# CONSUMERS' PREFERENCE FOR COWPEA IN NIGERIA

## Ifegwu K. U., and J.O. Ajetomobi

## Department of Agricultural Economics and Extension, Ladoke Akintola University of Technology, P.M.B.4000, Ogbomoso, Nigeria

**ABSTRACT**

The study measures the market value of Nigerian cowpea features. Five cowpea samples were bought once per month in 5 markets. In the market, price seller's characteristics were observed. In the laboratory, size of grain, eye colour, testa texture and damage levels were recorded. A hedonic pricing regression model was used to analyze data collected. Results indicate that eye colour is the most important determinant of cowpea market prices. Cowpeas with brown colour commands a clear premium in all but one market. The consumers discount prices for insect damage in most markets. In general, this study signals the need for cowpea breeders to identify cost effective ways of breeding for brown coloured cowpea (Ife-brown species) which is the most preferred by consumers.

Keywords: Consumers, Hedonic Pricing, Cowpeas, Nigeria

**INTRODUCTION**

Like other citizens in sub-Sahara African countries, cowpea (*Vigna unguiculata L. walp.*) commonly referred to as 'beans' in Nigeria has been a major food legume for several decades. Nigeria is the largest producer of cowpea in the world with an annual yield of about 2million metric tons on 4.4 million hectares or 0.45mt/ha (Pereira et al., 2001). Several factors account for the leading position of Nigeria in cowpea production, among which are the significant advances made by the International Institute of Tropical Agriculture (IITA) over the last two decades in improving production in sub-Saharan Africa (Singh et al., 1999}.

As a relatively inexpensive source of food, cowpea fits the needs of the rural-urban poor. Cowpea is highly nutritive. Its nutritive value lies in its high protein content of about

23%, which is double that of cereals with a protein content of about 23%, fat content of 1.3%, fibre content of 1.8%, carbohydrate content of 67%, and water content of 8-9% (Bressani,1985). It therefore has a tremendous potential to contribute to the alleviation of malnutrition among poor families (Mcfarlene, 1983). Cowpea seed is a nutritious component in livestock feed. Its forage contributes significantly to animal feed mainly during the dry season when the demand for feed reaches its peak. Epidemiological studies in over 40 countries of the world show a direct link between consumption of dry beans and reduced incidences of chronic diseases including cancer, and it is also used to enhance child survival (USAID, 2003). Furthermore, cowpea is an important legume in Nigeria which serves as a source of farm income (Afolami, 2002).

Despite the economic and nutritional importance of cowpea to consumers and producers, a major problem of cowpea production is the mismatch between improved varieties of cowpea and consumers preference (Faye et al., 2002). According to Faye et al., (2002) the characteristics of improved varieties of cowpea are not necessarily those priced by consumers. For example, the white cowpeas with dark eyes are the type widely accepted internationally but not necessarily the type West African consumers want. Another example of this mismatch between the improved varieties of cowpeas and consumers preference relates to size. While most West African consumers prefer larger grain size, some of the improved varieties are quite small. Consumers prefer large seeds for their sauce or rice and processors also prefer large seeds, since they yield larger amounts of flour. Cowpea varieties with smooth skin are difficult to cook, and given that time and energy have costs and can be scarce, especially in a pressurized urban environment, consumers prefer cowpeas which are quick to cook, to save time and fuel. (Faye et al., 2002) The most important preference for testa colour in West Africa is white, but in some areas consumers prefer red, brown or mottled grains (Langyintuo et al., 2003)

This study therefore focuses on providing information on how buyers value the different characteristics of cowpea varieties, which are vitally important to producers, marketers, consumers, policy makers and other role players in the cowpea value chain. This is because farmers will be reluctant to grow new varieties that consumers will not buy. Producers and merchants will be more likely to adopt storage and post harvest technologies that improve the characteristics that cowpea consumer's value. Researchers will achieve cost effectiveness by targeting research at characteristics that meet consumers' tastes and preference. There will be efficient marketing of farmers produce, whereby producers and marketers will realize fair income and consumers' utilities optimized. This will also lower the transaction costs of intermediaries in the cowpea value chain (Langyintuo et al., 2002). By providing such information, a significant contribution can be made to the growing importance of cowpea as a means to improve and sustain the livelihood of people in the study area.

The specific objectives of the study therefore are to (i) analyze cowpea characteristics across markets and consumer preferences and (ii) estimate the relationship between cowpea price and cowpea characteristics preferred by consumers. To guide research, the following hypotheses were stated: ( i) the characteristics of cowpea grains do not vary across markets and (ii) there is no significant relationship between cowpea price and consumer preference for cowpea choices.

**MATERIALS AND METHODS**

The conceptual basis for estimating consumer demand for a good's quality is Lancaster's model of consumption theory (Lancaster, 1971). The model regards the characteristics of the good and the good itself as the direct object of utility. Thus, price differences across different units of transaction are due mainly to quality differences that can be measured in terms of the characteristics. Based on the economic principle that products demand stems from the utility provided as a function of its quality characteristics (Brent, 1991) utility theory has

been used to analyze consumer choice of a good or a service based on price and a budget constraint. In the case of food products, the price a consumer is wiling to pay may be a function of the marginal implicit prices that an individual is willing to pay for each nutrient. A good way to understanding the hedonic analysis framework is to view each good in terms of the set of characteristics it possesses (Ladd and Suvannut, (1976).

For any given good say cowpea, let the set of characteristics be ordered and denoted as:

$$X = (xi.............xk)$$ ……………………………………………………… (1)

It is assumed that the preference of consumers in the market for a particular good is solely determined by its corresponding characteristics vector. In addition, it is assumed that there is a functional relationship between the good's price P, and the characteristic vector X, in the form of the equation:

$$P = f(x)$$ …………………………………………………………………… (2)

This functional relationship specifies the hedonic relationship or hedonic regression typical for the good in the market (Hans,2003). Using this concept, Faye et al. (2002) and Langyintuo et al. (2003) employed a profit maximization framework and a hedonic pricing model to asses the impact of cowpea characteristics on market price. They showed the importance of grain size and seasonal variations on cowpea prices. This study follows the framework outlined in the Faye et al. (2002) and Langyintuo et al. (2003).

In this study, primary data were generated through purchase of samples of cowpea types in six spatially separated markets in Osun state, Nigeria between October 2009 and march 2010. The state is largely urban and has an estimated population of about 3,423,535 people (NBS, 2006) .It is delineated into six geopolitical zones. They include Ede, Ife, Ilesha, Ikirun, Iwo and Oshogbo. Ikirun is the gateway through which cowpea is moved to the study area from the Northern part of Nigeria, where the commodity under study is largely produced. The markets were chosen based on volume of cowpea sales and geographical

spread. Five samples of cowpea were randomly purchased, once every month, in each market. In the market, the price and vendor characteristics were recorded. In the laboratory, size of grains, testa texture, eye colour and damage level were recorded. The data generated are therefore, pooled cross section and time series outcomes with 180 observations.

Cowpeas are agricultural commodities, therefore the effect of weather in a given year and other seasonal effects are likely to have related effects on the disturbances, for the different demand equations in different markets. These disturbances are not always related to the characteristics of the cowpea, hence the necessity to test for contemporaneous correlation (Judge et al ,1988) When contemporaneous correlation exists, it may be more efficient to estimate all equations jointly with the seemingly unrelated estimator (SUR), rather to estimate each one separately using least squares( Greene,1993). The data did not include seasonal variable for constraints of time and therefore were not tested for contemporaneous correlation. The problem of autocorrelation associated with time series data does not arise .The cross sectional units are randomized individuals (cowpea sellers) hence the disturbances of the cross sectional units were assumed mutually independent, but heteroscedastic. But by randomizing across sellers the presence of heteroscedasticity is ruled out (Langyintuo et al., 2003) consequently, the use of the linear model of hedonic pricing for parameter estimation was justified. The hedonic price function following Faye et al.(2002) is

$$P_i = \alpha_0 + \beta_{ik} \sum_{i=1}^{j=1} Z_{ik} + \mu \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots3.1$$

Where $P_i$ = per unit price of cowpea $\alpha_o$ = intercept $\beta_{ik}$ = Marginal value of characteristic k is good I, $Z_{ik}$ = Amount of characteristic k in good I, $\mu$ = error term

For each of the six markets studied, the Hedonic price function in (3.1) was expressed in the following form:

$$P_i = \alpha_0 + \alpha_1 Z_{i1} + \alpha_2 Z_{i2} + \alpha_3 Z_{i3} + \alpha_4 Z_{i4} + \alpha_5 Z_{i5} + \mu \dots\dots\dots\dots\dots\dots\dots\dots3.2$$

Where, $P_i$ = Price in ₦/kg is the dependent variable, $Z_1$ =Grain size (weight of 100 grains), $Z_2$ =Number of holes per 100 grain  $Z_3$ = eye colour, $Z_4$ = testa texture μ = error term

The eye colour and testa texture were entered as dummy variables. The approach used to create dummies for eye colour was to assign a value of one for the brown coloured grains and zero otherwise. A value of one was assigned to rough testa texture and zero otherwise. This is because the prices for white cowpea were generally lower than the brown variety in the study area and so also was the smooth testa variety over the rough. The choice of these classes of dummy variables as base variables was important because it allowed for positive values of the regression coefficients for ease of interpretation of the results.   For the expected signs for estimated parameters, the number of holes is expected to have a negative sign. The signs for brown skin colour and rough skin texture and grain size are expected to be positive.

## 4.  RESULTS AND DISCUSSION

### 4.1  Descriptive characteristics

Cowpea prices showed relatively high variation in the markets. Table 1 indicates that on the average, cowpea prices observed in Ikirun were consistently lower than those of Ede, Ife, Ilesa, Iwo and Osogbo. The minimum and maximum prices for Ikirun market ranged from ₦70 to ₦85 per kilogramme while the highest cowpea prices were observed in Ife with an average price of ₦108.37. The minimum and maximum prices ranged from ₦90 to ₦150 per kilogramme depending on variety. Average cowpea price for Ede market was ₦88.06 with a range of ₦80 to ₦95 per kilograme. For Ilesa market, the average cowpea price was ₦91.56 and the minimum and maximum prices ranged from ₦85 to ₦110 per kilogramme. In Iwo, average cowpea price was ₦98.87 with a range of ₦86 to ₦120. While the average cowpea price for Osogbo was ₦76.93 with a range of ₦70 to ₦80.The average price for all markets was N89.54 with a range of ₦70 to ₦150.    The variation in prices between Ikirun and Ife markets could be due to the fact that Ikirun is the gateway through which cowpea is moved to

the study area form the north where the commodity is produced. While the higher prices observed in Ife could be as a result of the large presence of high income buyers from the university community. Although, the average price of cowpea was lower in Ikirun than in Osogbo, the low standard deviation of price in Osogbo compared to the other markets of Ife, Iwo ,Ilesa and Ede suggests price stability in Osogbo market. On the other hand, cowpea prices were on the average most unstable in Iwo as depicted by the high standard deviation of price.

**Table 1:     Cowpea grain characteristics in the selected markets**

| Market | Price( N) per kg | | Mean Wt/ 100grains | | No.of holes/100grain | |
|---|---|---|---|---|---|---|
| | Mean | S.D. | Mean | S.D. | Mean | S.D. |
| Ede | 86.06 (80-95) | 3.91 | 18.9 (14.1-28.3) | 4.2 | 6.97 (1-20) | 4.87 |
| Ife | 108.37(90-150) | 18.71 | 19.6 (14.4-29.3) | 3.4 | 8.95 (3-20) | 4.04 |
| Ikirun | 75.45 (70-85) | 4.08 | 20.1 (14.2-29.4) | 3.7 | 8.20 (3-18) | 3.40 |
| Ilesa | 91.56 (85-110) | 5.62 | 19.5 (14.1-25.8) | 3.3 | 5.60 (3-10) | 2.07 |
| Iwo | 98.87 (86-120) | 9.34 | 19.0 (14.1-29.3) | 3.5 | 4.83 (2-17) | 3.04 |
| Osogbo | 76.93 (70-80) | 2.91 | 19.8 (14.5-29.9) | 4.4 | 6.70 (3-15) | 2.79 |
| All markets | 89.54 (70-150) | 14.82 | 19.5 (14.1-29.9) | 3.8 | 6.87 (1-20) | 3.73 |

**Source: Market survey**

**Note:** In parenthesis are the minimum and maximum prices, prices are in Naira, and S.D. stands for the standard deviation.

Across the major markets in Osun state, it was observed that, on the average, cowpea grains sold in Ikirun market were slightly larger than those of the other markets studied, with an average of 20.1grammes (Table 11). The average weight of 100 cowpea grains in Ife and in

Osogbo markets were 19.6 and 19.8g respectively. The average weight of 100 cowpea grains for Ede was 18.9 grammes with a range of 14.1 to 28.3g. In Ilesa market, the average weight of 100 grains was 19.5g while for Iwo market, the average weight of 100 cowpea grains was 19.0g with a range of 14.1 to 29.3g. Across the markets, the average weight was 19.5g per 100 grains. This is consistent with an earlier study by (Faye et al., 2002). The results indicate that in all markets the average grain size varied between 18.9 to 20.1gs with a mean of 19.5g, suggesting that cowpea grains sold in the various markets were on the average uniformly distributed. The low standard deviation indicates that grain size distribution was largely uniform in the different markets. However Ilesa market had the highest uniformity of grain sizes as indicated by the low standard deviation. The highest disparity in grain sizes was recorded in Osogbo as shown by the high standard deviation. This may be due to influx of many cowpea sellers from neighbouring towns and villages to Osogbo on market days.

In terms of grain susceptibility to stored pests, cowpeas sampled were minimally vulnerable. Table 1, shows that the average infestation levels observed based on the number of bruchid holes per 100 grains in Ede was 6.97. In Ife it was 8.95. Iwo had the lowest infestation level with 4.83 holes per 100 grains by Ilesa with an average infestation level of 5.60 per 100 grains. Ikirun and Osogbo recorded averages of 8.20 and 6.70 holes per 100 grains respectively. The highest level of average insect damage was observed in Ife with an infestation level of 8.95 and the lowest average infestation level was recorded in Iwo with 4.83 holes per 100 grains. The minimum and highest numbers of 1 and 20 were observed for all markets. While the average infestation level for all markets was approximately 7. This is consistent with the findings of Faye et al. (2003) who reported an average number of bruchid holes per 100 grains of between 6 and 9. It is however contrary to the results of Langyintuo et al. (2002) who reported an average infestation level of 13 and 14 holes. The low levels of insect damage may probably be as a result of the practice of picking out of damaged grains

before sale by the sellers or as they are displayed. The sellers appeared to know the implications of a low quality produce in terms of low demand.

Three distinct colours of cowpea were on sales in the markets surveyed. These are white, brown and mixed colours. However, only the white and brown colours were sampled. Brown coloured cowpea is more predominant than white. In terms of testa texture, two types were observed namely smooth and rough textures. The study showed that cowpea with rough texture dominates in all the markets.

## 4.2  Hedonic relationship and implicit prices

The estimated models fitted the data reasonably well given the variables used, with an overall value of the coefficient of determination of 92% (Table 3). Grain size had the expected positive sign in all the selected markets except Osogbo. Grain size was however statistically significant at the 5% level in Ife, Ilesa and Iwo markets. The consumers pay a premium of ₦3.35, ₦2. 53 and ₦2.47 per kg increase in hundred grain weight in Ife, Ilesha and Iwo markets respectively. For the number of holes, the result indicates that it had the expected negative sign and in all the markets except Ilesa. The coefficients were significant except in Ife and Ilesha. In Ede, an increase of one hole per 100 grains results in a discount of 33 kobo per kg. In Iwo market, a discount of 2% per kg is estimated for a unit increase in number of holes per 100 grains.

*Table 3:Estimated model coefficients for selected markets*

| Variable | Ede | Ife | Ilesa | Iwo | Osogbo |
|---|---|---|---|---|---|
| Grain size | 0.39 (5.47)* | 3.35 (4.41)* | 2.53 (8.43)* | 2.47 (8.43)* | - 0.01(0.10)* |
| No of holes | -0.33 (-5.18)* | -0.14 ( 0.27)* | 0.23 (0.49)* | -0.02 (0.60)* | - 0.81(5.23)* |
| Colour | 1.65 (2.50)* | 13.39 (3.22)* | -0.69 (4.37)* | 0.44 (0.22 )* | 1.21(1.51)* |
| texture | -1.69 –(3.72)* | 19.54 (7.03)* | 3.67 (3.35)* | -1.54 (0.88)* | 0.44 (0.73)* |
| Consonant | 80.38 (44.86)* | 46.07 (2.70)* | 48.30 (5.73)* | 53.12 (8.44)* | 81.12 (27.99)* |
| $R^2$ | 0.96 | 0.92 | 0.90 | 0.90 | 0.87 |
| Adj $R^2$ | 0.95 | 0.91 | 0.89 | 0.89 | 0.86 |
| Std Error | 1.79 | 17.07 | 8.42 | 6.30 | 2.90 |

*Source:* Market Survey, 2007.

**NOTE:**

      t-statistics are in parenthesis

\*      Significant at 5% level

This discount is a very negligible percentage of the average cowpea price in Iwo market. In Osogbo market an increase of one hole per 100 grains results into a discount of 81 kobo. Cowpea grain colour coefficients had the expected positive sign, except in Ilesha market, where consumers discount 69 kobo for the brown coloured cowpea representing 4% of the average cowpea prices in all markets. All the coefficients were statistically significant at the 5% level, except in Iwo. Consumers discount the price for testa texture by N19.54 in Ife representing 22% of the average cowpea prices in all markets. In Ede, consumers discount N1.69 per kg for the rough testa texture, representing 2% of the average cowpea prices in all

markets. Consumers in Ilesha pay a premium of N 3.67, representing 4% of the average cowpea prices in all markets.

**CONCLUSION**

This study used samples from six major markets in Osun state, Nigeria to estimate the value of cowpea characteristics for consumers. In the state, most consumers prefer brown coloured cowpea. The only exception was at Ilesha market where local preference for white coloured cowpea varieties is particularly strong. Although consumers are willing to pay a premium for large grain size, the coefficient is statistically significant in only three of the six markets. The impact of bruchid holes on cowpea prices was except in Ife and Ilesha. In spite of the fact that sellers sort out damaged grains, five of the six markets show statistically significant discounts for bruchid holes from the very first hole. Cowpea testa texture is significant in explaining price variation in Ilesha market, as consumers pay a premium of 4% of the average cowpea prices in all markets for rough textured grains. However, rough skin is discounted in the other markets. These results suggest that efforts to improve upon grain colour and grain size will be worthwhile in Osun state. Consumer sensitivity to grain damage by storage insects indicates that cowpea storage research and technology transfer will have substantial pay- off in the state markets and should be emphasized. In general, this study indicates that quality characteristics are very important in Osun state markets. Even low income consumers are willing to pay a premium for products that match their preferences and they are vigilant in identifying products that do not meet their standards. Price level differ from market to market, hence comparisons are facilitated by expressing the hedonic coefficients as a percentage of the average price in the market for a given period.

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