

CONSUMER WILLINGNESS TO PAY FOR QUALITY BEEF IN KAMPALA, UGANDA

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Abstract

Limited information on beef consumer preferences and beef quality are among the major challenges that impede development of Uganda's beef industry. This study aimed at determining the quality attributes and socio-economic characteristics that influenced the choice of beef bought by consumers and influenced their willingness to pay. The study surveyed 300 beef consumers in Kampala City and used a hedonic pricing model of analysis. The Hedonic Pricing model results indicated that income and beef attributes i.e. bone content, fat content, colour of the lean and colour of fat significantly influenced willingness to pay. The study concluded that there is a high willingness to pay for quality beef. The identified attributes could be used as a basis for establishing a grading or classification scheme for beef into economically distinguishable classes. This information may also be used by the various beef value chain actors to make improvements in their activities in an effort to meet consumer choices with different levels of willingness to pay.

Key words: Consumer, beef quality attributes, willingness to pay

1.0 Introduction

The global beef sector has suffered the most from the falling demand resulting from the post-2008 economic recession (OECD and FAO, 2011). Principally due to comparatively higher prices of beef, consumers have tended to switch from beef to other meats. Globally, growth in beef consumption has been lower compared to meat substitutes such as pork and chicken (FAO, 2011). Beef production in Uganda is estimated at 160,000 metric tons. However, it remains under-consumed in the country (FAO, 2007). The per capita consumption is 6kg compared to 50kg recommended by the FAO and WHO (FAO, 2007). Uganda has one of the best climates in Africa, one that is moderate with cool temperatures, and it receives rainfall throughout the year. This climate offers a conducive environment for growth of natural pasture and survival of animals, hence a comparative advantage for cattle rearing and beef production (Ministry of Agriculture Animal Industry and Fisheries (MAAIF), 2002). Uganda's beef industry provides subsistence and cash incomes to producers and livelihood to dealers in its trade (MAAIF, 2002). Beef contributes 17 % to 19% to agricultural GDP and 7% to 9% to the National GDP (MAAIF, 2002). Consumption of beef remains dominant in urban households compared to those in rural areas. A study undertaken by the Uganda Beef Producer Association (UBPA) in 2005 showed that 63% of the beef produced in the country is consumed in Kampala, where more than half of the population consumes beef every day. In addition, the results revealed that 90% of beef consumers buy fresh meat or at least meat that looks fresh (UBPA, 2005).

Limited information on beef consumer preferences (Baffoe, 2000) and beef quality (MAAIF, 2008) remain among the major challenges that impede development of Uganda's beef industry. The quality of beef supplied in Uganda's beef market varies in terms of fat content, bone content, fat colour and lean colour (UBPA, 2005). However, no empirical evidence exists to show preference of beef quality attributes and willingness to pay for such attributes among beef consumers. The government of Uganda is pursuing a strategy of "government intervention to promote production, processing and marketing of selected products" including beef (Kiziba, 2008). Such an intervention requires information on beef quality preferences of consumers to ensure that production meets beef consumers' quality demands.

According to Tey *et al.* (2008), producing beef that offers desirable eating experience and fits consumers' lifestyles was identified among the pre-requisites to increase beef demand among household beef consumers in Malaysia. Previous studies (Miller *et al.*, 2001; Lusk *et al.*, 2003; Feuz *et al.*, 2004; Killinge *et al.*, 2004; Kynda *et al.*, 2008) have found that some attributes such as beef tenderness, colour, flavour and marbling influence consumers' willingness to pay for beef. Besides, willingness to pay has also been found to be influenced by socio-economic characteristics including gender, age, income and education of the buyer. Selim *et al.* (2003) established the number of children, household size, educational level and income

as among important household characteristics that influenced fluid milk purchasing behaviours. Loureiro and Hine (2001) observed that the likelihood to purchase organic products and pay a premium price increased with increase in income and education levels of consumers. Carlos *et al.* (2005) found that women, youth, high-income class, and educated people were willing to pay an additional premium price for an organic product perceived to have good quality.

The current government effort to promote beef marketing necessitates promoting production of meat that meets the quality preferences and demand capacity of consumers. However, there is a knowledge gap on the factors influencing consumer choice for beef in Uganda. Thus, this study was formulated to determine quality attributes that influence the type of beef to buy and the beef attributes and consumer characteristics that influence willingness to pay for quality beef in Uganda.

2.0 Materials and Methods

2.1 Theoretical Framework

Most of the willingness-to-pay studies already mentioned have been based on the theory of consumer utility maximisation. The theory assumes a good with a myriad of attributes that combine to form bundles of utility-affecting attributes that a buyer bases on to make choice (Ho-Shui and Houston (2001). Consumers are therefore assumed to choose among all the available alternatives in such a manner that the level of satisfaction derived from consuming commodities is highest. Their preference for particular product attributes depends on the utility derived from the product attributes which subsequently determine their willingness to pay (Henderson and Quandt, 1980). The hedonic price model has been used in measuring consumers' willingness to pay for food product attributes (Shannon, 2001; Hayes and Lence, 2000; Sloof *et al.*, 1996; Schroeder and Mark, 2000; Carlos *et al.*, 2005; Akankwasa, 2007) and the contingent evaluation method (Loureiro and Umberger, 2003). This study adopts the hedonic price model because it theoretically captures the relationship of beef attributes and their influence on the price consumers are willing to pay for quality beef. The model estimates marginal intrinsic prices to indicate the influence of each attribute on the average price consumers are willing to pay for beef. A comparison of the magnitudes of the intrinsic prices of the attributes enables one to determine the quality attributes most influential on willingness to pay.

An advantage of the hedonic pricing method over the other economic models is the ease of use in analysing consumption data on quantity, prices, and other consumer socio-economic characteristics. The basic premise of the hedonic pricing method is that the price of marketed goods, such as beef, is related to its quality and quantity. An underlying assumption of the hedonic model is that goods can be distinguished by various product characteristics. As a result, marginal or implicit values can be

estimated for each characteristic at the observed purchase price, which is linked to the presence of the particular characteristic. Thus, the prices individuals would be willing to pay for the good would depend on the relative importance they attach to a set of attributes of the good, based on the utility derived from the attributes.

The hedonic price model by Lancaster (1966) and Rosen (1974) derived from the “consumer utility maximisation theory” was used for data analysis. The model assumes that the price consumers are willing to pay for a particular product depends on the satisfaction derived from the product’s attributes and other factors (Lancaster, 1966). The model may take on several basic functional forms such as linear, semi-log, and log-log. A regression of the price of a commodity or good on its attributes yields the implicit (intrinsic) price of each attribute of interest, which represents the value of each attribute and its contribution to the price of the commodity.

2.2 Specification of the Empirical Model

The consumer’s decision process is modelled using a random utility framework. Consumer utility $U(x,y)$, is assumed to be augmented with beef attributes (x) and socio-economic characteristics (y) which may affect their choice. Consumers are assumed to pay a price m for beef which they perceive to be of the best quality (with quality attributes of their preference). Mathematically, this can be represented as:

$$U(x_0, y) \leq U(x_1, y - m) \dots\dots\dots(1)$$

where 0 and 1 denote the choice of beef with the non-preferred and preferred attributes respectively. The consumer’s utility function is known if some components are observable, and thus can be considered random variables from the researcher’s standpoint. Utility therefore can be decomposed into an observable part and error term, ϵ_i .

Mathematically, $U(0, x, y) = V(1, x, y - m) + \epsilon_i$.

The random error term ϵ_i is assumed to be independently and identically distributed with a mean of zero. The consumer’s decision to pay a price m in terms of utility is expressed as:

$$V(0, x, y) + \epsilon_0 \leq V(1, x, y - m) + \epsilon_1 \dots\dots\dots(2)$$

Applying first order conditions for the choice of attributes x , we get

$$\partial u / \partial x_0 * \partial x_1 / \partial u = \partial p / \partial x_0 \dots\dots\dots(3)$$

Equation 3 states the law of equi-marginal utility between two goods x_0 and x_1 . $\partial p / \partial x_0$ is the marginal price for characteristics x and corresponds to the regression coefficients when estimating equation (1).

The hedonic price function for beef expresses the market price consumers are willing to pay (WTP) for beef as a function of the beef attributes and socio-economic characteristics of consumers. Thus, the relationship can be expressed as:

WTP = f (beef attributes, socio-economic characteristics)

The Hedonic Price Model was specified in linear form as follows:

$$WTP_i = P_i = \alpha + \sum_{i=1}^n \beta_i A_i + \sum_{i=1}^m \beta_j K_i + \varepsilon_i \dots\dots\dots(4)$$

where:

WTP_i = Price (P_i) of beef the consumers is willing to pay,

A_i = Beef Attributes

K_i = Socio-economic characteristics of the consumer

α = Intercept

β_i = Beef attribute parameters to be estimated

β_j = Socio-economic parameters to be estimated

A detailed analysis of correlation between the explanatory variables was carried out to avoid possible collinearity associated with increased probability for type II errors (Green, 2000). The Variance Inflation Factor (VIF) and Durbin-Watson tests were used to test for multicollinearity and autocorrelation respectively. The VIF >10 indicates multicollinearity and the Durbin-Watson value close to zero (0) or four (4) indicates autocorrelation (Green, 2000). The data tested negative for both multicollinearity and autocorrelation (VIF value between 1.09 and 1,19 and DW statistics =1,54). Consequently, a linear Hedonic Model was fitted and estimated using OLS.

The Hedonic Model expressed the mean price of beef consumers were willing to pay as a function of the marginal intrinsic prices of each attribute. The probability distribution of the t-statistic in respect to each independent variable was used to determine the variables which significantly influenced willingness to pay. Consequently, the marginal effect of each significant independent variable was determined from the respective β parameter. By comparing the magnitude of the intrinsic prices of the attributes, the most preferred quality attributes by beef consumers were determined. The results were used to test two hypotheses. The first hypothesis was that willingness to pay for beef is not influenced by juiciness of beef, bone content, fat content, fat colour and lean colour. The second hypothesis was that willingness to pay for beef is not influenced by consumers’ socio-economic characteristics, i.e. age, gender, educational level, income and household size.

With regard to analysis of beef attribute preferences among consumers, percentages and mean ratings as previously used by Love (1994) and Akankwasa (2007) in analysis of attribute determinants with ordinal attribute ratings, were estimated for each attribute. The magnitude of the percentages and ratings indicated the relative importance attached to the attribute when choosing the quality of beef to buy. This was a basis for determining the underlying determinants

for consumer's choice of beef. This descriptive analysis followed the individual consumer's choice among the quality attributes that they consider when choosing the quality of beef and their rating of the attributes on a 5-point hedonic scale (5 = Very important, 4 = less important, 3 = important, 2 = not important, 1 = not important at all).

The most desired eating quality attributes of beef have been identified among beef consumers in countries like Canada, United States, Australia, and Mexico among others (Thonney *et al.*, 1991; Warriss, 1996; Arker, 1991). Thonney *et al.* (1991) and Warriss (1996) identified texture and tenderness, juiciness, taste and flavour as the most important eating quality attributes of beef. Taste has topped a list of factors considered 'very important' by consumers when making food selection decisions (Food Marketing Institute, 1998). The National Beef Quality Audit established uniformity and consistency of quality attributes, inadequate tenderness, low overall palatability and excessive external fat (Smith, 1995) as the four beef quality concerns that influenced consumers' choice of beef. Due to low socio-economic status of the consumers and structure of the food/beef markets in Uganda, the palatability attributes of beef rather than credence attributes of the market were perceived to hold much more influence on consumers' choice for beef. Consequently, the attributes considered in the study included juiciness of beef, lean colour, and fat colour, fat and bone content in the meat.

2.3 The Study Area and Sampling

The study focused on beef quality attribute preferences of beef consumers. Kampala district was purposely selected for the study since it has the highest concentration (63%) of beef consumers in Uganda (UBPA, 2005). The district is the most urbanised and has the highest population, increasing at a rate of 3.14 to 5.61% (UBOS, 2010), which indicates a high potential for beef consumption. A survey was conducted on a sample of 300 beef consumers at household level of the District in March to May 2010. A combination of critical case purposive sampling, cluster sampling and simple random sampling was applied to select this number of cases, which would be decisive in explaining the research phenomenon (Patton, 2002) given the available resources. This number of cases is also adequate to make analytical and logical study generalisations (Patton, 2002).

A multi-stage, stratified sampling procedure was used to identify beef consumers to participate in the study. This procedure was employed to ensure that consumers of varying socio-economic characteristics especially income status (low, medium and high) were represented in the total sampled observations. Household levels were defined according to the amount of monthly income the head of a household earned: low income (less than Ugshs 0.5 million), middle income (Ugshs 0.5-1.0 million) and higher income (more than Ugshs 1.0 million) respectively. This income categorisation was meant to ensure that the estimates of beef consumers willing to

pay for quality beef are obtained from a sample representing all the income groups of beef consumers in Kampala district. This was achieved with guidance from local leaders in the respective divisions. Four out of the five divisions that make up Kampala district were sampled randomly since consumer groups of interest in the study could be obtained in any of the divisions. The selected divisions were Central, Kawempe, Nakawa and Lubaga divisions, with a population of 20, 22, 23 and 13 parishes respectively (UBOS, 2008). Makindye Division was left out by the random sampling procedure.

Two parishes from each of the four divisions were purposively selected. Purposive sampling was meant to ensure that each division is represented in the survey sample, making it possible to account for variations in market price of beef across divisions. This approach would also enable us to make realistic inferences on the market prices. A list of households was obtained from the office of the parish administrative division and households categorised into three income groups. The population of households was clustered by income category. In total, each cluster had a population of at least 400 households while the cluster of the low income households had the highest number (950 households). One hundred (100) households from each of the three income categories (household clusters) were selected by simple random sampling and the head of each household considered a respondent in the study (household beef consumer). The total sample size included 300 household beef consumers.

2.4 Data and Variable Measurement

This study was an exploratory, qualitative and quantitative research with limited resources. Hence a structured questionnaire was used to obtain primary data mainly on the socio-economic characteristics of beef consumers and beef quality attributes. The variables collected included juiciness, fat content, bone content, hygienic conditions, fat colour and lean colour of beef. Table 1 defines the variables used and their respective measurements.

Table 1: Variables and their measurements

Variable	Definition and measurement
Dependent: $WTP_b = P_i$	Maximum price a consumer would be willing to pay given beef with all quality attributes of their preference (Uganda shillings per Kg)
Independent variables:	
<u>Beef attributes:</u>	Fat content of beef measured by the proportion of fat to lean in beef.
FATC: Fat content of beef	Choice of preference based on respondent's beef consumption experience and measured on a 3-point hedonic scale rank to obtain quantitative-nominal data (3 = very fatty, 2 = Less fatty, 1 = lean).

BONC: Bone content of beef	Measured by the proportion of bone to lean in beef. Choice of preference based on respondent's beef consumption experience and measured by a 3-point hedonic scale rank to obtain quantitative-nominal data (3 = very boney, 2 = Less boney, 1 = no bones)
LCOL: Lean colour of beef.	The visual outlook of the meat. Choice of preference based on respondents beef consumption experience and measured on a 3-point hedonic scale rank to obtain quantitative-nominal data (3 = Bright red, 2 = Red, 1 = Pale red).
FCOL: Fat colour of beef	The visual outlook of the fat in the meat. Choice of preference based on respondents' beef consumption experience and measured on a 3-point hedonic scale rank to obtain quantitative-nominal data (3 = White, 2 = Yellowish, 1 = Creamy)
Socio-economic variables:	
EDUC: Education level of beef consumer	Highest level of education attained by the household head. Levels categorised into ordinal scale ranging from less educated to highly educated categories. (1 = Primary, 2 = Secondary, 3 = Tertiary, 4 = University and above)
HHSIZ: Household size	The number of family members in the household. Data is quantitative-discrete
INC: Income of beef consumer	Measured by approximate monthly cash earnings of the household head. Income earnings categorised into an ordinal scale of rank ranging from very low to very high income categories (Uganda shillings per months)
SEX: Sex of beef household beef consumer	Sex of beef household beef consumer – dummy variable (0 = male, 1 = female) were used for female or male respondents

3.0 Results and Discussions

Table 2 shows the descriptive statistics of the socio-economic characteristics of beef consumers and their respective WTP prices in Kampala.

Table 2: Descriptive statistics for household characteristics and willingness to pay variables

Variable	Percentage of respondents	Willingness to pay prices (Ugshs per Kg)		
		Mean estimate	Std. error	Coefficient of variation
<i>Income (Ugshs per month)</i>				
< 0.2 million	52.0	8,785 ^a	298	37.38
0.2 - 0.5 million	26.7	12,946 ^b	437	25.31
> 1.0 million	22.3	13,733 ^a	4064	29.59
F-statistic				39.13*

<i>Education level of household head</i>				
Primary	34.3	11,095 ^a	475	36.64
Advanced level	19.1	10,523 ^a	616	37.97
Above advanced level	46.6	10,785 ^a	408	39.19
F-statistic				1.58*
<i>Household size</i>				
< 4 people	12.0	11,720 ^a	868	
4-6 people	55.7	10,874 ^a	350	36.34
> 6 people	32.3	10,457 ^a	518	41.47
<i>Sex of household head</i>				
F-statistic				
Female	46.6	10,930 ^a	402	38.74
Male	53.3	10,738 ^a	381	37.46
F-statistic				0.12
Overall	100	10,837	4018	37.99

Means with the same letters indicate not significantly different ($p > 0.05$) by pair wise t-test of least square means.

* indicates significant at 5 % level.

Source: Sample survey of household beef consumers in Uganda, March-May, 2010.

The results showed that the average household size was 5.8 people compared to a national average of 4.7 members per household (UBOS, 2002). The household sizes of 55.7% of the respondents ranged between 4 to 6 people, implying that the nuclear family was predominant among the households. The majority (65.7%) of household heads were at least high school graduates and the rest (34.3%) had attained between primary and ordinary level education. Male-headed households (53.3%) were lower than the national estimate of 73.9% (UBOS, 2002). This is because the proportion of female-headed households tends to be higher in urban than in rural areas. Expectations are that it would be more pronounced in the capital city as shown by these results. Income distribution results indicated that 52% of the respondents earned less than Ugshs 0.2 million per month, whereas a relatively small number (22.3%) earned more than 1.0 million.

Consumers were willing to pay an average of Ugshs 10,837 per Kg of beef with all quality attributes of their preference (Table 2). The mean prices consumers were willing to pay in respect to income categories were estimated. These prices were compared to determine whether they were significantly different. Their percentage deviation from the current average market price for beef was estimated. The results from this analysis revealed that the price consumers were willing to pay for quality beef were significantly ($p < 0.05$) different across income levels (Table 2). The results further indicated that consumers whose income was higher were willing to pay a

higher price than those whose income was lower. For example, consumers earning more than 1.0 million Ugshs per month were willing to pay 56.3% more than those earning less than 0.2 million. This result is in conformity with results presented in Table 2, which indicated that consumers' income significantly affects their willingness to pay for quality beef. High incomes among beef consumers implies positive attitudes towards highly priced beef and willingness to pay a higher price and vice versa. The result is consistent with findings by Selim *et al.* (2003), that higher income consumers were willing to pay higher prices for fluid milk than low income consumers.

In general, consumers were willing to pay a significantly (t-statistic = 20.79 and $p < 0.05$), higher price (by 113%) for quality beef than the price they were paying for the prevailing quality of beef in the market (butcher and abattoir). This result implies that consumers were very willing to pay for quality beef. This result is consistent with a variety of previous literature for example (Dillon, 2004, Killinger *et al.*, 2004; Platter, 2005; Kynda *et al.*, 2008) on the effect of beef quality attributes on willingness to pay for beef.

As previously explained, the study relied on extrinsic cues (visual attributes) of beef that were theoretically expected to determine consumers' choice of beef, as used by Thonney (1991) and Warriss (1996). As such, bone and fat content in the meat, fat colour and lean colour were used to establish beef quality attributes that determine consumers' choice of meat. Table 3 presents the percentage distribution of consumers' rating of the importance of beef quality attributes in determining their choice of beef.

Table 3: Consumers' rating of the importance of beef attributes in determining choice of beef (sorted from largest to the smallest).

Beef Attribute	% of respondents who consider the attribute most important	Mean score/rating on a scale of 0 to 1
Fat content	61.3	0.521
Bone content	24	0.423
Fat colour	7	0.316
Lean colour	5	0.226
Beef juiciness	1	0.155

Source: Sample survey of household beef consumers in Uganda, March to May, 2010.

The results showed that fat content was superior to all other attributes tested. Fat content was scored at 52.1% in determining consumers' choice of beef (Table 3). The percentage distribution of the scores for this attribute indicated that it was considered very important by most (61.3%) of the beef consumers. Fat content is among the beef attributes perceived as indicators of beef tenderness and

palatability, which increase utility derived from beef consumption. According to Smith (1995), fat content makes beef juicy and gives it savoury flavour that determines taste and palatability. Fat content significantly ($p < 0.001$) influenced consumers' willingness to pay for beef (Table 4). Hence it is one of the key underlying factors for beef quality and pre-determinates consumers' choice of food product to buy. It therefore implies that consumers prefer and are willing to pay for fatty beef because of its associated palatability.

The next underlying determinant of beef quality was bone content (Table 3). The percentage distribution of the scores (42.3%) indicated that it is very important in determining consumers choice of beef. A plausible explanation given by respondents for the bone attribute is the perception that consumers would want to maximise utility by paying for what they can eat (Alinda, 2010). Consumers, however, scored juiciness and fat colour as important (47.1%), implying that they were also determinants of consumers' choice of beef. However, scores for lean colour and juiciness of beef were 31.6% (Table 3), indicating that these attributes respectively were somewhat important in determining consumers' choices. The percentage distribution of their respective scores consistently indicated that they were considered very important by a very small percentage (6%) of beef consumers. The results further indicated that consumers preferred less fatty, less boney, white fat and slightly red lean (Figure 1). When asked to account for their choice of preferences, most consumers (71%) revealed that less fatty meat is more tasty and palatable to them (Figure 1).

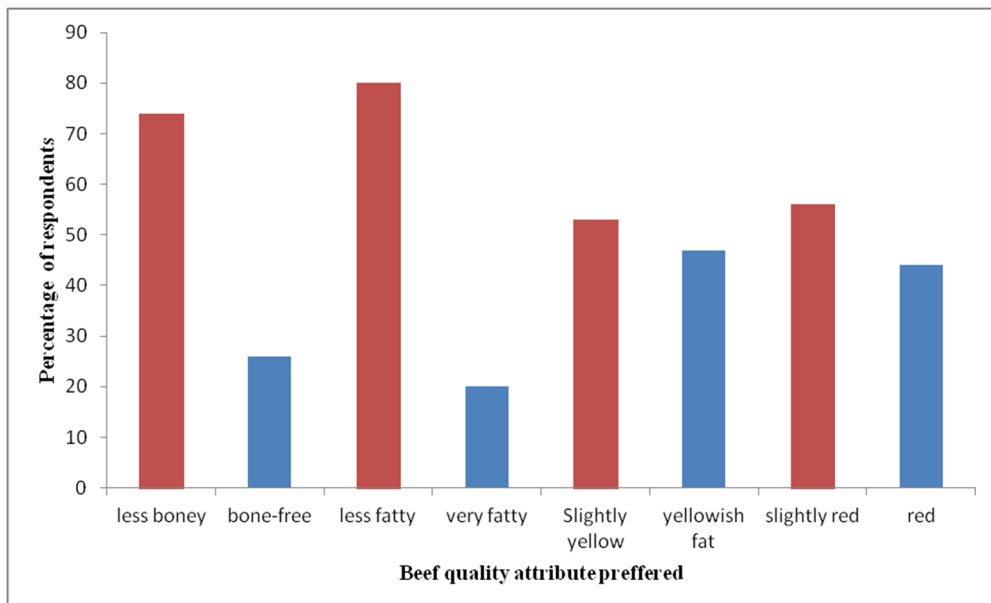


Figure 1: Percentage distribution of respondents by type of beef quality attribute

To determine the beef attributes and socio-economic factors that influence the WTP for beef, equation 4 was estimated. Data was also analysed using different functional forms i.e. linear, log-linear and log-log forms. With the exception of household size and age, the rest of the independent variables were measured on an ordinal scale. This implied that an attempt to transform them to log form to enable estimation of the non-linear model would not allow estimation of marginal effects, an inherent characteristic of the hedonic price model. However, the prices consumers were willing to pay were transformed into log form and the log linear model was estimated. Though the F-statistic (21.39) in respect to this functional form of the hedonic model was significant ($p < 0.001$), its respective adjusted R-square (49%) was lower than that of the linear function form (53%). Six out of ten variables were significant in both linear and log linear functional forms. The variables household size and age were transformed into log form and the log-log model estimated. Compared to the linear and the log linear functional form, the adjusted R-square for the log-log model was lowest (48.6%). Thus the linear model structure was preferred for the hedonic price model over the non-linear because it could account for more variation in willingness to pay and allow estimation of marginal WTP in respect to the ordered scale variables in the model.

Table 4 shows the analytical results of the linear hedonic price model for beef consumers. It was observed that the adjusted R-square was 0.53. It implied that slightly more than half (53%) of the variation in the WTP model can be explained by beef quality attributes and socio-economic characteristics of the consumers.

Table 4: Estimated coefficients of the Hedonic Price Model

Variable	Coefficient (β)	Std. error	[β /st er.]	P > t
Intercept			1.477	0.141
Beef quality attributes				
Juiciness of meat	0.069	0.051	1.350	0.178
Bone content of the meat	-0.166***	0.052	-3.224	0.001
Fat content of the meat	0.338***	0.052	6.525	0.000
Lean colour of the meat	-0.163***	0.052	3.123	0.002
Fat colour of the meat	-0.138**	0.054	-2.559	0.011
Hygienic conditions at the selling points	-0.047	0.053	-0.896	0.371
Consumers' socio-economic characteristics				
Sex of respondents	-0.018	0.052	-0.344	0.731
Age of respondents	0.032	0.059	0.537	0.592
Household size	-0.098	0.062	-1.588	0.114
Income of respondents	0.585***	0.053	10.943	0.000
Education level of respondents	-0.100	0.546	-0.183	0.855

Adjusted R² = 0.53
F-statistic = 20.50
Glejser x = 6.576

Source: Sample survey of household beef consumers in Uganda, March-May, 2010.

Note: p-value significance level *** refers to 1%, ** refers to 5% and * refers to 10%.

The F-statistic was significant at the one percent level ($p < 0.01$). Thus the regression equation met the goodness of fit test. The new homoscedastic hypothesis was accepted since the x values were not statistically significant at the one percent level. The results indicated that some of the socio-economic characteristics and beef quality attributes significantly ($p < 0.05$) influenced willingness to pay for quality beef by household consumers.

The beef attributes that were found to influence consumer willingness to pay for beef are bone content in the meat, fat content in the meat, colour of the lean and colour of fat. Bone content was found to have a negative significant effect to the consumer's willingness to pay for quality beef. This result implies that beef consumers would be willing to pay a higher price for less boney meat. Most respondents (85.3%) in this study expressed preference for less boney meat than lean and offals (Alinda, 2010). The explanation given by respondents for this attribute was the perception by consumers that one is paying for a portion of beef (i.e. bones) that he or she will not eat (Alinda, 2010).

The coefficient for fat content in the meat was positive and statistically significant. This implies that fat content had a significant effect on consumer's willingness to pay for quality beef. This result further implies that consumers were willing to pay a higher price for more fatty beef. The possible explanation could be that fatty beef is tastier and has a savoury flavour (Killinger *et al.*, 2004). This agrees with findings that fatty beef has a savoury flavour for which consumers were willing to pay a price premium (Insauti *et al.*, 2005).

The coefficient for fat colour was negative and statistically significant, implying that consumers would be willing to pay a lower price for meat with yellow fat or a premium price for white colour of fat in the meat. According to surveyed respondents (Alinda, 2010), white colour of fat is perceived as an indicator of less aged, more tender and palatable beef. This gives the consumer higher satisfaction and subsequent higher willingness to pay. Besides, yellow colour of fat is perceived by consumers as an indicator of hard and unpalatable beef that lowers the expected utility and subsequently consumers' willingness to pay (Alinda, 2010). This result implies that willingness to pay decreased with increased perception of the toughness of the beef. Consumer studies (Miller *et al.*, 2001; Dillon, 2004; Kynda *et al.*, 2008) consistently demonstrated that consumers were less willing to pay for less tender beef.

The coefficient for lean colour was negative and statistically significant, implying that consumers' willingness to pay a higher price decreased for beef that appeared more red. Like yellow colour of fat, red lean was perceived by consumers in this study as an indicator of beef that is not tender and less tasty and hence undesirable for consumption (Alinda, 2010). This result implies that increased perception of less beef tenderness by consumers decreased their willingness to pay for beef. Beef tenderness is among the determinant attributes for consumers' willingness to pay for beef (Kynda *et al.*, 2008). These results were used to test the hypothesis that willingness to pay is not influenced by the various beef attributes. This hypothesis was rejected because the coefficients of bone content, fat content, fat colour and lean colour were statistically significant.

Income was the only significant variable among the socio-economic characteristics of household beef consumers that had an influence on the willingness to pay for beef. The coefficient of income was positive and statistically significant ($p < 0.001$), implying that consumers were willing to pay more as their income increased. Beef is a highly valuable food item for which the market price remains relatively higher compared to other foods. Willingness to prioritise expenditure on beef will therefore increase with increase in income. This will subsequently increase willingness to pay for it. This result is consistent with findings by Nuwagira (1996) that demand for beef is positively elastic with income. Similar findings were reported by Selim *et al.* (2003) in the analysis of the factors influencing willingness to pay for milk products.

The coefficient for household size variable was negative but had no significant effect on willingness to pay for quality beef. This means that there is a negative correlation between household size and willingness to pay. Expectations are that as the number of dependants increases in the family the disposable income per person decreases, which would make households less willing to pay for quality beef. However, the influence was not statistically significant. The coefficient of the gender variable had a negative sign, suggesting that female consumers would be willing to pay a higher price for quality beef than male consumers. However, there was no sufficient statistical evidence to support this claim. Finally, the coefficient for the education variable was not statistically significant. This result implied that education level had no significant influence on the willingness to pay for quality beef in the current study. This finding differs from a study by Selim *et al.* (2003), which established that education level influenced the willingness to pay for milk products. These results were used to test the hypothesis that willingness to pay is not influenced by consumers' socio-economic characteristics. This hypothesis was accepted for all included variables with an exception of income. The coefficient of the income variable was the only one which was statistically significant.

4.0 Conclusion and Policy Recommendations

The major purpose of this study was to determine consumer willingness to pay for quality beef and the factors that influence it. Several factors of beef attributes and socio-economic characteristics were considered. Using the hedonic price analysis, beef attributes and socio-economic factors that are important in explaining consumer willingness to pay were determined and their coefficients estimated. A multistage, stratified sampling procedure was used to identify beef consumers to participate in the study. Primary data was then gathered through face-to-face interviews of a sample of 300 respondents. The results showed that the coefficients for bone content, fat content, lean colour and fat colour were statistically significant. This implies that among the beef factors, these four attributes determine consumer willingness to pay for quality beef. On the other hand, the income of respondents was the only socio-economic characteristic that significantly influenced consumer willingness to pay for beef.

These results led to the conclusion that the attributes of fat and bone content in the meat are important in determining consumers' choice of beef quality to buy. Consumers prefer less fatty than very fatty beef and less boney than meat with many bones. They are willing to pay a premium price for these established attributes and also for beef that is perceived to be more tender (only slightly yellow fat and slightly red lean). Willingness to pay for quality beef varies significantly across income levels of household beef consumers. The high income households will be willing to pay much more than the low income households. Consumers would be willing to pay a higher price for quality beef given an increase in their incomes. Overall, there is a high willingness to pay for quality beef among household consumers.

The findings of this study lead to some policy recommendations for improving beef quality in the market. The information generated shows that a grading or classification scheme based on the identified attributes could achieve the objective of sorting beef into economically distinguishable classes which can satisfy consumer choices with different levels of willingness to pay. Grading with respect to quality attributes would therefore make beef sales at differentiated prices possible. Ultimately, it would enhance sales volumes and returns for beef producers, processors and traders in the value chain. There is also need to target supply of higher quality grades in specific locations where the high income category of consumers is most dominant. It will enhance beef business activities and reap high returns and incomes for both producers and traders. This information can also be used by farm and ranch managers to adjust their production systems as well as the management of forage-finished versus concentrate-finished beef cattle so as to meet market requirements and obtain premium prices for their products. Farmers can substantially increase the values of their animals by improving fat content, lean colour and fat colour through feeding and breeding management systems. The market seems to prefer beef with some fat content and some market segments

prefer white fat colour to yellow fat colour in beef. A cost benefit analysis would be necessary to determine the net benefits to farmers/ranchers of raising better conformed animals with desired fat levels. Extension work is necessary to educate farmers and ranch managers on how to evaluate these characteristics in live animals.

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References

- Aaker, D.A. (1991). Managing brand equity. In: *Prospects for after 1993*. New York: The Free Press.
- Akankwasa, K. (2007). Consumer acceptability and willingness to pay for the introduced desert bananas. Unpublished M.Sc. Thesis, Makerere University Kampala, Uganda.
- Alinda, F. (2010). Consumer willingness to pay for quality beef in Uganda. Unpublished M.Sc. Thesis, Makerere University, Kampala, Uganda.
- Baffoe, K.J. (2000). Structural adjustment and agriculture in Uganda. Working Paper W.P.149.
- Carlos, D., Solorzano, M. and Marshall, M. (2005). Consumer preference of fresh-cut melon product: A potential value added product for modern growers. Indiana Melon Growers. Available at http://www.ifama.org/conferences/1140_Paper_Final.pdf.
- Organisation for Economic Cooperation and Development (OECD) and Food and Agriculture Organisation (FAO). (2011). OECD-FAO Agricultural Outlook 2011-2020, Published in June 2011. Available at www.agri-outlook.org. European Commission, Agriculture and Rural Development.
- Feuz, D.M., Umberger, W.J., Chris, R. and Sitz, B. (2004). U.S. consumers' willingness-to pay for flavour and tenderness in steaks as determined with an experimental auction. *Journal of Agricultural and Resource Economics* 29(3):501-516
- Food and Agriculture Organization. (2011). Food outlook. Global market analysis. Available at <http://www.fao.org/docrep/014/a1981e/a1981e00.pdf>.
- Food and Agriculture Organization of the United Nations. (2007). FAO Statistical Year Book Country Profiles. Available at http://www.fao.org/ES/ESS/yearbook/vol_1_2/pdf/Malaysia.pdf on 5/02/2010.
- Food Marketing Institute. (1998). *A retailer's guide to electronic payment systems costs*. Washington, DC: Food Marketing Institute.
- Greene, W.H. (2000). *Econometric analysis*. Englewood Cliffs: Prentice Hall.
- Hayes, D.J. and Lence, S.H. (2000). A new brand of agriculture: Farmer-owned brands. *Reward Innovation. Choice* (Fall 2002):2.
- Henderson, J.M. and Quandt, R.E. (1980). *Microeconomic theory: A mathematical approach*, 3rd edn. New York: McGraw-Hill.
- Ho-Shui, L. and Houston, J.E. (2001). Factors affecting consumer preferences for major food markets in Taiwan. *Journal of Food Distribution Research* 32 (1).
- Insausti, K., Goni, V., Petri, E., Gorraiz, C. and Beriain, M.J. (2005). Effects of weight at slaughter on the volatile compounds of cooked beef from Spanish cattle breed meat. *Journal of Meat Science* 70: 83-90.
- Killinger, K., Calkins, C., Umberger, W., Feuz, D. and Eskridge, K. (2004). Consumer visual preference and value for beef steaks differing in marbling level and colour. *Journal of Animal Science* 82:3288-3293.
- Kiziba Investments Limited. (2008). An Expert Sub-Sector Study Report on the Beef Sub-Sector in Uganda. Final Report, Kampala.
- Kynda, C., Margaret, W. and Thomas, R. (2008). Consumer preference for meat attributes. University of Nevada Cooperative Extension Fact sheet-08-11.
- Lusk, J.L., Rosen, J. and Fox, J. (2003). Demand for beef from cattle administered hormones or fed genetically modified corn: A comparison of consumers in France,

- Germany, the United Kingdom and the United States. *American Journal of Agricultural Economics* 85:16-29.
- Lancaster, K.J. (1966). A New Approach to Consumer Theory. *Journal of Political Economy* 74:132-157.
- Loureiro, M.L. and Hine, S. (2001). Discovering niche markets: A comparison of consumer willingness to pay for a local (Colorado-Grown), organic and GMO-free product. A Selected Paper, 2001 American Agricultural Economics Association Meetings.
- Loureiro, M.L. and Umberger, W.J. (2003). Estimating consumer willingness to pay for country-of-origin labeling. *Journal of Agricultural and Resource Economics* 28:287-301.
- Love, J. (1994). Product acceptability evaluation. In: AM Pearson, and TR Duston (eds.) *Quality attributes and their measurements in meat, poultry and fish products*, pp. 337-358. Glasgow: Blackie Academic and Professional.
- Miller, R.K., Crouse, H.R. and Tatum, J.D. (2001). The influence of diet and time on feed on carcass traits and quality. *Meat Science* 19:303-313.
- Ministry of Agriculture Animal Industry and Fisheries (MAAIF). (2002). Overview of the livestock sub-sector. Report. Kampala, Uganda.
- Ministry of Agriculture Animal Industry and Fisheries (MAAIF). (2008). "Overview of the livestock sub-sector. Report. Kampala, Uganda.
- Nuwagira, A. (1996). An econometric analysis of beef demand in Uganda. Unpublished M.Sc. Thesis, Makerere University, Kampala, Uganda.
- Patton, M.Q. (2002). *Qualitative research and evaluation methods*, 3rd edn. Thousand Oaks: Sage Publications.
- Platter, W.J., Tatum, J.D., Belk, K.E., Koontz, S.L., Chapman, G.L., and Smith, G.C. (2005). Effect of marbling and shear force on consumers' willingness-to-pay for beef strip loin steaks. *Journal of Animal Science* 82:890-899.
- Rosen, S. (1974). Hedonic prices and implicit markets: Product differentiation in pure competition. *Journal of Political Economy* 82(1):35-55.
- Schroeder, T.C. and Mark, D.R. (2000). How can the beef industry recapture lost consumer demand? Department of Agricultural Economics, Kansas State University, Manhattan.
- Selim, A., Hatirli, A., Burhan, B. and Riza, A. (2003). Factors Affecting Fluid Milk Purchasing Sources in Turkey. *Journal of Food Quality and Preference* 15:509-515.
- Shannon, J.N. (2001). A Hedonic Price Analysis of thorough Red Broodmare Characteristics. *Journal of Agribusiness* 17(2):299-314.
- Sloof, M., Tijskens, L.M. and Wilkinson, E.C. (1996). Concepts for modeling the quality of perishable products. *Trends in Food Science and Technology* 7:169-171.
- Smith, G.C. (1995). Beef quality and palatability: How veterinarians can help producers improve the quality of the cattle and carcass. In: Proc. 59th Annual Conference for Veterinarians, Coll. of Veterinary. Kansas State University, Manhattan, pp. 295-302.
- Tey, Y., Mad, N.S., Alias, S., Zainalabidin, R. and Amin, M. (2008). Demand for beef in Malaysia: Preference for quantity, quality or lean. Institute of Agricultural and Food Policy Studies. Department of Agribusiness and Information System, Faculty of Agriculture, University of Putra Malaysia, Malaysia.

- Thoney, M.L, Perry T.C, Armbruster G, Beermann, D.H. and Fox, D.G. (1991). Comparison of steaks from Holstein and Simmental x Angus steers. *Journal of Animal Science* 69:4866-4870.
- Uganda Beef Producer Association (UBPA). (2005). An expert sub-sector study report on the beef sub-sector in Uganda. Kiziba Investment Ltd. Kampala, Uganda.
- Uganda Bureau of Statistics (UBOS). (2002). *The 2002 Uganda Population and Housing Census, Population Size and Distribution, October 2006*. Kampala, Uganda.
- Warriss, P.D. (1996). What is meat quality? In: SA Taylor, A Rimundo, M Severini and FJ Smulders (eds.) *Meat quality and meat packaging*. Utrecht: ECCEAMST.