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Assessing Consumer Priority Attributes in Indigenous Chicken Products: Implications for Marketers

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Abstract
Principal component analysis was applied to assess consumer priority attributes of indigenous chicken eggs and meat in Kenya. Results show that whereas in Makueni consumers considered skin color, tenderness, size and price to be important attributes influencing their choice and preferences for IC meat, in Nairobi the focus was on freshness, sex, skin texture and price as the major significant quality attributes that influenced purchase decisions. The findings could be used for developing quality standards for chicken meat and eggs and gradually revise such standards as more empirical information on changing consumer demand for quality become available.
Keywords: Attributes, Priority, Indigenous chicken,

1.0 Introduction

Indigenous chicken (*Gallus domesticus*) plays important roles among many Kenyan households by contributing towards food and nutritional security. They provide a key source of proteins from meat and eggs for human diets. The subsector also serves as a source of households' income and employment (ASDS, 2010). Indigenous chickens are widely distributed across most African countries (Gueye, 2003). In East African region, consumers generally prefer indigenous to exotic birds breeds due to the perception that it tastes better, nutritious and the perceived health benefits (USAID, 2010). Poultry contributes 55% to the livestock sector, 30% to the agricultural sector and 7.8 % to the GDP (USAID, 2010). The sub sector also employs 2 – 3 million people in Kenya. In 2010 the total number of chickens in Kenya stood at 37.3 Million distributed as follows: 84% indigenous, 5.7% broilers, 8.3% layers and 1.7% other birds (USAID, 2010). White meat (Poultry and Pig) accounts for about 19% of the meat consumed in Kenya locally and for export (Export Processing Zone Authority [EPZA], 2005).

The indigenous chicken contributes 71% of the total egg and meat produced and therefore, influencing significantly on the rural trade, welfare and food security of the smallholder farmers (Nyaga, 2007). In Africa, the average per capita consumption of poultry meat is 4.5 kg (USAID, 2010). In Kenya, poultry meat consumption is expected to increase from 376,200 metric tons(MT) in 2010 – (2kg per capita as a rough average estimate) to 1,124,505 MT in 2020- (4.5 kg percapita – African average per capita consumption in 2010(USAID, 2010).These represent a 200 Percent increase over the consumption in 2010.

The growth in demand for poultry meat and eggs from indigenous birds in Kenya, particularly in urban areas is high. This is due to perceived taste, toughness and freedom from chemical contaminants. During the purchase process, consumers follow a process which includes examining attributes within a product that gives them the highest satisfaction. Marketers on the other hand strives to maximize sales of their products. Knowledge on the priority attributes that consumers seek in both IC eggs and meat is scanty and undocumented. These paper fills this knowledge gap by assessing priority attributes in indigenous chicken meat and eggs. Findings will inform marketers on appropriate product selection resulting into revenue maximization through increased sales.

2.0 Materials and Methods

2.1 The study area

This study was conducted in Makueni and Nairobi counties of Kenya. Makueni was selected for the study because poultry production is a major economic activity in the area due to its location in the arid and semi-arid region where crop production becomes unfavourable. Furthermore, in 2015, Makueni produced 2,178 tonnes of poultry meat making it the fourth largest producer in the country (GoK, 2015). Nairobi is included since it forms the main terminal market as well as abattoir for indigenous chicken that comes from Makueni and other regions in Kenya. The market serves consumers of diverse socio economic orientation. Being the capital city, the population is therefore composed of consumers from different backgrounds who are expected to have diverse preferences. Consequently, up to 60% of indigenous chicken produced in Makueni is sold in Nairobi (MoLD – Makueni, 2013). Makueni county lies between latitude $1^0$35' South and longitude 37^0 10' East. Rainfall ranges from 300mm to 1200mm in the high areas. The altitude range is 600 meters to 1900 meters above sea level. It lies in the arid and semi-arid zones of the eastern region of the country hence making it suitable for livestock production (Makueni County Integrated Development Plan, 2013). Two sub counties; Kaiti and Makueni out of six sub counties were purposely selected for the study. Nairobi county on the other hand lies between latitude 1^0 17' south and longitude 36^0 49' East and has nine sub counties. The county has a total area of 696.1 KM^2 with an estimated population of

3,942,054(Kenya Bureau of Statistics, 2013). Temperature ranges from 10^0c to 29^0c. It has a bimodal rainfall pattern with long rains falling between March and May and short rains experienced between October and December. The mean annual rainfall is 786.5 mm. Consequently, two sub counties; Westlands and Starehe were selected for the study.

2.2 Sample size

Determination of the sample size was based on the formula below as specified by Cochran (1963) and used in Kothari (2004).

$$n = \frac{z^2 pq}{e^2}$$

n is the sample size,

p is the proportion of the population (50%) containing the major attributes of interest(consumption of indigenous chicken and eggs). This is chosen because the proportion of population consuming IC meat and eggs is unknown.

Q is 1-p,

Z is the standard variation of 1.96 given a confidence level of α =0.05 and

e is the acceptable precision level of 6.93%

A sample size of 200 was thus selected based on the following computation;

1.96x1.96x0.5x0.5/0.0693x0.0693 = 200

2.3 Data Analysis

Data collected was analyzed using both descriptive and inferential statistics with the aid of Excel and STATA version 11 software.

2.3.1 Priority attributes considered in indigenous chicken meat and eggs

To assess attributes of indigenous chicken meat and eggs that influences choice and consumption, a five point likert scale analysis of 11 items for IC meat and 7 items for IC eggs was used. Principal component analysis is used to reduce large number of variables into a few components that explains most of the variation in the original variables. Variable reduction into a few components eliminates redundancy which occurs when variables are highly correlated. The procedure involved execution of five steps which led to the generation of principal components. The first step involved testing for internal reliability using Cronbachs' Alpha where a value greater than 0.7 indicates internal consistency among the variables and value less than 0.7 is unreliable (Cronbach, 1951). In the second step, all the variables were subjected to a Kaiser Meyer Olkin (KMO) test to ensure sampling adequacy. Based on KMO rule, variables with a value equal to or greater than 0.6 can be used for further analysis (Vines, 2000). The third step involved calculation of eigen values and accumulative variance proportion. Eigen values indicate the total variance explained by a component on the variables. The component that had eigen values equal to or greater than 1 were considered in the next step while those with eigen values less than 1 were dropped from the subsequent analysis (Kaiser, 1974). Significant components were subjected to Varimax rotation in order to minimize the number of variables with high loadings on the components. Consequently, varimax is an orthogonal rotation that ensures variables are not correlated. The final step in principal component analysis involved interpretation of principal components based on the variables that produced high correlation coefficient with respective component. Consequently, variables that had a correlation coefficient of 0.3 or more were retained from the Varimax rotation and were used in explaining the components (Tabachnick and Fidell, 2011).

3.0 Results and Discussion

3.1 Priority attributes for indigenous chicken meat

Eleven variables were subjected to Principal component analysis (PCA) in order to derive new variables through variable reduction technique. The first step in the process involved testing for reliability in variables. Consequently, Cronbach's alpha was used to test for internal reliability and a reliability coefficient of 0.710 for Makueni and 0.73 for Nairobi implied that factor analysis through PCA is possible. The second step involved testing for sampling adequacy where KMO values of 0.655 and 0.651 for Makueni and Nairobi respectively implied that the data was adequate to conduct PCA analysis. Table 3.1 shows extraction of eigen values, proportion and cumulative explained by all the components. The proportion indicates the total variance in variables which is explained by the component in consideration while total cumulative explains the total variation in variables that is explained by all the significant components. According to Kaiser (1974), significant components are those that yield eigen values greater than 1. Results in Table 3.1 indicate that in both Makueni and Nairobi, four components were extracted with eigen values greater than 1. These four components explained 61% and 63% of the variance in the variables for Makueni and Nairobi data respectively. The four components are therefore important in explaining consumer priorities and choice for indigenous chicken meat in Makueni and Nairobi Counties. The eigen values were plotted against their corresponding components to produce a scree plot. The number of significant components coincided

to the point on the scree plot.

The significant components were rotated using varimax rotation which gave loading coefficients (Table 3.2). The rotated variable coefficients were used in the interpretation of the principal components based on which variable had the strongest correlation with the respective component.

Table 3.1: The eigen values of the extracted components

	MAKUENI			NAIROBI		
Component	**Eigen values**	**Proportion**	**Cumulative**	**Eigen values**	**Proportion**	**cumulative**
Component 1	2.933	0.266	0.266	2.531	0.230	0.230
Component 2	1.614	0.146	0.413	1.919	0.174	0.174
Component 3	1.129	0.102	0.516	1.380	0.125	0.530
Component 4	1.032	0.093	0.610	1.099	0.099	0.630

Extraction Method: Principal Component Analysis.

Skin color, freshness and smell had the highest weights in component one in Makueni. Component 1 can therefore be regarded as representing appearance. These results indicate that skin color of IC is highly considered by consumers before making a purchase decision. Yellow skin color in IC is associated with the nutritive component of the meat making it highly preferred. In Nairobi, freshness and smell was highly correlated with component 1. This indicates that consumers in Nairobi consider freshness as a major determinant of choice and consumption of indigenous chicken. Fresh meat is considered to be tastier than frozen meat as preservation results in loss of nutrients and taste. This implies that traders should endeavor to supply live and fresh IC to consumers in order to increase their sales. These results are consistent with the findings of other researchers; Nantachai et al. (2007) established that brown and yellow meat color was highly correlated with chicken prioritys in Thailand, Prameela and Husain (2007) argued that product features such as taste and freshness determined consumers' choice and priority. However, the findings contradicts those of Toluwase et al. (2017) who found that freshness reduced the priority and choice for local chicken in Ghana while imported, frozen and cheap chicken meat was highly preferred. To guarantee freshness in IC, there have emerged small slaughter sites managed by IC traders to assist in slaughtering live chickens bought by their customers. This trend should be replicated by IC traders all over the country to enhance their sales.

The second component was highly correlated with tenderness and age in Makueni which implied that this component can be regarded to represent tenderness in meat. The probable reason for tender meat is due to ease in preparation and the softness in chewing. In Nairobi, component 2 is highly correlated to sex and tenderness. Male ICs are preferred due to their tendency to have low fats and are big in size at an early age hence making them tender at maturity compared to the females. This result corroborates with the findings of other researchers; Aklilu (2007) found out that buyers look at the age of chicken when they buy them for different purposes while Sodjinou, (2014) indicated that consumers paid premium prices for chickens between 6 – 12 months. Higenyi et al. (2014), found that age, sex and tenderness were considered by consumers while purchasing native poultry in Uganda. However, the results contradict those of Sodjinou, (2014) who found that sex of chicken and guinea fowl in Benin did not influence their consumption. Increasing production of male IC will increase sales revenue for producers due to priority for male chicken by consumers

The third component was highly correlated with size, sex and skin texture in Makueni while in Nairobi, skin texture and skin color were highly correlated with the third component. The components therefore represent size and appearance respectively for Makueni and Nairobi. These findings indicate that Makueni consumers consider size of chicken before purchase and prefer large IC. Accordingly, Nairobi consumers consider texture of indigenous chicken while making purchase decision. The probable reason for this is the perception that high utility is derived from big IC in Makueni while in Nairobi consumers perceive smooth texture to represent tenderness in meat. The findings are in consistence with those of Higenyi et al. (2014) who established that texture, taste and flavor were the most significant meat quality attributes for consumption and use of native poultry in Uganda. Nantachai et al. (2007) found that smoothness influenced consumer priority for chicken meat in Thailand.

The fourth component was correlated with price in both Makueni and Nairobi. This component can be regarded as representing cost in consumer prioritys and choice. This indicates that consumers incorporates price of the product in their purchase decisions and hence price reduction can increase consumption levels. This results are consistence with the findings of the logistic regression where the odds in favor of frequent consumption increased by 1.0068 and 1.0055 in Makueni and Nairobi respectively for unit increase in price in the price of indigenous chicken. These findings however are in contrast to the findings of Toluwase et al. (2017) who established that price of chicken did not significantly influence consumer priority in Ghana.

Table 3.2: The Varimax Rotation for meat components

	MAKUENI				NAIROBI			
Variables	**Comp 1**	**Comp 2**	**Comp 3**	**Comp4**	**Comp 1**	**Comp 2**	**Comp 3**	**Comp4**
Price						-0.6757		0.6818
Size			0.6112					0.5784
Plumage color		0.3876					0.3881	
Skin texture			0.3981				0.6074	
Age		0.4834				0.4516		
Smell	0.4334					0.5762		
Freshness	0.5336					0.6123		
Tenderness		0.5758				0.5136		
Fat content						0.5951		
Sex			0.6075				0.6169	
Skin color	-0.5381						0.5576	

3.2 Priority attributes for indigenous chicken eggs

Principal component analysis (PCA) was used to derive new variables significant in IC eggs through variable reduction technique. The first step involved testing for reliability in variables. Cronbach's alpha was used to test for internal reliability and reliability coefficients of 0.71 and 0.70 for Makueni and Nairobi respectively implied that factor analysis through PCA is possible. The second step in PCA involves testing for sampling adequacy (Kaiser, 1974). KMO values of 0.71 and 0.75 were obtained for Makueni and Nairobi respectively. The values indicated that PCA can be conducted. The third step involved extraction of eigen values using PCA. Table 4.8 shows extraction of eigen values, proportion and cumulative explained by all the components. The proportion indicates the total variance in variables which is explained by the component in consideration while total cumulative explains the total variation in variables that is explained by all the significant components. According to Kaiser (1974), significant components are those that yield eigen values greater than 1. Results in Table 3.3 indicate that in both Makueni and Nairobi, two components were extracted with eigen values greater than 1. These two components explained 55% and 52% of the variance in the variables for Makueni and Nairobi respectively. The two components are therefore important in explaining consumer priorities and choice for indigenous chicken eggs in Makueni and Nairobi Counties.

The components were rotated using varimax rotation which gave loading coefficients (Table 3.4). The rotated variable coefficients were used in the interpretation of the principal components based on which variable had the strongest correlation with the respective component. A correlation value of 3.0 and above was used in this study to indicate strong association between the original variables and the principal components.

Table 3.3: The Eigen values of the extracted eggs components

	MAKUENI			NAIROBI		
Component	**Eigen values**	**Proportion**	**Cumulative**	**Eigen values**	**Proportion**	**cumulative**
Component 1	2.5734	0.3676	0.3676	2.5489	0.3641	0.3641
Component 2	1.2750	0.1822	0.5498	1.0693	0.1528	0.5169

Extraction Method: Principal Component Analysis.

Table 3.4: The Varimax rotation for eggs components

	MAKUENI		NAIROBI	
Variables	**Comp 1**	**Comp 2**	**Comp 1**	**Comp 2**
Price		0.6528	0.5334	
Size		0.6669	0.5323	
Shell color	0.3912		0.4691	
Cleanliness	0.5278			0.5714
Freshness	0.4918			0.7099
Shape	0.4978			0.3881
Packaging			0.3508	

The first component highly correlated with cleanliness and shape of an egg in Makueni and price and size of an egg in Nairobi. The first component can be considered to represent egg appearance in Makueni. This indicates that consumers in Makueni consider cleanliness and shape of an egg before making purchase decision. Shell color and freshness also had high factor loadings in this component implying their relevance in purchase decision. In Nairobi, the first component can be considered to represent value of an egg which is anchored on price and size. The result implies that consumers in Nairobi are more focused on the price of an egg and its size while making purchase decisions. The probable reason is that eggs that are large in size give more utility to consumers than small sized eggs. Accordingly, low price for eggs implies high purchasing power and hence consumers can increase the quantity of purchase. Conversely, in Makueni consumers perceive clean eggs to be an indicator of freshness hence more taste. These findings corroborate with those of other researchers; Senbeta et al. (2015) found that consumers preferred large eggs with brown color in Ethiopia while Hanis et al. (2013) established that consumers paid premium prices for large and brown colored eggs. Players in the egg distribution chain should therefore endeavor

to market large sized eggs in Nairobi and clean eggs in Makueni to maximize their returns.

The second component is correlated with size and price in Makueni and freshness in Nairobi. The component can therefore be regarded to represent value and appearance for Makueni and Nairobi respectively. The attributes of choice in the two counties are dissimilar; whereas Nairobi consumers give priority to price and freshness, in Makueni priority is given to cleanliness and size. The probable reason for sensitivity to freshness among Nairobian egg consumers can be attributed to the fact that most eggs consumed are imported from other regions and hence the likelihood of loss in quality for eggs while in stores and transit. Value chain players need to optimize in quality preservation of eggs while in transit and stores to increase revenue.

4.0 Conclusion and Recommendations

Principal component analysis (PCA) was conducted to evaluate attributes of indigenous chicken meat and eggs that influences choice and consumption. The analysis showed that whereas in Makueni consumers considered skin color, tenderness, size and price to be important attributes influencing their choice and preferences for IC meat, in Nairobi the focus was on freshness, sex, skin texture and price as the major attributes that influenced their consumption. In indigenous chicken eggs, cleanliness and size were considered the most important attributes by consumers in Makueni while price and freshness influenced choice and consumption for Nairobi consumers. Traders should improve on their transport and storage facilities so as to maintain quality of indigenous chicken products before reaching final consumption point. Establishment of slaughter facilities at each market to ensure that consumers access fresh indigenous chicken will increase marketers margins. Finally, traders should present and package IC products with priority attributes to increase on sales volume and revenue.

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