

Analysis of Consumer Preference in Product Attributes: A Case of Indigenous Chicken Eggs in Kenya

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Abstract

Indigenous chicken eggs are highly preferred in Kenya by majority of both rural and urban consumers. In the recent past, research has focused on improving productivity levels resulting to Improved indigenous chicken eggs with less focus on consumer preferences. Despite their efforts, Indigenous chicken eggs dominate the market and the country is egg deficit. This study sought to identify and analyze preference attributes of indigenous chicken' eggs that influences choice and consumption. The specific objectives were to; identify and rank indigenous chickens' eggs attributes that influences choice and consumption and analyze the influence of these attributes on price of eggs. Multistage sampling technique was employed to select 180 respondents in Nairobi and Makueni counties. Kendall coefficient of concordance test was used to identify and rank the attributes of indigenous chicken' eggs while semi-logarithmic functional form of hedonic pricing model was employed to analyze the influence of eggs attributes on price. Results indicated that consumers buying indigenous chicken eggs prefer and are willing to pay premium prices for brown shelled, non oval eggs. Small and medium sized eggs were also more preferred and received price premiums compared to the larger sized eggs. Small and medium sized eggs were perceived to be organically produced with less chemical components. The study recommended for incorporation of this attributes by breeders. Farmers can enhance the preferred egg attributes by adopting better production systems while retailers can use the attributes in formulating appropriate marketing strategies in indigenous chicken eggs business.

Keywords: Attributes, choice, Hedonic pricing.

1. Introduction

Indigenous chickens(IC) contributes 71% of the total egg and poultry meat produced in Kenya and therefore impacts significantly on the rural trade, welfare and food security of smallholder farmers (Philip, 2007). Over 21 million people in rural areas depends on IC for livelihood support. Consumers exhibit high preferences for indigenous chicken eggs and are willing to pay 41.53% more compared to other eggs (Bett et al., 2011). This preference is due to increasing knowledge on health complications associated with food consumption (Changhee, 2011). Today's consumers want an ever-widening variety of food products with various characteristics of nutrition convenience, food safety, environment and other traits. In general, changes in food consumption patterns are primarily as a result from increase in income and changes in food prices. As income increases, so is the demand for quality and safety particularly for food products. The new awareness is attributed to dietary changes associated with more disposable income and urban growth. For instance, in 2005, Kenya produced 60,000 tonnes of eggs in shells and imported 240 tonnes to fill the shortage in supply (FAO, 2008). The deficit is an indication of the local market failure to stimulate production. Production of indigenous chicken is characterized by low levels of inputs and outputs (Okitoi, 2007)with low productivity levels, which limits their potential for commercialization. This has resulted in development of improved indigenous chicken that have high productivity levels compared to IC. Emphasize on IIC eggs through high productivity levels has left out consumer preferences which is an important component in product acceptability and marketing. Nonetheless, improved indigenous chickens' eggs have failed to fill the widening gap in demand for eggs and IC eggs continue to dominate market share. There is therefore a knowledge gap on what consumers prefer in the IC eggs that is probably not in the recently released IIC eggs. Lack of consumer preference analysis could be a factor that limits utilization and subsequently low production of newly released IIC eggs. The problem therefore is insufficient information on the factors that determine choice of eggs by consumers in the market. The overall objective of this study is to fill this gap in knowledge. The paper will achieve this through its twofold objectives; to identify and rank attributes of indigenous chicken eggs that influence choice and consumption and to analyze the influence of these attributes on price of eggs. The results will inform and guide producers of improved indigenous chickens' eggs on the management practices and production systems to adopt in order to enhance attributes that fulfils market requirements hence increasing chicken' egg prices and demand. Consequently, traders will be able to adopt strategies in transportation, handling, storage and transformation in order to improve retail level chicken egg prices through emphasis on retail level attributes that are important to end users.

Several studies have applied hedonic pricing to disentangle preference attributes from bundled goods and their economic valuation. Egg types have different attributes which determine their attractiveness to

consumers. These attributes are heterogeneous, making each egg type distinct. Hannah (2015), employed hedonic price model to analyze the effects of common beans attributes on price in Kiambu Kenya. Results indicated that consumers were willing to pay premium prices for taste, price and cooking time. Dalton (2003), used hedonic price model to evaluate consumption attributes perceived important by rice consumers in West Africa. Results showed that grain elongation and swelling were important in relation to the amount of rice prepared and the amount that can effectively feed a household. Timothy et al., (2006) sought to analyze cattle prices in central corridor of West Africa by employing hedonic price model. Specifically, the study was to determine if market participants have systemic preferences for cattle attributes and their willingness to pay premium price for the attributes. The results of the study indicated that animal age, sex, breed, body condition, purpose of purchase, season of sale and market location were the most significant factors influencing short run cattle prices in the study region. Ramatu et al. (2014) sought to determine the quality characteristics of dressed local and imported chicken that influence consumer preference and how these affect the prices of chicken. The study employed hedonic pricing model which indicated that consumers were willing to pay premiums for imported, non fatty and tender attributes of chicken. Changhee (2010) analyzed retail prices of eggs in Korea using hedonic price model in order to identify those attributes that affect prices and the respective value of each attribute. Results indicated that the status of eggs fertility, organic feeding and free range feeding are the main attributes that positively affect the retail price of eggs. Ahmad et al., (2013) employed conjoint analysis technique to determine preferences for eggs attributes in Malaysia. The technique was applied to establish the trade-offs that consumers make between size, colour, size of the package, functional attributes and price. Results indicated that large eggs, omega eggs, brown and ten per packs were ideal characteristics and consumers were willing to pay more for them.

The above studies indicate that there is an increasing interest in studying the demand for food attributes. However, little is known about the demand for food attributes among consumers in Kenya. This study therefore attempts to identify the relative importance and willingness to pay for IC eggs attributes demanded by Kenyan consumers using hedonic pricing model.

2. Materials and Methods

2.1 Theoretical framework

Egg types have different attributes which determine their attractiveness to consumers while making purchase decision (Becker, 1965 and Lancaster, 1966). According to these theories, consumers choose indigenous chicken eggs that maximize their utility based on consumption characteristics. The underlying assumption postulates that products consist of utility-bearing attributes and that the values of those attributes collectively contribute to the price of the product (Rosen, 1974). This approach is called the hedonic pricing method in which the price of indigenous chicken egg is viewed as a composite of implicit values/prices of each individual attribute. The price of a good is a function of the amount of attributes that it contains and of the values placed on them (Carman, 1997). This can be represented as:-

$$P = \beta_0 + \sum_{j=1}^m (\beta_j Z_j + \varepsilon) \dots \dots \dots (i)$$

Where the vector Z stands for a particular variable of indigenous chicken egg, β_0 is the intercept; β_j is the regression coefficient and ε is the random error term satisfying the classical regression assumption.

2.2 The study area and sampling

This study was conducted in Makueni and Nairobi counties of Kenya. Makueni county lies between latitude 1°35' South and longitude 37° 10' East (Makueni county integrated plan (CIDP), 2013). Nairobi county on the other hand lies between latitude 1° 17' south and longitude 36° 49' East and has nine sub counties. The target population for this study consisted of all consumers of indigenous chicken eggs in Nairobi and Makueni counties. Multistage sampling technique was used and 180 consumers selected in the four sub counties as follows; Kaiti 33, Makueni 57, Starehe 43 and Westlands 47 consumers.

2.3 Data Analysis

Data was collected using semi-structured questionnaire which ensured that responses gathered sufficiently meets the needs of all objectives within the study. Data collection was administered by well trained enumerators selected from the respective sub counties due to their familiarity with the geography of the area and native language. Data was analyzed using both descriptive and inferential statistics with the assistance of Excel and STATA Version 11.0 computer software packages. For the first objective, indigenous chicken egg attributes that were identified during preliminary survey were presented to consumers for confirmation and ranking using Kendall coefficient of concordance. In the second objective, hedonic pricing model was used to analyze the influence of IC eggs attributes on price.

2.4 Theoretical framework

Eggs differ in their physical characteristics. Such variations are exhibited in attributes such as; size, shell colour, shape, freshness and packaging. Indigenous chicken egg is represented as a bundle of characteristics or attributes which consumers consider while making their purchase decision (Becker, 1965 and Lancaster, 1966). According to these theories, consumers choose IC eggs that maximize their utility based on consumption characteristics. The underlying assumption postulates that products consist of utility-bearing attributes and that the values of those attributes collectively contribute to the price of the product (Rosen, 1974). This approach is called the hedonic pricing method in which the price of IC egg is viewed as a composite of implicit values/prices of each individual attribute.

$$P = \beta_0 + \sum_{j=1}^m (\beta_j Z_j + \varepsilon) \dots \dots \dots (i)$$

Where the vector Z stands for a particular variable of indigenous chicken egg β_0 is the intercept; β_j is the regression coefficient or the implicit price of the variable and ε is the random error term satisfying the classical regression assumption. The regression coefficient β_j indicate the marginal change of price with respect to a change in the j th characteristic; Z_j changes by one unit when all other marginal effects are kept constant.

2.4.1 Empirical Model

Regression equations were carried out for egg attributes on price. The price is the dependent variable upon which product attributes are regressed.

$$\ln p_i = \alpha_0 + \sum_{n=1}^k \beta_{shell\ color} + \sum_{n=1}^k \beta_{size} + \sum_{n=1}^k \beta_{clean} + \sum_{n=1}^k \beta_{shape} + \sum_{n=1}^k \beta_{package} + \sum_{n=1}^k \beta_{fresh} + \sum_{n=1}^k \beta_{region} + \sum_{n=1}^k \beta_{SD} + \varepsilon \dots \dots \dots (ii)$$

Where P is the price of IC egg in Kenya Shillings, SD represents socio-demographic factors influencing market price β_s are parameter estimates and ε is stochastic error term. Overall variables described above are dummy variables. In a semi logarithmic functional form (adopted for this study), the effect of a dummy variable on the dependant variable is not equal to the first derivative of the regression function with respect of the dummy variable in question, unlike the effect of a continuous variable (Kennedy, 1981). This implies that the first derivative (β) is a potentially imprecise approximation of the effect of the dummy variable on the dependent variable. Among the approaches available to correct this is the method suggested by (Kennedy 1981). Following this method, the effect of a change of x_k is from zero to one on P, can be calculated as follows (Kennedy, 1981).

$$g_k = \exp\left(\beta_k - \frac{1}{2} v(\beta_k)\right) - 1 \dots \dots \dots (iii)$$

Where $v(\beta_k)$ is the estimated variance of the estimated coefficient β_k

Table 1: Explanatory Variables and the Priori expectations for the study

Dummy Variable	Categories	Priori Expectation
Shell color	White	+
	Brown	-
Freshness	Fresh	+
	Otherwise	-
Shape	Oval	+
	Otherwise	-
Size	(extra large)	-
	small	+
	medium	+
	large	+

3.0 Results and Discussion

3.1 Socioeconomic characteristics of the sampled households

Out of the sampled respondents in both counties, 56% comprised of male while the rest were female as shown in table 2 implying that in Urban centres there is a large percentage of male as compared to women who in most cases are found in rural areas engaged in farming activities. This can be attributed to rural – urban migration in search of employment by majority of men (Table II). The mean age for the respondents was 36 years (table II). The youngest respondent was aged 17 years and was a male while the oldest was aged 85 years and was a female. The literacy rate of 96.5% seemed to be higher in the study area compared to the national average literacy rate of 87.01% (World Bank, 2009). Majority of the respondents; 48% had secondary level of education, 18% had primary level of education, 14% had Diplomas and 12% had Degrees. The average family size for the current study was 4 members with a minimum of 1 and a maximum of 11 family members. Among the sampled

respondents, 72% were married while 27% were single. 35% of the respondents received a monthly income of upto Ksh. 10,000 (table II). Only 21% of the respondents earned a monthly income of above Ksh. 30,000.

Table 2: Socio Economic Characteristics of the sampled households

Characteristic	%	MIN	MAX	MEAN	SD
Gender					
Male	57				
Female	43				
Age	—	17	85	36.09	12.89
Household size	—	1	11	4.1	2.35
Marital status					
-married	72.5				
-single	26.5				
-widow	0.5				
-divorced	0.5				
Monthly income					
<Ksh 10,000	35				
Ksh.10,000-20,000	28				
Ksh.20,000-30,000	16				
>ksh.30,000	21				

3.2 Attributes of I.C Eggs.

I.C eggs that were identified during the preliminary survey were presented to respondents for verification and ranking. The attributes were; shell color, size, shape, cleanliness, price, freshness and package. Results of Kendall's ranking indicated that size, price, shell color and freshness of the I.C eggs were the most important attributes influencing consumer choice and consumption. Cleanliness and Package of the IC eggs were the least ranked attributes influencing choice and consumption (Table III). The F-test results indicated that 36% of the respondents were in agreement on ranking of the IC eggs attributes at 99% confidence level. The null hypothesis was thus rejected and alternative which stated that there is significance agreement among respondents in ranking the IC eggs attributes adopted.

Table 3: Kendall Ranking of the Indigenous Chicken Eggs Attributes.

IC egg attribute	Rank	Sum of Ranks
Price	2	512.5
Size	1	502
Shell color	3	666.5
Cleanliness	6	829
Freshness	4	678.5
Shape	5	794
Package	7	917.5
N	175	
W	0.17	
F calculated	36.51	
F- Critical	2.10	
Significance	1%	

3.3 Influence of Indigenous Chicken Eggs Attributes on price

For the indigenous chicken eggs, a total observation of 180 respondents was made. The estimation of semi-logarithmic form of equation was completed using the ordinary least squares method (OLS). The model included seventeen independent variables which were all dummies with the exception of age and household size of the respondent. Heteroskedasticity and multicollinearity is a problem associated with cross-sectional data, hence they were tested using Breusch-pagan test and variance inflation factor (VIF) respectively. A mean VIF was 1.79 and no variable individually had a VIF of above 5 (rule of thumb) for presence of multicollinearity. The hypothesis for homoskedasticity in error term was thus accepted ($P > 0.10$). The significant effect of each independent variable on the price of eggs was tested with a t-statistic. The hypothesis of a coefficient not different from zero is rejected for one variable at $\alpha = 0.01$, three variables at $\alpha = 0.05$ and two variables at $\alpha = 0.10$. The remaining variables are found statistically insignificant. Insignificant coefficients of the variables suggested that consumers either do not have adequate information to incorporate the characteristics into their buying decisions or that they place no value on such attributes when they buy indigenous chicken eggs. The results of F-test ($F = 3.41$ significant at one percent) indicates that the independent variables as a set significantly affect the

dependent variable (Price of I.C egg). The R-square (0.26) indicates that 26% of the variability in I.C egg price is explained by the empirical model. Table IV shows estimates of coefficients, corresponding standard errors and marginal implicit prices. Marginal implicit prices are calculated by multiplying the average price with the relative change which is the corrected unbiased partial derivative of price with respect to each product attribute (Kennedy, 1981). The attributes are interpreted with respect to the default dummies (Gujaratti, 1995). White shell color is negatively related to price. *Ceteris paribus* a change in shell color from brown to white significantly ($P < 0.05$) results in 8.1% decrease in price of indigenous chicken eggs. This indicates that compared to brown eggs, white eggs will attract price discounts of Ksh.1.4/egg. This is contrary to our expectation of price premium in favour of white shell. The study found that 78% of respondents preferred white eggs compared to 22% who had purchased brown shelled eggs. This implies that although consumers show preference for white shell, they are unable to value it while making purchase decision probably because of wide spread brown eggs. The estimated implicit price show a strong potential for developing niche markets for I.C eggs. This attribute was ranked third in importance by consumers while making their purchases. Cleanliness and freshness, though with an expected positive relationship to price, were not significant ($P > 0.10$). There was no significance difference between prices of clean and non clean eggs and fresh and non fresh eggs. Further still during Kendall ranking of attributes' importance, the two attributes ranked least on the scale. This indicates the wide availability of fresh and clean eggs in the market to the extent that consumers do not make distinction between the two categories when valuing eggs. Shape of an I.C egg significantly ($P < 0.10$) influenced the price of eggs. *Ceteris paribus* the price of an oval egg tends to be 7% (Ksh. 1.25/egg) less compared to that of a non oval egg. This premium price for non oval eggs could be attributed to other specific roles/purposes upon which such eggs are purchased (beautification, tourism or breeding) and the perception that they have more value than the ordinary oval eggs. Indeed, the study only found out that only 6% of consumers had purchased non oval eggs implying the scarcity nature of such eggs. This implies that breeders, producers and retailers can capitalize on this new emerging market by increasing such eggs in the market. As expected, eggs prices are found to be significantly influenced by the size. Small sized eggs were found to significantly ($P < 0.10$) positively influence market price. *Ceteris paribus*, the price of a small sized egg tends to be 15% (Ksh. 2.76/egg) more than that of an extra large egg (default). Consequently, medium eggs significantly ($P < 0.05$) influenced price and the price of a medium sized egg tends to be 9% (Ksh. 1.77/egg) more than that of an extra large egg *ceteris-paribus*. This study also found out that consumers bought 7%, 52%, 38% and 3% of small, medium, large and extra large eggs respectively. This implies the perception that small eggs are produced organically and hence more nutritious with minimal health related problems than large and extra large eggs which showed no significant difference in their prices. Producers and retailers should endeavour to fulfil this niche market by targeting it with small and medium sized eggs so as to fully maximize on returns. The study also found that size was the most ranked egg attribute in making the purchase decision. The price of eggs was also found to respond to other socio-economic attributes such as household size and region. The study found that large household paid a premium of 2.0% compared to small sized households indicating market imperfection. This was significant at ($P < 0.01$). On the other hand, price of eggs varied significantly across sub counties, for instance the price of eggs in Westlands were 15% (Ksh.2.7/egg) higher ($P < 0.5$) than the price of eggs in Kaiti. Consequently, consumers in Makueni and Starehe paid premium compared to those in Kaiti although this was not statistically significant. The price difference is due to differences in geographical locations and socio-economic status of the consumers in these regions.

Table 4: Estimation of Hedonic Price Model for Indigenous Chicken' Eggs

Variable	Coefficient	Std error	Relative impact	Implicit price(Ksh.)
Shell color(white)	-0.07920**	0.03230	0.0818	1.4
Freshness(fresh)	0.0446	0.0334	0.0450	0.8
Shape(oval)	-0.0687*	0.0389	0.0703	1.25
Cleanliness(clean)	0.01860	0.03648	0.01809	0.32
Size (extra large)	Default	-	-	-
small	0.1463*	0.0750	0.1542	2.76
medium	0.0954**	0.0459	0.0989	1.77
large	0.06409	0.0430	0.06529	1.16
Sub county (Kaiti)	Default	-	-	-
Westland	0.1423**	0.0584	0.1509	2.70
Starehe	0.02364	0.05361	0.0224	0.40
Makueni	0.0182	0.0482	0.0171	0.307
Gender (Male)	0.0392	0.03018	0.0395	0.70
Education	0.0050	0.0133	0.0049	0.88
Income	0.0121	0.01020	0.0121	0.21
Age	0.0000	0.0012	0	0
Marital status	-0.01043	0.0327	0.0099	0.17
House hold size	0.01936***	0.0058	0.0195	0.34
Constant	2.6271	0.1188		
F	3.41***			
R²	0.2637			
Adjusted R ²	0.1864			
N	180			

4.0 Conclusion

The objective of the study was to establish consumer preference attributes in indigenous chickens' eggs. Hedonic pricing model was employed to analyze preference attributes and their influence on price in Makueni and Nairobi counties. Findings of the research have shown that shell colour, size and shape are important attributes influencing price and consumption of IC eggs. Furthermore, socio-demographic characteristics of the respondents such as household size and region (sub-county) influenced prices of indigenous chicken eggs confirming existence of market imperfection in the I.C market. Results also imply that with the increasing rational buyers faced by abundant choices of product in the market particularly eggs, the market can survive only by fine tuning the value delivery process. The study made the following recommendation; first, Farmers in the study region and beyond should consider altering their feeding and management practices of indigenous chicken so as to influence incorporation of preference attributes in the IC eggs for sale through quality feeds and sound production systems. Second, researchers should incorporate attributes of choice based on consumer preferences in their breeding work to enhance acceptability of eggs in the market. Mass media may help promote the attributes of interest to consumers. However, these findings are subject to the limitations of this study. The data was collected from four sub counties in Kenya and hence may not reflect the overall behaviour of Kenya egg consumers because the demographic distribution of shoppers in the data set may differ from general Kenyan egg consumers. Consequently, the selection of attributes and their levels is limited to pilot survey done; it is most likely that there are other attributes of eggs that are important to the consumers beyond those studied.

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