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Hedonic analysis of cowpea markets and consumers' preferences in Ogbomoso Metropolis Oyo State, Nigeria: An ancova approach

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ABSTRACT

This paper analysed cowpea markets and consumers' preferences in Ogbomoso metropolis using a household hedonic approach. 60 cowpea sellers were selected by a purposive random sampling technique in four major markets from Ogbomoso North (Sabo market and New Waso market) and Ogbomoso South (Arada market and Caretaker market) Local Government Areas of Oyo State, Nigeria. 50% of the cowpea sellers were male and female respectively. 96.67% of them sell more than one varieties. 96.67% of respondents sell a combination of varieties i.e. Peu/Drum, Sokoto, Mala, Olo and Oloyin for their nutritive value, popularity and availability which may be used for boiled whole grain cooking, fried cowpea balls (akara), and steamed cowpea cake (moin-moin). Over 50% of respondents (cowpea marketers) use storage chemical which reduces the attack of weevils to be able to sell cowpea that has no or few numbers of bruchid holes. The mean prices of peu/drum cowpea, sokoto cowpea, mala cowpea, olo cowpea and oloyin cowpea are ₦359.67, ₦291.83, ₦324.00, ₦376.00, and ₦394.17. The analysis of covariance (ANCOVA) which was used capture price-quality relationship of the type of cowpea purchased by consumers revealed that there is a significant relationship between the number of holes in each of the cowpea varieties and their respective prices in the various markets sampled in the study area. Hence, the numbers of holes appear to be the major determining factors affecting the prices of various cowpea types in the study area.

Introduction

Demand theory has traditionally been based on the fundamental precept that a product or a service generates utility. Hence, utility theory has been used to analyse consumers' 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 willing to pay may be a function of the marginal implicit prices that an individual is willing to pay for each nutrient (Brooker *et al*, 1986).

According to Faye et. al., (2002), cowpea is one of the most ancient crops known to man, with its center of origin and subsequent domestication being closely associated with pearl millet and sorghum. In the modern world it is a broadly adapted and highly variable crop, cultivated around the world primarily as a pulse, but also as a vegetable (for both the grains and the green peas), a cover crop and for fodder. Cowpea has many varieties. The most commonly cultivated varieties are: IT 90K-76, IT 90K-59, IT 90K-277-2, IT 87D-941, IT 89KD-88, IT 98KD-88, IAR-48 and Ife brown (Afolabi, 2002). However when they reach the markets it becomes difficult to identify them by their code variety names. Traders in the state however, generally sell five basic types of the commodity, which they have categorized in line with physical features and their price premium. The locally variety include dubbed *peu/drum*, *sokoto*, *mala*, *oloyin* (flat and large) and *olo*.

Langyintuo et. al., (2003) reported that cowpea grain in West Africa passes through a well-established value chain with regional trade flowing mainly from the semi-arid production areas in the Sahel to the more urbanized coastal zones. Thus, the international research and development community has recognized the importance of cowpea to the development of West and Central Africa. The Bean Cowpea Collaborative Research and Support (CRSP) program funded by the United States Agency for International Development (USAID) has conducted research on production, marketing and utilization of cowpea in West Africa for over 20 years. Cowpea production in West and Central Africa represents almost 70% of world production of cowpea and about 80% of world cowpea. Nigeria is the largest cowpea producer accounting for about 22% of the total, followed by Brazil which produces 10% on 1.144 million hectares of land annually (Pereira, *et al*., 2001).

The general objective of the study was to analyse cowpea markets and consumers' preferences in Ogbomoso metropolis using a household hedonic approach, and the specific objectives were to: analyse the different characteristics of cowpea in the various market in Ogbomoso metropolis; compare these characteristics across market and consumers preference in Ogbomoso metropolis; and estimate the relationship between cowpea price and cowpea characteristics preferred by consumers in Ogbomoso metropolis.

Literature Review

The hedonic pricing method is most often used to value the individual characteristics of agricultural goods because it is relatively straightforward and uncontroversial to apply, since it is based on actual market prices and uses fairly easily measured data. Since its introduction, numerous economists have employed hedonic pricing models as a tool for estimating the price-quality relationships of commodities over

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time or through cross-sectional data analysis (see for example Rosen, 1974; Brorsen *et. al.*, 1984; Espinosa & Goodwin, 1991; Faye *et. al.*, 2000). Several analytical methods have been used in measuring consumer's acceptance and willingness to pay for products. These include; product improvement index model Thomas (2002), Analysis of Variance (ANOVA) (Mead *et. al*., 1993) and hedonic pricing method (Ladd and Martin, 1976).

The concept underlying hedonic models is that the price of a heterogeneous good is a function of the attributes of that good. The model then tries to capture the relative importance of each attribute in determining the price of the good (Ladd and Martin, 1976).

The approach is based on the assumption of perfect competition and utility maximization and that, participants are price takers and have full information and the product is assumed to be purchased by consumers for its attributes (Ladd and Martin, 1976).

Lancaster (1971) "a hedonic price function is a regression of observed prices of a commodity against its quality attributes". Waugh (1928) formulated hedonic price analysis based on the observation that the different lots of tomatoes, asparagus and cucumbers in the vegetable market in Boston, Massachusetts, showed considerable variations in price.

Waugh tried to identify those quality traits that were significantly influencing daily market prices. Rosen (1974) presented a model of product differentiation based on the hypothesis that any good is valued for its utility-generating, attributes. According to him, consumers evaluate product quality attributes when' making a purchase decision.

The general theory of hedonic pricing approach as reported by Lanpyintuo et al., (2003) closely follows a consumer goods approach and considers individual characteristics as utility providing attributes in utility maximizing problem. The characteristics of improved varieties of cowpea are not necessarily those priced by consumers. The most important preference for testa colour in West Africa is for white, but in some areas consumers prefer red, brown of mottled grains (Langyintuo et. al., 2003.

The availability of market for cowpea both domestically and regionally makes it a potential income and food security crop for the rural poor and so the need to understand its consumers, hence defining the market. The critical characteristic of a market is that it brings buyers and sellers together to set prices and quantities; leading to their definition of a market as a mechanism by which buyers and sellers interact to determine the price and quantity of a good or service (Samuelson and Nordhau, 1995; Adipala *et. al.*, 1999)

The hedonic prices for cowpeas can provide interesting insights into the role of product quality in cowpea markets, a complete understanding of the relationship between cowpea prices and other product characteristics including variety, storage method, grain size, can provide important information to market traders regarding appropriate marketing strategies to manage inventories, and for assigning priority to factors that augment price premiums. Furthermore, such information can allow plant breeders to assess the importance of key variety characteristics for strengthening the competitive position of cowpeas. A hedonic price model was therefore selected for this study.

Materials and Methods

The study was carried out in Ogbomoso Metropolis, which comprises of Ogbomoso North and Ogbomoso South Local Government Areas of Oyo State.

The weather is usually characterized by hot, bright days, except in rainy seasons. Primary data was used for this study. In all, 60 cowpea sellers were selected. The cowpea sellers were randomly selected from the major markets in Ogbomoso North (Sabo market and New Waso market) and Ogbomoso South (Arada market and Caretaker market) Local Government Areas of Oyo State, Nigeria.

The area is characterized by moderate temperature of 25.5^{0}c while the rainfall is modest too.

Due to the climate condition, the people are involved in crop farming and livestock farming mostly arable farming in form of maize, yam cowpea and vegetable generally.

The data was collected through the use of structured questionnaire. Information collected were input – output data as well as those on the socioeconomic characteristics of the farmers.

Price and non-price data was collected through a questionnaire directed at cowpea sellers. The questionnaire was translated into the local language to facilitate understanding of the questions by the sellers. In the market, the retail prices of purchased cowpeas were noted. Cowpea grains are usually being sold in bowl weights and one congo and this is equivalent to 1.64kg.

The prices were expressed in naira per kilogram. Other non-price variables that were observed and recorded were gender of sellers, variety of cowpea, the number of bruchid holes per 100 grains, skin texture and skin colour of purchased samples. In the laboratory, 100 grains of each sample was counted into cellophanes and the number of grains which has holes from the 100 grains were recorded. Data was analysed using descriptive statistics and hedonic pricing model. Descriptive statistics involved the computation of mean and frequency counts data was presented using tables and percentages. An analysis of covariance (ANCOVA) was used to estimate the relationship between cowpea price and cowpea characteristics.

Results and Discussion

Market

25% of the total respondents were equally selected from each of the four major cowpea markets in the study area which include *Waso* market and *Sabo* market (Ogbomoso North Local Government Area) as well as *Caretaker* market and *Arada* market (Ogbomoso South Local Government Area). A total of 60 cowpea sellers were drawn from the 4 major cowpea markets according to volume of cowpea sales and geographical spread of Ogbomosho metropolis.

Sex

50.0% of the cowpea sellers from all the 4 major markets male and female respectively. This could imply both women and male counterparts appreciate the crop.

Type of Cowpea sold

3.33% of the cowpea sellers sold only oloyin, while the other 96.67% of them sold the combination of different varieties (drum, sokoto, mala, olo, oloyin).

By implication, most of the respondents sell more than one varieties and that implies the respondents will have higher sales and more income generation over those selling oloyin alone.

Reason for selling each of the cowpea varieties

peu/drum

5.00% of the cowpea seller sold peu/drum cowpea because their customers confirmed its nutritive value, 11.67% of them sold it because their customers confirmed that it is easy to prepare. 73.33% of the cowpea sellers do not sell peu/drum cowpea for whatever reasons.

Hence by implication, peu/drum is not always available in the 4 major cowpea markets in the study area.

Sokoto white

26.67% of the cowpea seller sold sokoto white cowpea to their customers because it is popular, and 71.67% of them sold it to their customers because of its availability, while the rest 1.67% of them sold it because of the combination of different reasons which are popularity, availability, and cheaper in price.

By implication, most of the cowpea sellers sold sokoto white due to its availability and that implies that sokoto white is common in this part of the country when compare with other varieties.

Mala

66.67% of the cowpea sellers sold Mala cowpea because it is popular, and 23.33% of them sold it because of its availability, while the rest 10.00% of them sold it due to the combination of different reasons which are popularity, availability, cheaper in price.

Olo

60.00% of the cowpea sellers sold Olo cowpea because of its nutritive value, 40% of them sold it because it was easy to prepare. By implication, most of the cowpea seller sold Olo cowpea due to its nutritive value and that implies that both sellers and consumers are aware of the high protein content.

Oloyin

23.33% of the cowpea sellers sold Oloyin cowpea because of its ease of preparation, and 76.67% of them sold Oloyin cowpea due to a combination of different reasons which are easy to prepare, nutritive value, and availability.

Intended uses of cowpea purchased

3.33% of the cowpea buyers use the cowpea purchased for boiled whole grain cooking, while the rest 96.67% of them use the cowpea purchased for different uses which are for boiled whole grain cooking, for fried cowpea balls (akara) and for fried cowpea balls (akara).

Type of cowpea, buyers like best

For whole grain cooking

96.67% of them bought *Oloyin* cowpea for whole grain cooking. This implies that *Oloyin* cowpea is mainly bought for whole grain cooking.

For fried cowpea balls (akara)

91.67% of the cowpea sellers said that their customers bought *Sokoto* white cowpea for fried cowpea balls (akara). This implies that majority of consumers use *Sokoto* cowpea for fried cowpea balls (akara).

For steamed cowpea cake (moin-moin)

91.67% of the cowpea sellers said that their customers bought s*okoto* white cowpea for steamed cowpea cake (moin-moin). This implies that majority of consumers use s*okoto white* cowpea for steamed cowpea cake (moin-moin).

Reason for preference of Oloyin Cowpea by buyers for whole grain cooking

96.67% of the cowpea sellers said their customers prefer Oloyin Cowpea for whole grain cooking due to combination reasons as quick cooking quality, flavor and less weevil damage.

Reason for preference of Sokoto white cowpea by buyers for fried cowpea balls

86.67% of the cowpea sellers said that their customers prefer sokoto white cowpea for fried cowpea balls due to a combination of more than one reasons which are peeling quality, high foaming capacity and cheaper in price when compare to other cowpea's varieties.

Reason for preference of Sokoto white cowpea by buyers for steamed cowpea cake (moin-moin)

46.67% of the cowpea sellers said that their customers prefer sokoto white cowpea for steamed cowpea cake (moin-moin) due to a combination of factors like grinding ability, flavor and cheaper in price.

Storage chemical used to stored cowpea grain

13.33% of the cowpea sellers use wood ash, 38.33% of them use DD Force Insectides and 1.67% of them use the combination of more than one chemical preservatives. 46.67% of them did not use any storage chemical. This implies that over 50% of the cowpea use storage chemical which reduces the attack of weevils to be able to sell cowpea that has no or few numbers of bruchid holes.

Numbers of holes of cowpea per Congo

Peu/drum

In Waso market and Caretaker market, the peu/drum cowpea has an average of 13 numbers of holes per Congo. In Sabo market, the peu/drum cowpea has an average of 12 holes per Congo. In Arada market, the peu/drum cowpea has 11 holes per Congo.

Sokoto White

In Waso market and Arada market, the sokoto whit**e** cowpea has an average of 14 holes per Congo. In Sabo market, the sokoto whit**e** cowpea has an average of 18 holes per Congo. In Caretaker market, the sokoto whit**e** cowpea has an average of 16 holes per Congo.

Mala

In Waso market, the Mala cowpea has an average of 17 holes per Congo. In Sabo market, the Mala cowpea has an average of 16 holes per Congo. In Caretaker market, the Mala cowpea has an average of 14 holes per Congo. In Arada market, the Mala cowpea has an average of 13 holes per Congo.

Olo

In Waso market, the Olo cowpea has an average of 12 holes per Congo. In Sabo market, the Olo cowpea has an average of 11 holes per Congo. In Caretaker market, the Olo cowpea has an average of 15 holes per Congo. In Arada market, the Olo cowpea has an average of 12 holes per Congo. By evidence it suggests that cowpea sellers sort cowpeas to remove damaged grains.

Oloyin

In Waso market, the Oloyin cowpea has an average of 10 holes per Congo. In Sabo market, the Oloyin cowpea has an average of 13 holes per Congo. In Caretaker market, the Oloyin cowpea has an average of 10 holes per Congo. In Arada market, the Oloyin cowpea has an average of 12 holes per Congo. By evidence it suggests that cowpea sellers sort cowpeas to remove damaged grains.

Mean price of cowpea

The cowpea seller in the various sampled markets sold peu/drum, sokoto white, Mala, Olo and Oloyin at such mean prices as ₦359.67, ₦291.83, ₦324.00, ₦376.00, and ₦394.17 respectively. The result shows that Oloyin is the most expensive while sokoto is the cheapest.

Analysis of Covariance (ANCOVA)

The result from the analysis of covariance (ANCOVA) showed that there is a significant relationship between the number of holes in each of the cowpea varieties and their respective prices in the various markets sampled in the study area. By implications, the numbers of holes in each variety of cowpea significantly affect their respective selling prices. Hence, the higher the number of holes, the lower will be prices that will be charged per each variety of cowpea across the various markets in the study area.

Descriptive Statistics of Cowpea sellers and Characteristics of the sampled cowpea

Characteristics	Frequency	%
Market Distribution		
Waso	15	25.00
Sabo	15	25.00
Caretaker	15	25.00
Arada	15	25.00
Sex		
Male	30	50.00
Female	30	50.00
Type of Cowpea Sold		
Oloyin	2	3.33
Combination (Peu/drum,Sokoto Male,Olo0	58	96.67
Reason for selling drum		
Don't sell drum	44	73.33
Nutritive value	9	15.00
Easy to prepare	7	11.67
Reason for selling Sokoto		
Popular	16	26.67
Availability	43	71.67
Combination (Popular,Availability,Cheaper in Price)	1	1.67
Reason for selling Mala		
Popular	40	66.67
Availability	14	23.33
Combination (Popular, Availability, Cheaper in price	6	10.00
Reason for selling Olo		
Nutritive value	**36**	**60.00**
Easy to prepare	**24**	**40.00**
Reason for selling oloyin		
Easy to prepare	14	23.33
Combination (Easy to prepare, Nutritive value, Availability)	46	76.67
Intended uses of cowpea purchased by buyers		
Boiled whole grain cooking	2	3.33
Combination (Fried cowpea balls, Steamed cowpea cake and Others)	58	96.67
Types of cowpea, buyers like best for whole grain cooking		
Mala	1	1.67
Olo	1	1.67
Oloyin	58	96.67
Reason for Oloyin cowpea being preferred by buyers for boiled whole grain cooking.		
Quick cooking quality	2	3.33
Combination (Quick cooking quality, Flavour, Contain less weevil)	58	96.67
Types of cowpea buyer like for fried cowpea balls (akara)		
Sokoto	55	91.67
Mala	5	96.67
Reason for Sokoto White cowpea being preferred by buyers for fried cowpea balls		
Peeling quality	1	1.67
High foaming capacity	7	11.67
Combination(Peeling quality, High foaming capacity, cheaper in price)	52	86.67
Types of cowpea buyer like for steamed cowpea cake (moin-moin)		
Sokoto	55	91.67
Mala	5	8.33
Reason for Sokoto White Cowpea preferred by buyer for steamed cowpea cake (moin-moin)		
Flavour	1	1.67
Texture	1	1.67
Grinding ability	28	46.67
Combination (Flavour, Texture, Grinding ability, Cheaper in price)	30	48.01

Numbers of holes of peu/drum per Congo

Waso	14	15	25
Sabo	18	15	25
Caretaker	16	15	25
Arada	14	15	25
Total	62	60	100

Numbers of holes of Sokoto per Congo

Waso	14	15	25
Sabo	18	15	25
Caretaker	19	15	25
Arada	14	15	25
Total	62	60	100

Numbers of holes of Mala per Congo

Waso	17	15	25
Sabo	16	15	25
Caretaker	14	15	25
Arada	13	15	25
Total	60	60	100

Numbers of holes of Olo per Congo

Waso	12	15	25
Sabo	11	15	25
Caretaker	15	15	25
Arada	12	15	25
Total	50	60	100

Numbers of holes of Oloyin per Congo

Waso	10	15	25
Sabo	13	15	25
Caretaker	10	15	25
Arada	12	15	25
Total	45	60	100

Cowpea	Mean price (₦)
Peu/drum	359.67
Sokoto	291.83
Mala	324.00
Olo	376.00
Oloyin	394.17

Analysis of Co-Variance for average cowpea price (ANCOVA)

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Type of cowpea sold	1	35.92	3.81	3.81	0.08	0.784
Average no of hole/100	3	466.22	466.22	155.41	3.10	0.034
Error	55	2756.19	2756.19	50.11		
Total	59	3258.33				

Conclusions and Recommendations

This paper analysed cowpea markets and consumers' preferences in Ogbomoso metropolis using a household hedonic approach. 60 cowpea sellers were selected by a purposive random sampling technique in four major markets from Ogbomoso North (Sabo market and New Waso market) and Ogbomoso South (Arada market and Caretaker market) Local Government Areas of Oyo State, Nigeria. 50% of the cowpea sellers were male and female respectively. 96.67% of them sell more than one varieties. 96.67% of respondents sell a combination of varieties i.e. Peu/Drum, Sokoto, Mala, Olo

and Oloyin for their nutritive value, popularity and availability which may be used for boiled whole grain cooking, fried cowpea balls (akara), and steamed cowpea cake (moin-moin). Over 50% of respondents (cowpea marketers) use storage chemical which reduces the attack of weevils to be able to sell cowpea that has no or few numbers of bruchid holes. The mean prices of peu/drum cowpea, sokoto cowpea, mala cowpea, olo cowpea and oloyin cowpea are ₦359.67, ₦291.83, ₦324.00, ₦376.00, and ₦394.17. The analysis of covariance (ANCOVA) which was used capture price-quality relationship of the type of cowpea purchased by consumers revealed that there is a significant relationship between the number of holes in each of the cowpea varieties and their respective prices in the various markets sampled in the study area. Hence, the numbers of holes appear to be the major determining factors affecting the prices of various cowpea types in the study area.

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