsic attributes of cowpea in the study area?

Is there any relationship between price and cowpea intrinsic attributes in the study area?

2. Overview of Cowpea Characteristics

Extrinsic attributes of cowpea are those physical properties that one can see and also feel such as cowpea grain size (large, medium and small), testa texture (smooth and rough), and eye colour (white and black) and skin colour (white, black, brown and red). Intrinsic attributes of cowpea are those inherent qualities of cowpea that are demand driven in terms of proving sweet taste and nutritional value to the customers which includes protein content, sucrose contents and dry content. The protein content in cowpea is increasingly attracting global interest because in the final analysis, the process of using plant protein as additive is largely dependent on the utilitarian characteristics (i.e. extrinsic or intrinsic) that they supply to foods [20]. Consequently, the nexus between crop protein quality and processing indices that influences operational performance of protein products merits thorough investigation [21]. In a study [4] and [22], on the protein content of cowpea in 12 West African states and the US, it was revealed that cultivars ranges from 22 % to 29 % with most accessions having protein contents values between 22 % and 24 % which implies that it has a reasonable amount of folic acid and vitamin B which is known to shore up the immune system of infants and help prevent *neural defects* in unborn children.

The sucrose percentage in cowpea, according to [23], ranges between 17 % and 33 %. The energy content of Sucrose as a carbohydrate is 3.94 kilocalories per gram or Kilojoules per gram. They are quick to metabolise and as a result provides quick source of energy, necessitating a rapid increase in blood glucose upon intake [24]. The dry matter content of cowpea is high. It comprises all its solid (carbohydrates, fats, proteins, vitamins, minerals and antioxidants) content excluding water. The dry mater or weight is what determines the energy content in food measured in kilocalories and kilojoules.

2.1. Consumer Demand Characteristics and Preferences

Consumer preferences represent the subjective (individual) tastes as measured by utility of several types of products. Consumer preferences permit the consumer to rank these types of products according to the levels of utility they give the consumer [25]. Consumers are value-driven and consumer preference and patronage are positively related to the anticipated as well as derived value of the product. This value is inherent in the consumers' belief system, serving as prototypes from which attitudes and behaviours develop, thus, consumers tend to have a positive behavior to products that they believe meet their value demand. Perceptibly, studies in consumer's preferences and willingness to pay for food attributes have been increasingly attracting attentions of scholars like. Knowledge of consumer preferences for cowpea could greatly assist in the domestic cowpea production and marketing. The local cowpea traders and producers could also benefit from a study on consumer preferences of objective characteristics or attribute. This information nonetheless offers assistance in the gamut of demand-driven marketing strategies to especially improve the level of availability of cowpea in retailing quantity throughout the year. The fundamental precept that a product or a service generates utility has been based on traditional demand theory. Jean-Baptiste Say (1767-1832) has been outstanding among the classical economists on propounding that "*Supply creates Demand"*. Purposively, utility theory has been used to analyze consumer's choice of goods and services based on inherent satisfaction (util) of the product and its price within the buying limit of the budget constraint. The price a consumer is willing to pay in the case of food, as opined could be determined by an additional implicit satisfaction derived from consuming each unit of the product. Relying on the fundamental principles of economics which submits that demand is determined by the satisfaction derivable from the consumption of a product posits that a hedonic pricing model can be used to assess the effects of varying products characteristics on its prices.

2.2. Market Performance of Cowpea

Marketing is a prime mover and stimulator of production. This is because marketing identifies the needs, wants and preferences of the consumers and relays the information to the producers, who respond by providing such products satisfactorily to the consumers, at a profit. The marketing function is a veritable instrument in linking a farming community to an urban market economy. It integrates the rural areas with semi-urban and urban areas through a network of distribution and exchange channels. Agricultural markets provide the arena for potential exchange of agricultural products. The provision of secured market helps to increase output and to diversify subsistence production into commercial farming. note that agricultural markets can be viewed as the collective instruments that permit compromises to be reached, not only on the type of products to produce and distribute, but also on the value to be assigned to them. Cowpea value chain comprises network of producers, wholesale buyers, petty traders and various markets that facilitate the movement of the product from local production points in rural areas to consumers through urban wholesale and retail distributors. The value chain starts with the out-growing of cowpea by small scale farmers across the region. The products then pass through different layers of middlemen to get to the urban areas. For instance, a typical channel for cowpea distribution in countries such as Burkina Faso and Niger consists of the farmers who sell to local middlemen, who in turn sell directly to urban wholesalers or through commission agents.

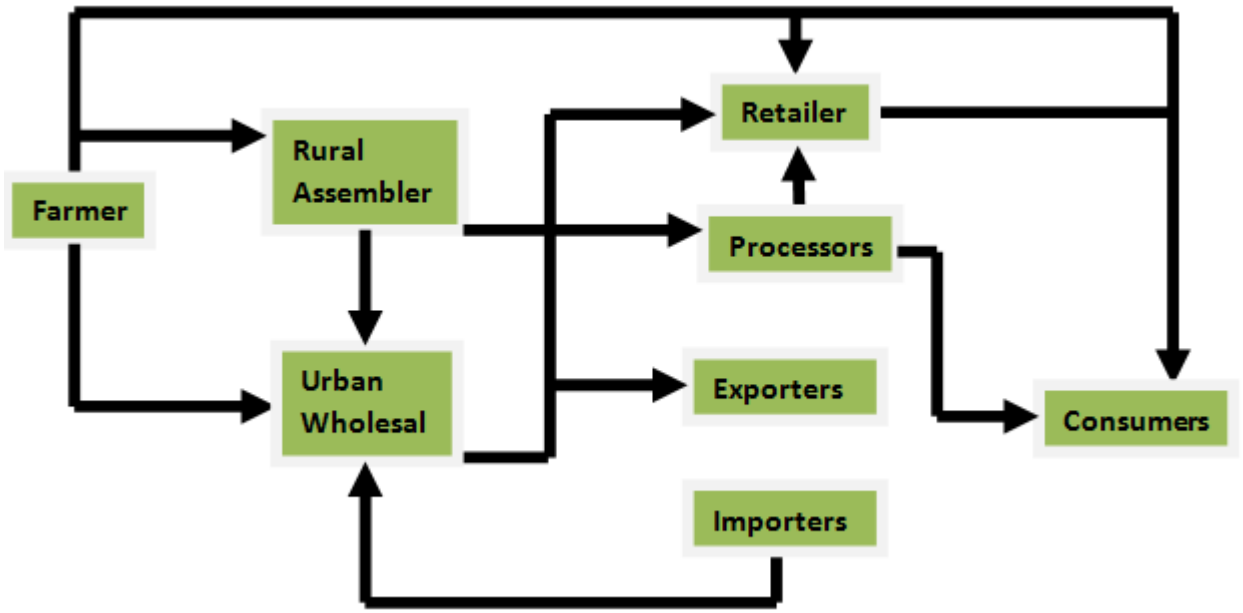

Figure1.A typical within country value chain in West and Central Africa
Source: authors' conceptualization

2.3. Cowpea Pricing Dynamics

Cowpea prices, from anecdotal evidence, in Niger State area of Nigeria show distinct seasonality, with the lowest prices occurring during the harvest period (i.e. from September to December) and highest prices occurring from planting along the gestation period to maturity (April to August). The variations in prices between peak and low price ranges differ significantly from year to year. For instance, the month-to-month variation as observed from our field work between 2014 and 2016 was 47% for December - June and 78% for December – August. Just like groundnut, the prices of cowpea in Niger State (North-Central) area of Nigeria are persistently higher than other cereal prices. . The ratio price of cowpea to that of cereal ranges from 1.45 to 2.1[26].

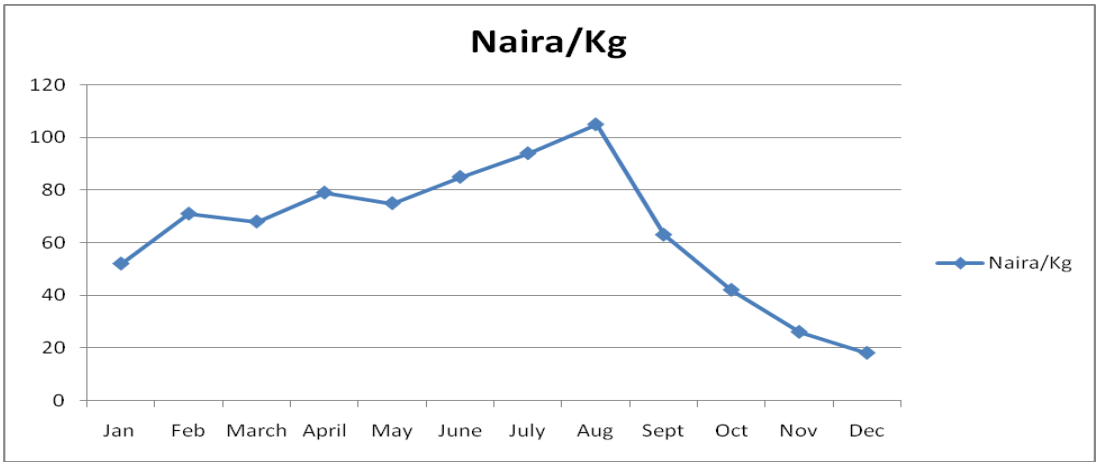

Figure2. Month-to-Month Variations in Prices of Cowpea
Source: Researchers' field survey – (2014 to 2016)

3. Methodology

3.1. Description of Study Area

The area of the study is Niger State, North-Central Region of Nigeria.Niger State shares boundary with Kebbi State to the west, with Zamfara State, to the north, with Kwara State to the south west, with Kaduna State to the northeast, with Kogi State to the south and with Federal Capital Territory (FCT) to the southeast.It has international boundary with Benin Republic to the North West along Agwara and BorguLocal Government council Areas (LGAs).The

State currently has 25 LGAs namely: Lapai, lavum, Magama, Mariga, Mashegu, Mokwa, Muya, Pailoro, Rafi, Rijau, Shiroro, Suleja, Tafa and Agaie. Others are Agwara, Bida, Borgu, Bosso, Chanchaga, Edati, Gbako, Gurara, Katcha, Kontagora, and Wushishi. She has a total population of 3,950,249 (2006 National Census). The study area lies within North Central Zone of Nigeria and has Guinea Savannah type of vegetation and has an annual rainfall that ranges between 1100mm to 1200mm and its peak around the months of July and August. Niger State covers an estimated land mass of 86,000sq km (about 10% of Nigerian total mass) of which 85% is arable land. The temperature ranges between15.22^{0}C to 36.51^{0}Cwith relative humidity between 60 percent at noon to 80 percent late night, and the major occupation is farming.

Figure3. Niger State, North-Central Region of Nigeria
Source:www.ekekeee.com

3.2. Sampling Technique

Primary data was collected using multi–stage sampling technique. The first stage was a purposive selection of Niger State in the North-Central Region of Nigeria because of the prevalence of cowpea producers and retailers in the study area. Monthly time series method of data collection for two and half years (July, 2014 to December, 2016) was used to collect data for this study from randomly selected markets. The second stage was also a purposive selection of two local government areas (Bida and Chanchaga) with large preponderance of cowpea retailers in the study area. The third stage was random selection of 10 respondents in each market in the two LGAs for the purpose of cowpea samples; this was carried out once a month for two and half years (30 months) giving a total of 300 respondents in each LGA and a composite sample size of 600for both LGAs.

For each kilogram of cowpea bought over the period of investigation, the key variables sought for during data collection were:

1. Protein content - (%)
2. Sucrose content - (%)
3. Dry Matter content - (%)
4. Skin colour - white
   Red
   Black
   Brown
5. Eye colour - Black
   White
6. Testa Texture - Smooth

Rough

7. Location of Market

3.3. Analytical Techniques

3.4. Hedonic Price Model

Hedonic price model was used to analyze data collected. This model of Consumption Theory formed the conceptual basis for estimating consumer demand for goods' quality. The model regards constitution of the product as the direct object of utility. making use of this concept designed the consumer characteristics models which describes the

price of a good as a direct aggregation of the implicit value of its characteristics /attributes.

Hedonic model of cowpea characteristics is explained below:

$PC = \sum_j^m = X_{cj} + \beta_{cj} + \varepsilon$ …… (1)

Where:

PC = Price of cowpea as expressed in N/kg

Xcj = Quality of cowpea grain characteristic j, such as (grain size, testacolour, eye colour, number of bruchid/100 grains, testa texture etc.)

β_{cj} = Impact value of characteristic j.

ε = Stochastic variable or residual term or error term.

From the general function, the regression model was thus estimated:

$P_{it} = \delta + \sum Yir + Yirt + \sum \Psi_{ik}M_{ikt} + \sum\beta_{ij}X_{ijt} + \sum_{it} + \varepsilon$ …….... (2)

P_{it} = Price of cowpea in ₦/kg

δ = Constant term

irt = Monthly (r = 1 and 0 otherwise)

M_{ikt} = Monthly dummy (K1, 2.3….6) to present for the effect of time in price variability

X_{ijt} = Characteristics of cowpea(j = 1,2,3, . . . j) protein content, Sucrose content, dry matter content, skin colour, testa texture and Eye colour etc.

β, y and Ψ = parameters to be estimated

ε = Stochastic variable

3.5. Ordinary Least Square (OLS) multiple Regression Technique

$P = \delta_0 + \delta_1\chi_1 + \delta_2\chi_2 + \delta_3\chi_3 + \delta_4\chi_4 + \delta_5\chi_5 + \delta_6\chi_6 + \delta_7\chi_7 + \delta_8\chi_8 + \mu$…….. (3)

Where;

δ = Constant term

P = Market price per unit of cowpea bought in (₦Kg)

χ_1 = Sucrose content (%)

χ_2 = Protein content (%)

χ_3 = Dry matter content (%)

χ_4 = Skin colour (dummy variable 1 for white, 0 otherwise)

χ_5 = Testa Texture (dummy variable 1 for rough 0 otherwise)

χ_6 = Eye colour (dummy variable 1 for urban mkt. 0 otherwise)

χ_7 = Location of market (dummy variable 1 for urban mkt. 0 otherwise)

χ_8 = Cooking time (minutes)

$\delta_1 - \delta_8$ = Slopes

μ = Standard Error

3.6. Proximate Analysis of Cowpea

3.6.1Moisture Content (%)

This process involved the putting of 1gram of powdered cowpea sample in a weighing balance into a petri-dish; this is followed by placing it in a drying oven at 100^0C for three hours after which it was removed and weighed again.

Moisture Content (%) = Weight of fresh sample - weight of dry sample x100

Weight of fresh sample

Dry Matter Content (%)

This requires subtracting 100 from moisture % gives the actual dry weight of a substance.

Crude Protein (%)

The following Apparatus were employed:

(1) Macro kjeldahl digestion and distillation units

(2) Kjeldahl flasks (500ml)

(3) Conical flasks 250ml

Reagents

- Conc acid H_2SO_4 (98%) N_2 free
- Potassium Sulphate, reagent grade
- Mercuric oxide
- Sodium hydroxide, 40% solution
- Boric Acid/Indicator Solution.
- Adding 5ml of Indicator Solution (0.1% methyl red and 0.2% bromocresol green in alcohol) to a litre saturated with boric solution and Standard Solution (01N).

Method

This involves first *digestion* process, 1gram of the powdered cowpea sample is weighed into a dilution flask, 10gram of potassium sulphate is added, 0.7 gram of $H_{g2}0$, also 20ml conc H_2SO_4 is added into the flask. This will be put into a heating chamber for

4hrs to give a clear solution. Next is *distillation*, on cooling 90ml of distilled H_20 is added, re-cool, adding 25ml of sulphide solution then mix. 40ml of NaoH solution is added while tilting the flask so that 2 layers were formed. The distillate will be collected in a conical flask containing 50ml boric acid/indicator solution. The 50ml distillate is collected. The third stage is *titration* process; the 50ml distillate in the conical flask will be titrated against standard aid solution:

Crude protein (%) = T.V x0.05x0.014x10x100x 6.25

Weight of sample (g)

Were = TV = Tidal Value

0.05 = Normality of standard acid

0.014 = standard value

10 = diffusion factor

100 = %

6.25 = N_2 converting factor

Lipid (%)

Reagent/Equipment

- Petroleum ether (B.p 40-60^{o}c)
- Extraction thimbles
- Soxhlet extraction apparition

Method

The process requires weighing of 2gram of sample into extraction thimbles in a weighing balance. This will be well folded. This thimble will be placed inside the Soxhlet apparatus-connected to a dry pre-weighted solvent flask beneath the apparatus and put the required amount of solvent and connect to condenser. . The boiling rate will be adjusted to condensation rate of 2 to 3 drops and extract for 16 hours.. On completion, the thimble will be removed and reclaim ether using the apparatus. The ether will be completely removed on a boiling bath and dry flask at 105^{o}C for 30mins. The thimble will be cool in a desiccation and reweigh.

Crude Fat (%) = Weight of fat x 100

Weight of sample

Crude Fibre %

Reagents

1) Con H_2SO_4 (0.25N)
2) NaoH (0.313N)
3) Antifoam reagent (Octyl alcohol)
4) Ethyl alcohol, and
5) ConcHcl, 1% v/v.

- **Apparatus** Beakers, 6ooml
- Round-bottom flask condenser unit
- Buchner funnel Hartley 3 section pattern
- Buchner flask, 1 litre
- Crucibles, silica with porous base, and
- Rubber cones to fit above

Method

The process involves weighing of 2gram of the sample into 600ml beaker, 70ml of diluted H_2 SO_4, will be added into the beaker, beaker and placed under condenser to boil for 1min. It will gently boil for exactly 30mins, using distils water to maintain volume and to wash down particles. At this stage, it will be filtered using Whatman No. 541 Paper in a Buchner Funnel, making use of suction and wash thoroughly with boiling H_2O. The remnant will be transferred back to beaker and 70ml of diluted NaoH solution is added.

This residue that is put back to the condenser is allowed to boil for a while. After being allowed to boil for exactly 30 minutes, is filtered using porous crucible and wash with boiling water. The sample will be transferred into a crucible and dried overnight at 100^{o}C cool and weighed. Ash at 500^{o}C for 3 hours, cool and weighed.

Crude fibre (%) = Weight of dried residue – weight ash residue x 100

Weight of sample

ASH %

Method

This involves weighing of 2g of the powdered sample into a dry crucibleand then placed into a muffle

furnace at t 600ºC for 6hrs, cool in desiccatorsand weigh again.

$$\text{Ash (\%)} = \frac{\text{Weight of Ash}}{\text{Weight of sample}} \times 100$$

Carbohydrate Content The carbohydrate content is always the last to be calculated, it is assumed to be the unknown sample therefore it is calculated as:

Percentage Dry matter content-(% Ash + % Lipid + % Crude Protein + % Crude Fibre) = % CHO and if you add % CHO + % moisture = 100. If it does not give, 100% then analysis in the variables are wrong.

Sucrose Content Method

This involves first knowing the already calculated amount of percentage of carbohydrate as stipulated in the previous section above. . The sucrose content is known from percentage carbohydrate content consisting of (glucose + fructose). 1 glucose unit will bind to 1 fructose unit to give 1 sucrose unit, glucose + fructose => sucrose

Hence = % carbohydrate/ 2 = 1 SUCROSE.

Glucose (50%) + fructose 50% = 1 SUCROSE. (AOAC 2005).

4. Results and Discussion Socioeconomic Characteristic of Respondents

Table1. Age distribution of the respondents in Chanchaga markets

Age (in years)	Frequency	Percentage (%)
20 – 29	80	26.70
30 – 39	170	56.66
40 – 49	50	16.66
50 – 59	0	0.00
Total	**300**	**100**

Mean Age: 34

Source: Researchers' field survey – (2014 to 2016)

Table 1 above indicates that from the frequency distribution 26.66% of the respondents are between the ages of 20 – 29; 56.66% are between the ages 30 – 39; 16.66% is between the age of 40 – 49 and no respondents were within age of 50 and above. The results showed that the mean age of the respondents is 34; this reveals that the respondents are young, agile and very energetic. This supports [11]'findings that youth play important role in selling cowpea in markets in most parts of Senegal.

Table 2. Gender distribution of respondents in Chanchaga markets

Sex	Frequency	Percentage (%)
Male	210	70.00
Female	90	30.00
Total	**300**	**100**

Source: Researchers' field survey – (2014 to 2016)

Table 2 indicates that male respondents were70% in the market while female respondents were 30%.. This implies that more males participate in the retailing of the cowpea than females. submit that as far as gender is concerned, most of the retailers of cowpea are male.

Table3. Marital status of the respondents in Chanchaga markets

Sale	Frequency	Percentage (%)
Single	20	6.70
Married	280	93.33
Divorced	0	
Separated	0	
Total	**300**	**100**

Source: Researchers' field survey – (2014 to 2016)

Table 3 shows that 6.70% of the respondents are single whereas 93.33% of the respondents are married and 0% are neither separated nor divorced. This implies that most of the respondents who are engaged in retailing the farm product (cowpeas) are married. This finding aligns with that of who discovered that the retailers in markets of Kano are mainly married with children.

Table 4. Household size of respondents in Chanchaga markets

Household size	Frequency	Percentage %
0	20	6.70
1-5	160	53.33
6-10	120	40.20
16-20	0	0
Total	**300**	**100**

Mean Household Size: 5

Source: Researchers' field survey – (2014 to 2016)

Table 4 indicates that 6.70% of the respondents do not have households, 53.33% of the respondents have between 1-5 households while 40% of the respondents have household sizebetween 11-15. Hence the respondents have moderate household sizes. The result showed that the mean household size of respondents was 5; it reveals that the respondents have lesser dependents.

Table 5. Age distribution of the respondents in Bida markets

Age (in years)	Frequency	Percentage
21-30	80	26.70
31-40	180	60.20
41-50	30	10.20
51-60	10	3.20
Total	**300**	**100**

Mean Age: 36 years

Source: Researchers' field survey – (2014 to 2016)

Table 5 shows that 26.70% of the respondent are between the age of 21-30, 60% are between the age of 51-60. The result shows that the mean age of the respondents is 36. This reveal they are young, agile and very energetic. According to [2] the youths play important role in selling cowpea in markets in most part of Senegal.

Table 6. Sex distribution of respondents by gender in Bida markets

Sex	Frequency	Percentage %
Male	220	73.33
Female	80	26.70
Total	**300**	**100**

Source: Researchers' field survey – (2014 to 2016)

Table 6 shows that 73.33% of the respondents are male whereas 26.70% represent female respondents. This reveals that more male participated in retailing cowpea in Bida market. According to as far as gender is concerned most of the retailers of cowpea in Kano are male.

Table7. Marital status of the respondent in Bida markets

Status	Frequency	Percentage %
Single	31	10.34
Married	269	89.66
Divorced	0	0.00
Separated	0	0.00
Total	**300**	**100**

Source: Researchers' field survey – (2014 to 2016)

Table 7 shows that 10.34% of the respondents in the market are single, whereas 89.66% of the respondents are married. According to the retailers in markets of Kano most of them are married with children and in husbands' houses.

Table 8. Household size of respondents in Bida markets

Household size	Frequency	Percentage%
0	22	7.33
1-5	183	60.00
6-10	95	31.66
11-15	0	0.00
16-20	0	0.00
Total	**30**	**100**

Mean household**:** 5

Source: Researchers' field survey – (2014 to 2016)

Table 8 shows that 6.70% of the respondents have no household 60% of the respondents have between 1-5 households, whereas 33% of the respondents have between 11-15 household sizes. The result showed that the mean household size of the respondents is 5; it reveals that the respondents have lesser dependent.

Price against variety, sucrose content, protein content and dry matter content in Bida markets

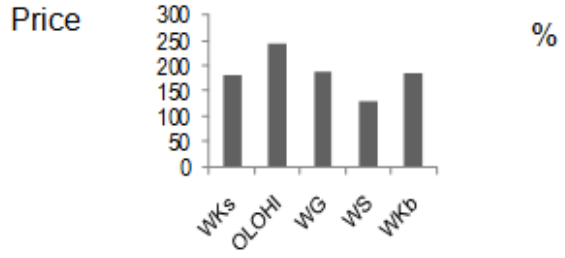

Fig 4: Variety.

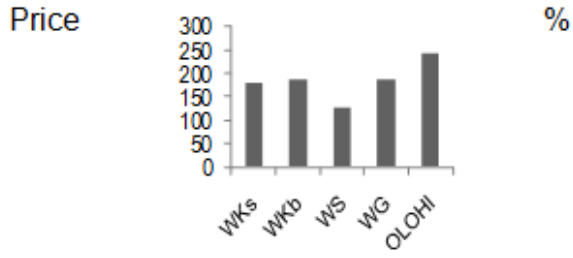

Fig 5: Sucrose content

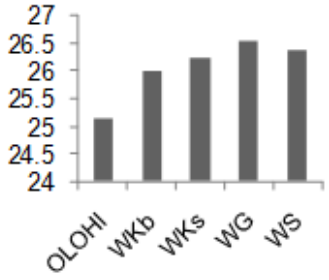

Fig 6: Protein Content.

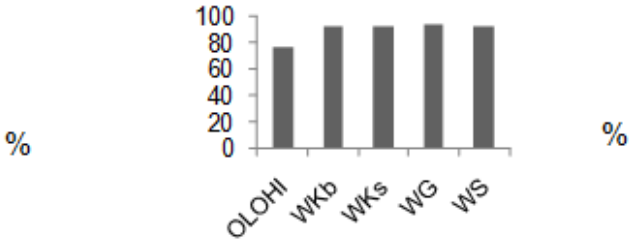

Fig 7: Dry matter content

Figs 4 and 5 above showed that specie**Olohi** has the highest in terms of price against others in terms of variety and sucrose content. Similarly, specie Waken Gwari (**WG)** has the highest in terms of price against others in terms of protein content as shown in fig 6. Comparably, specie Waken Sokoto **(WS)** has the highest in terms of price against others in terms of dry matter contentas shown in fig 7. These show that as the consumer demands more of some species of cowpea as a result of quality characteristics that it increases the price of cowpea in market, which is in agreement with [9] and the law of demand.

Price against variety, sucrose, protein and dry matter contents in Chanchaga markets

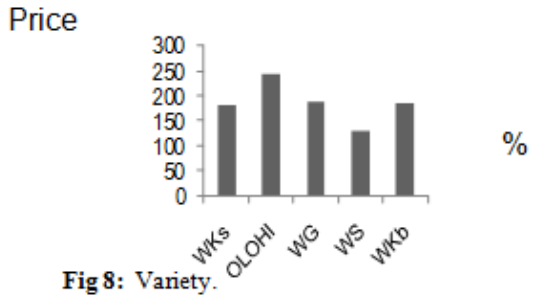

Fig 8: Variety.

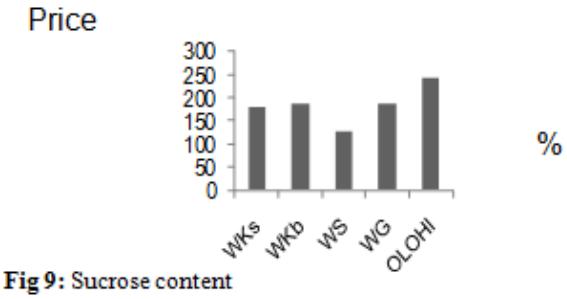

Fig 9: Sucrose content

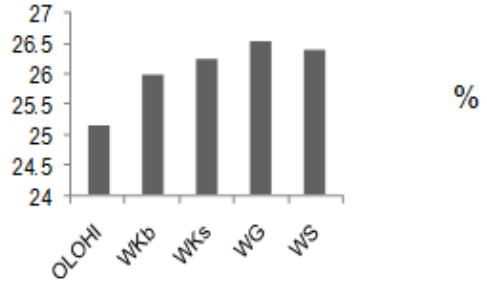

Fig 10: Protein Content.

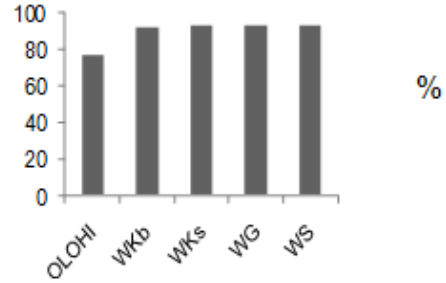

Fig 11: Dry matter content

Figs 8 and 9 above showed that specie **Olohi** has the highest in terms of price against others in terms of variety and sucrose content. Similarly, specie Waken Gwari (**WG)** has the highest in terms of price against others in terms of protein content as shown in fig 10. Comparably, specie Waken Soko to **(WS)** has the highest in terms of price against others in terms of dry matter content as shown in fig 11. These show that as the consumer demands more of some species of cowpea as a result of quality characteristics that it increases the price of cowpea in market, which is also in consonance with [9] and the law of demand.

Table9. Multiple Regression Market (Chanchaga Markets)

Price/kg	Coef.	T
Age	1.152449	3.69***
weight	3.899661	3.04 ***
Sc	- 36.75727	- 1.26
Tt	15.74222	0.62
Ec	34.98019	1.63
Suc	4.890919	1.86 *
Protein	8.025068	2.44 **
Dmc	7.563818	2.43 **
R-square		0.8005
Adj. R-square		0.7246

Source: Computed from Researchers' field survey data– (2014 to 2016)

Note *** Significant at 1%
** Significant at 5%
* Significant at 10%

From Table 9 above: The adjusted R- square (R^2) for Chanchaga Markets shows that 72.46% (0.7246) of changes in price of cowpea is brought about by the changes in the explanatory variables (Age, Grain Weight, Skin colour, Testa Texture, Eye colour, Sucrose content, Protein content, and Dry matter content). The regression coefficient Age, Weight, Suc, Protein, and Dmc shows positive relationship and significant impact indicating that increase in demand of any of these variables will lead to an increase in price at statistical robust levels of significance of10%, 5% and even 1%. This supports, which stressed that consumers' demand is determined by the utility experienced by users. In line with this, price the consumer pays for an extra unit of cowpea should be equal to extra satisfaction derived from its consumption (marginal utility of a commodity as holds in microeconomics principles is equal to its price).

Table10. Multiple Regression Market (Bida Markets)

Price/kg	Coef.	T
Age	.3575663	1.76*
Weight	3.581438	3.93***
Sc	30.52648	2.64***
Tt	13.35234	0.58
Ec	35.81193	0.215
Suc	5.059549	1.61*
Protein	4.800778	-2.03**
Dmc	11.16962	4.89***
R-square		0.8297
Adj. R-square		0.7755

Source: Computed from Researchers' field survey data– (2014 to 2016)

Note *** Significant at 1%
** Significant at 5%
* Significant 10%

From Table 10 above:The adjusted R- square (R^2) forBida Markets shows that 77.55% (0.7755) of changes in price of cowpea is brought about by the changes in the explanatory variables (Age, Grain Weight, Skin colour, Testa Texture, Eye colour, Sucrose content, Protein content, and Dry matter content) is explained by the explanatory variables. The regression coefficient Age, Weight, Sc, Suc, Protein, and Dmc shows positive relationship and significant impact indicating that increase in demand of any of these variables will lead to an increase in price at statistical robust levels of significance of 10%, 5% and even 1%. This also supports, which stressed that consumers' demand is determined by the utility experienced by users. In line with this, price the consumer pays for an extra unit of cowpea should be equal to extra satisfaction derived from its consumption (marginal utility of a commodity as holds in microeconomics principles is equal to its price).

5. Summary

This study is an assessment of consumers' preference for cowpea quality characteristics and price trends using Niger State, North-Central region of Nigeria as a case study. This survey was conducted in markets within two LGAs viz: Bida and Chanchaga The study used survey method and administered 600 questionnaires and at the end of the exercise vital and reliable information was retrieved. The study reveals that 60% of respondents were aged between 31 – 40 years with 26.70% female and 73.33% male. Also 93.33% of the respondents are married while 6.30% attested that they are single. Furthermore, 60% of the respondents have 1 – 5 members as household size and 33% have between 6 – 10 members as household size. The regression analysis revealed that the respective value of R^2 for Chanchaga markets is 0.72 and Bida markets is 0.77 which means that 72% and 77% of changes in the price of cowpea is explained by the changes in quality characteristics of cowpea in each market. The results indicated that consumer valued high protein content, sucrose content and dry matter content as the most important attributes as such they attracted higher prices. This supports, which stressed that consumers' demand is determined by the utility experienced by users. In line with this, price the consumer pays for an extra unit of cowpea should be equal to extra satisfaction derived from its consumption (marginal utility of a commodity as holds in microeconomics principles is equal to its price).

6. Conclusion

This study used a regression analysis to elicit consumers' preference for cowpea quality characteristics and price trends in five varieties of cowpea. The results indicated that consumer valued high protein content, sucrose content and dry matter content as important attributes in cowpea as such these quality characteristics have positive relationship with its price and as well statistical significant impact on its price.

7. Recommendations

1. Policies should encourage plant breeders to focus in development cowpea varieties that have high sucrose content, protein content and dry matter content to improve healthier consumption
2. Emphases should be more on providing better seedling of cowpea varieties especially the Waken Gwari variety which have high protein

content and complementary foods and first nutrients food given to infants

3. Existence of co-operatives in the market storage facility is necessary to increase and keep the shelf quality of the cowpea.

4. Government should encourage the female gender to actively participate in the value chain of cowpea through symposium and workshops.

5. Concerted efforts should be made by all sectors in the provision of improved seedlings particularly the variety with text colour (brown) because it has the higher sucrose level and provide micro nutrient among infants and young children of 6-23 months old during introduction of semi-solid food at the exposure of breast milk.

6. Increase protein content would make cowpea more attractive for the food industry and will have a positive impact on consumers' health through diet.

References

[1] Faye, M., Ndiaye, M., & Lowenberg-Deboer, J. *Identifying cowpea characteristics which command prices premiums in Senegalese markets*: An overview. Proceedings of the Third World Cowpea Conference ,pp. 424 – 433, 2000. Ibadan: Nigeria IITA proceedings.

[2] Faye, M., Jooste, M., Lowenberg-Deboer, J., & Fulton, J. *Impact of sucrose contents and cooking time on cowpea prices in Senegal.* South African Journal of Economic and Management Sciences, 9(2), 207 – 212, 2006.

[3] FAO. *What we do.* Retrieved 11 December 2015.

[4] Hall, A. E., Cisse, N., Thiaw, S., Elawad, H. O., & Ehlers, J. D. *Development of cowpea cultivars and germplasm by the Bean*, Cowpea CRSP. *Field Crops Res, 82 (6)*, 103-134,2003.

[5] Aveling, T. *Cowpea Pathology.* Pretoria, South Africa: Cowpea Pathology Research, 2000.

[6] Sanginga, N. *Role of biological nitrogen fixation in legume based cropping systems*: A case study of West Africa farming systems. Plant Soil, 252(1), 25 – 39, 2003.

[7] Ali, Z. B., Yao, K. N., Odeny, D. A., Kyalo, M., Skilton, R., & Eltahir, I. M. *Assessing the genetic diversity of cowpea [Vigna unguiculata (L.) Walp.] accessions from Sudan using simple sequence repeat (SSR) markers*. African Journal of Plant Science, 9(7), 293 – 304, 2015.

[8] FAO. *FAO launches anti-hunger petition, 11 May 2010".* Fao.org, Retrieved 15 August 2016, 2010.

[9] Prereia, P. A., Del Peloso, M. J., Lacosta, J. G., & Yokoyama, L. P. *Beans product perspective for production, consumption and genetic improvement.* Cowpea Research National Meeting, Embrapa Rice and Beans. Trersina, PIAU, Brazil, 2001.

[10] Anowor, O. F., Ukwueni, N. O., & Ezekwem, S. O. *Agricultural Productivity and Poverty Alleviation: An Econometric Analysis*. American Journal of Sustainable Cities & Society, *2*(1), 109 – 129, 2013.

[11] Faye, M., Jooste, A., Lowenberg-Deboer, J., & Fulton, J. *The influence of Cowpea characteristics on cowpea prices in Senegal.* Agrekon, 43(4), 418 – 429, 2004.

[12] Mundua, J. *Estimation of consumer preferences for cowpea varieties in Kumi and Soroti districts, Uganda.* Makerere University,2010.

[13] Adipala, E., Obuo, J., & Osiru, D. *A survey of cowpea cropping systems in some districts of Uganda*. African Crop Science Conference Proceedings, 3, 665 – 672, 1997.

[14] Sabiti, A. G., Nsubuga, E. N., Adipala, E., & Ngambeki, D. S. *A socio-economic aspect of cowpea production in Uganda: A rapid rural appraisal.* Uganda Journal of Agricultural Sciences, *2*(1), 59 – 99, 1994.

[15] Babaji, B., Yahaya, R. A., Mahadi, M., Jaliya, M., Sharifai, A., Kura, H., et al. *Growth Attributes and Pod Yield of Four Cowpea (Vigna unguiculata (L.) Walp.)* Varieties as Influenced by Residual Effect of Different Application Rates of Farmyard Manure. Journal of Agricultural Science, *3*(2), 2011.

[16] Akinwale, R., & Obisesan, I. *Collection and characterization of some underutilized cowpea (Vigna Unguiculata L.) cultivars of southwestern Nigeria*. Journal of Sustainable Development and Environmental Protection, 2(2), 37 – 47, 2012.

[17] Anowor, O. F., Ukwueni, N. O., & Ikeme, M. *The Impact of Trade Liberalisation on Nigeria Agricultural Sector.* Journal of Economics and Sustainable Development, *4*(8), 14 - 24,2013.

[18] Otitoju, G. T., Otitoju, O., Nwamarah, J. U., & Baiyeri, S. O. *Comparative Study of the Nutrient Composition of Four Varieties of Cowpea (Vigna unguiculata) and Their Products (Beans-Based Products).* Pakistan Journal of Nutrition, 9, 540 – 546, 2015.

[19] Van der Laan, H. L. *Agricultural Marketing in Tropical Africa: Obstacles to Systematic Study.* (H. L. Van der Laan, T. Dijkstra, & A. Van Tilburg, Eds.) Leiden: Ashgate Publishing Limited, Africa Studies Centre, Leiden, 1999.

[20] Ragab, D. M., Babiker, E. E., & Eltinay, A. H. *Fractionation, solubility and functional*

properties of cowpea (Vigna unguiculata) proteins as affected by pH and/or salt concentration. Food Chemistry, *84*(2), 207 – 212, 2004, February.

[21] Jane, E. D., Rivas, N. R., & John, C. *Selected functional properties of sesame flour and two protein isolates.* Journal of Science, Food and Agriculture,, 32 (3), 557–564, 1981.

[22] Jayathilake *et a*l . *Cowpea: An overview on its nutritional facts and health benefits: Nutritional and Health Properties of Cowpea*. Journal of the Science of Food and Agriculture 98(13), 1 – 14s, 2018.

[23] Noubissie, T. J., Youmbi, E., Njintang, N. Y., & Nassourou, M. A. *Generation Means Analysis of Seed Sucrose Content in Cowpea (Vigna unguiculata L. Walp.)*. Asian Journal of Agricultural Sciences, 3(6), 475 – 480, 2011.

[24] Havemeier S, Erickson J and Slavin J, *Dietary guidance for pulses: the challenge and opportunity to be part of both the vegetable and protein food groups*. Ann NY Acad. Sci. 13(92), 58–66,2017.

[25] Deol J. K. and Bains K, *Effect of household cooking methods on nutritional and anti nutritional factors in green cowpea (Vigna unguiculata) pods*. Journal of the Science of Food Technology 47(1), 579–581, 2010.

[26] Hossein Zare, Saeed Rajaeepur . *The tasks of social workers working with children of divorce: A Review*, UCT Journal of Management and Accounting Studies**,** Issue 4, pp. 5-10, 2013.