Consumers' Preferences and Willingness to Pay for Honey Quality Attributes in Nyandarua County, Kenya

"To be considered for the JRC travel sponsorship"

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Abstract
Honey adulteration and limited consumer knowledge are some of the major challenges facing the honey sector. Despite the interventions of planting bee flora to ensure honey quality, limited empirical information exists on consumers' preferences for honey quality features. This study assessed consumers' preferences for honey quality attributes and estimated willingness to pay for these attributes in Nyandarua County, Kenya. Further, inclusion of bee floral source label as a quality attribute is a useful contribution to empirical literature. Random Parameter Logit model was used to analyze choice experiment data from 252 honey consumers. The empirical results showed that consumers had a positive preference for bee flora source label, origin labelling, joint certification, continuous viscosity and dark brown color of honey. Preference heterogeneity across various attributes was observed. Consumers were willing to pay the highest premium for honey viscosity. The results of this study will help in developing market positioning strategies for honey as well as policies to promote consumption of honey of high quality.

Keywords: Honey quality attributes; choice experiment; bee floral source label; preference heterogeneity; random parameter logit; Kenya

1.Introduction

Honey value chain is important to the livelihoods of many producers, consumers and other stakeholders in developing countries like Kenya. It is also an important product in the international market where it is a foreign exchange earner for many countries (Buba, 2013; Agboola et al., 2021). In Kenya, the production potential for honey is estimated at100,000 metric tonnes per year and only 20% of this has been tapped with most of the production coming from arid and semi-arid areas in Kenya (RoK, 2013). The honey demand has increased during and after the Covid-19 era since it was proven to increase the body immunity. With increase in population and preference towards natural foods by an increasing number of consumers (García, 2018), the honey demand has also increased considerably. The national honey consumption level is about 38,000 metric tonnes and about 13,000 metric tonnes of honey is demanded to bridge the gap of the standard annual national consumption level through importation (KNBS, 2019). In addition, as the demand for honey increases, the honey sector will be an important driver of economic growth and a pathway out of poverty in Kenya.

Honey adulteration and low consumer knowledge are some of the major challenges facing the honey sector. Consumers use a wide range of parameters to judge honey quality such as aroma, taste, trust regarding the purity and honey source (Ismaiel *et al.*, 2014) . A recent intervention to promote honey quality by National Museum of Kenya (NMK) ,and Kenya Agricultural and Livestock Research Organization (KALRO) involved sensitizing beekeepers to plant bee flora. Despite this intervention, there is limited empirical information on consumers' preferences and willingness to pay for honey quality features since consumers are the final customers of the value chain. They are the pool effect that would pool even production. In addition, there is limited empirical information on what consumers consider to be quality honey. Currently, to survive in a market where honey is adulterated, honey producers need to adopt an orientation towards consumers and marketing. They should not only focus on what they are able to produce but rather should produce what consumers require and thus attempting to satisfy their need. Therefore, improving honey quality will help to protect consumers' health, increase consumer satisfaction as well as increase the income of honey producers.

There is vast research on consumer preference and willingness to pay (WTP) for quality attributes in various foods; for example, preferences for attributes related to vitamin A-fortified sugar in Kenya (Pambo et al., 2017) , preferences for safety and quality attributes of artisanal fruit juices in Kenya (Otieno & Nyikal, 2017), WTP for apple attributes in Italy (Ceschi et al., 2018),producer WTP for geographical indicators (Maina *et al.*, 2019) local stakeholder's preferences for attributes of foreign land lease design in Kenya (Otieno & Oluoch, 2019), WTP for attributes of fair-trade goat meat in Kenya (Otieno, 2020), WTP for welfare attributes of chicken in Kenya (Otieno & Ogutu, 2020) and preference and WTP for enriched snack product traits in Ethiopia (Ahmed et al., 2020). However, empirical research on consumer preference and willingness to pay for honey quality attributes is limited. One exception is a study by Juma et al. (2016) on consumer WTP for honey attributes. The study mainly focused on geographical indicators and failed to capture consumer preferences in an integrated manner since it omitted important attributes like color, which is critical in influencing consumers' purchase decisions. To the best of our knowledge, the analysis of consumer preference and willingness to pay for

bee flora label and other honey quality attributes is quite limited. Understanding consumer preferences for honey attributes will help producers to develop niche market strategies that will target the right consumers and increase consumption.

Against this background, the objective of this study is to evaluate consumers' preferences for bee flora source and other honey quality attributes in Kenya, and thereby estimate WTP for each attribute and identify potential factors that govern heterogeneity in attribute preference. Addressing this objective will help to understand WTP for different honey quality attributes which is important in the decision -making process for producers and traders.

2. Materials and methods

2.1 Choice experiment design

The choice experiment design involved extensive literature review, key informant interviews and two focus group discussions (FGDs) each with 12 randomly selected consumers. As suggested by Bateman et al. (2002) ,FGD was used to validate the attributes identified and the attribute levels for which were included in the design. Six attributes - bee flora source label; origin labelling; inspection and certification; viscosity; color; and price per 500grams of honey were selected for the CE design from the validation process. The attributes and their levels are shown in Table 1.

Bee flora source label, origin labelling, viscosity and color were set at two levels while inspection and certification and price were set at three levels. Bee floral source is important since honey quality characteristics are based on floral source hence planting bee flora will ensure health safety of the consumers and this will help to improve consumers' confidence. Origin labelling attribute is necessary as it influences consumer purchase of food (Juma *et al.*, 2016). Inspection and certification is important because the institutions that handles inspection of honey are important in assuring consumer confidence in the efficacy of the process. Honey viscosity is the most important determinant of honey quality (Warui et al., 2014). Colour is an important visual perceptual property of honey quality.

Table 1: Honey quality attributes used in CE design

Attribute	Description of the attributes	Attribute levels
Bee flora source label	Indication of whether honey is produced from established bee flora or not.	Yes; No
Origin labelling	Indication of information about the place where the honey is produced	Yes; No
Inspection and Certification	Which institution should do inspection and certification of honey quality and safety?	Public agency e.g. KEBs; Private agency e.g. Kenya Consumer Organization; Joint inspection by public and private institutions
Honey viscosity	Flow of honey	Continuous; Breaking
Color	Color of the honey	Dark brown; Light brown
Price	Price of 500grams of honey (Kshs)*	350;400;450

*Note: * At the time of survey USD$1 was equal to Kshs 120.29*

Moreover, price was included to allow computation of tradeoff between honey quality attributes and money. The current prices of honey in the market was used to determine the appropriate levels for the CE design. The average price of 500g of honey from various honey consumption outlets is (Kshs 400) which was used as the base price level. As in other previous CE studies (Juma et al., 2016 ;Otieno & Ogutu, 2020) a uniform interval was adopted for the price attribute to make sure there is proper scaling of the WTP estimates.
The CE design was generated by a two-step procedure using NGENE software (Choice Metrics, 2009). At the first stage, a fractional orthogonal design was generated from the six attributes and this was used in a pilot survey of 36 respondents. The information gathered from this stage was analyzed to obtain prior parameters. At the second stage, the priors were used to generate a D-optimal CE design which is a design which enables estimation of parameters with low standard errors from a smaller sample (Bliemer and Rose, 2010).

The design had a high D-optimality, D-efficiency measure of 80% and a relatively good utility balance, a B-estimate of 76%, which surpasses the minimum threshold measure of utility balance, which is a B-estimate of 70%. This shows there was a very limited likelihood of dominance by any alternative in the choice situations. Furthermore, the CE design generated had an A-efficiency measure of 82%, implying that the variance matrix could yield reliable estimates (Huber and Zwerina, 1996).
The final design had choice profiles which were randomly blocked into six sets of four choice tasks. Consumers were randomly assigned to one of the six sets. Each choice task consisted of two alternatives (A and B) and an opt-out alternative (C). During the survey, respondents were asked to consider only the attributes presented in the choice tasks and to treat each choice task independently. One of the choice tasks presented to the respondents is illustrated in Table 2

Table 2: Choice attributes and levels presented to consumers

	Honey option A	**Honey option B**	**Status quo**
Bee flora source label	Yes	No	
Origin labelling	No	Yes	
Inspection and certification	Private	Joint	
Viscosity	Breaking	Continuous	
Color	Dark brown	Light brown	
Price	350	400	

2.2 Sampling and data collection

The study was conducted in Nyandarua County- Nyandarua West and Nyandarua South sub counties where honey production normally takes place in the county. Nyandarua County was selected because the county is not developed in terms of honey production and quality and a lot of work has been done in other areas but little in Nyandarua. Cochran's (1977) formula was

used to determine a sample size of n = 384, assuming a confidence interval (p) of 95% and that the desired level of precision, (e) = 5%.
Structured questionnaire and a choice experiment design was used to collect primary data from honey consumers.. A multi-stage sampling approach was employed. At the first stage, Nyandarua county was purposively selected since the county is not developed in terms of honey production and consumption and most of the projects that are geared towards promoting honey quality are implemented in the county.At the second stage ,Kinangop and Oljororok subcounties were purposively selected due to their high intensity in honey production and consumption in the county. At the third stage, a systematic random sampling method was used to select every third household honey consumer and they were interviewed at different consumption points which include residential places, open- markets and places of work. Employing sampling proportionate to size criterion,132 respondents were selected from Nyandarua South and 120 respondents from Nyandarua West. This was in line with the population distribution (KNBS, 2019). Data was collected through face-to-face interviews of consumers using a structured questionnaire and CE survey.

2.3 Choice modelling framework

Choice modelling theoretical framework is based on Lancaster Consumer theory (Lancaster, 1966) and it is consistent with random utility theory (McFadden $Zarembka, 1974 ;Louviere et al., 2000; Hanley et al., 2001). According to consumer theory, utility is the satisfaction that a consumer derives from the attributes of a good unlike the good as a whole (McFadden & Zarembka, 1974; Louviere et al., 2000).

2.4 Data analysis

The CE data on consumer preference and WTP for honey quality attributes was analyzed using Random Parameter Logit (RPL) model following (Revelt and Train, 1998). RPL has several advantages. First, it captures unobserved heterogeneity. Second, it relaxes the assumption of independence of irrelevant alternatives by making the choice alternatives to be chosen, not to be independent. The utility that consumer i obtains from alternative j in time period t or choice situation is given by:

$$U_{ijt=}\beta'_i X_{ijt} + y'Z_{it} + \varepsilon_{ijt} \quad (1)$$

where β_i is a vector of individual random specific utility parameters(i.e. coefficient vector of unobserved variables for each consumer and varies in the population), X_{ijt} is a vector of observed variables representing honey attributes, γ are consumer parameters which are fixed for all the consumers in the choice set (e.g. price attribute), ε_{ijt} is unobserved random term (result in unobserved heterogeneity) and is assumed to be independent and identically distributed (IID).

Therefore, the probability of consumer i choosing alternative j among m alternatives in a choice situation t ,conditional on β_i' , takes the following specification;

$$L_{ijt}(\beta_i) = \frac{\exp(X_{ijt}\,\beta_i' + \gamma' z_{it})}{\sum_{j=1}^{m} \exp(X_{ijt}\,\beta_i' + \gamma' z_{it})} \quad (2)$$

where β_i' is a vector of unobserved parameters, $X_{ijt}$is a vector of variables representing honey attributes, m represents the total set of alternatives .Conditional on β_i' the probability of consumer $i's$ observed sequence of choices is the product of standard logits.

Suppose β_i' which is the consumers' taste, do not vary across choice situations for one consumer in repeated choice tasks, but they vary over all consumers, the probability can be written as:

$$S_i(\beta_i) = \prod_t L_{ijt}(\beta_i) \quad (3)$$

Since β_i is unknown it is integrated out in order to get unconditional choice probability. The unconditional probability of the sequence of choices that consumer i made is given as:

$$P_i(\theta) = \int S_i\,(\beta_i) f(\beta_i|\theta) d\beta_i \quad (4)$$

There are two important concepts of parameters in this equation. The coefficient vector β_i which are the parameters relating to consumer i ,(parameters specific to consumer i) and they represent consumer's tastes, and it varies among consumers, and θ which is the mean and covariance of β_i or the parameters describing the distribution of the consumer-specific estimates. The aim of this model is to estimate the θ which is done through choice probability simulation, since Equation 4 which is an integral does not have a closed mathematical form and hence cannot be computed analytically hence we approximate the probability through simulation and maximize the simulated log-likelihood function. The simulated probabilities were inserted in the log-likelihood function. The log-likelihood function is written as:

$$LL(\theta) = \sum_i \ln P_i\,(\theta) \quad (5)$$

$P_i\,\theta$ is approximated by a summing all the randomly selected values of β_i . For any value of the parameters θ selected, a value of β_i is drawn from its distribution, and $S_i(\beta_i)$, i.e. the product of standard MNL models, is calculated. These calculations are repeated for numerous draws and the average of the $S_i(\beta_i)$ is viewed as the approximate choice probability, as shown in equation 6 below:

$$SP_i\,(\theta) = \left(\frac{1}{R}\right) \sum_{r=1}^{R} S_i\left(\beta_i \frac{r}{\theta}\right) \quad (6)$$

where R is the number of draws of β_i, $\beta_i^{r/\theta}$ is the r^{th} draw from $f(\beta_i|\theta)$ and SP_i is the simulated probability of consumer i's sequence of choices. As suggested by (Train, 2003), standard Halton draws were used in the simulation instead of random draws to increase accuracy of estimation. Up to 100 Halton draws were used in the simulations. The simulated log-likelihood function is:

$$SLL(\theta) = \sum_i ln\left(SP_i(\theta)\right) \quad (7)$$

The estimated parameters are those that maximizes the $SLL(\theta)$. WTP for each attribute is the monetary value that the consumers were willing to pay for an attribute. Price being one of the honey attributes in the explanatory variables ,trade-offs between the honey attributes and money i.e. consumers' marginal WTP, for each of the other non-price attribute levels were calculated following (Hanemann, 1984) as follows:

$$WTP = -1 * \left(\frac{\beta_k}{\beta_p}\right) \quad (8)$$

whereby β_k is the coefficient which is estimated for honey attribute level in the choice set and β_p is the marginal utility of the attribute of price. The marginal WTP (implicit price) for a discrete change in an attribute gives a measure of the relative importance that consumers attach to that attribute within the design. Following Train & Weeks (2005), the current study directly estimated the WTP in a WTP space. This approach involves deriving the WTP estimates directly by reformulating the mixed logit model. It produces more realistic WTP estimates than the conventional method. The model was estimated using maximum simulated likelihood procedure in STATA 16.0 econometric software utilizing 100 Halton draws for the simulations.

3. Results and discussion

3.1 Respondents' characteristics and honey consumption

More respondents were male about (67.8%) with secondary education level and 11 years of completed formal schooling on average. This corroborates with national statistics, which show that in Kenya, about 84% of the population have completed primary education (KIPPRA, 2018).The average age of the respondent was 40years, this shows that they are in economically active age bracket, hence an important segment of honey consuming population. This is in line with Selmi et al., (2020) that honey consumers in Kota Bengkulu are young adults between 21-45years .The average household had four family members who consume on average 1kg of honey per month.

The average household income was Kshs 34,829 which is higher than the minimum wage of Kshs13,572 (KNBS, 2019).This implies that respondents were able to afford honey which is quite expensive and even pay for honey attributes. This is in line with Garcia-Yi, (2015) that as income increase , people's WTP for yellow peppers grown without pesticides also increase. About 53.38% of consumers, bought honey from the beekeepers, while 20.54%, 14.34%,7.55%, 1.94% and 1.55% purchased from hawkers, supermarket, kiosk, roadside and from the market respectively. Results shows that 46.9% of the respondents consume honey at least once per day while 33.7% consume twice per day. About 67.5 % respondents reported of being aware of honey produced from established bee flora and 41.5% of the respondents have consumed it. About 39.2% of the respondents never read quality label while buying honey.

Table 3: Respondents' characteristics, honey purchase and consumption behaviour

Variable	Statistic (n = 252)
Gender of respondent (% Male)	67.8
Average age of respondent (years)	40.4 (13.4)
Level of education (%)	
Primary	27.9
Secondary	41.5
College/Diploma	21.7
Bachelor degree	7.8
Other (MSc, PhD)	1.2
Average Years of schooling completed	11.5(3.1)
Average household income (Kshs)	34829 (27944)
Average household size	4.4 (3.4)
Average volume of honey consumed (Kgs per Month)	1.2 (1.0)
Place of honey purchase (%)	
Beekeepers	53.88
Hawkers	20.54
Supermarket	14.34
Kiosk	7.55
Roadside	3.49
Heard of honey produced from established bee flora before this interview (%Yes)	60.5
Have consume honey from established bee flora (% Yes)	41.5
Frequency of consuming honey per day (% once)	46.9
Frequency of consuming honey per day (% twice)	33.7

* Standard deviations are in parentheses (for continuous variables)

3.2 Preferences for honey quality attributes

Table 4 contains the simulated likelihood estimates of the RPL model for different choices. All the honey attributes were specified as random variables with normal distribution, apart from price, which was specified as fixed (Train, 2009).The coefficient for price is significant with the expected negative sign. The magnitude of parameter coefficients showed how strongly respondents valued the respective attributes relative to alternative reference attributes.

Due to extensive involvement of KIIs, consumers in FGDs and consultations with CE experts, all variables are statistically significant at 1% level with exception of joint certification and dark brown color which were significant at 5% and 10% level respectively. This means that all variables were relevant and contributed to explaining consumers' behaviour when faced with the choices.

Table 4: RPL estimates for honey quality attributes

Variable	Coefficient	Standard errors
Bee flora label	0.229***	0.080
Origin labelling	0.386***	0.117
Private Certification	-0.554***	0.161
Joint Certification	0.214**	0.098
Continuous viscosity	0.727***	0.136
Dark Brown color	0.169**	0.088
Price	-0.015***	0.002
SdBee flora label	0.818***	0.288
sdOrigin labelling	0.554**	0.258
sdPrivate Cert	0.397	0.452
sdJoint Cert	0.860***	0.215
sdViscCont	0.856***	0.215
sdDark Brown	0.739***	0.227
No of respondents	252	
No of observations	3,024	
Log-likelihood	-436.34607	
Pseudo-R2	0.33	
χ 2 (ρ- value)	628.4(0.0001)	

Note: ***, **, * represent statistically significant at 1%, 5% and 10% level respectively.

From the results, consumers had a positive preference for bee flora label attribute and this may be attributed to consumers' awareness of the health risks and would be interested in a product's mode of production (Ngigi *et al.*, 2010). Moreover, consumers in developing countries still show lack of confidence in the quality of honey. Indeed, this result corroborates those of (Warui et al., 2014) that shows all honey consumers and producers perceive floral/nectar sources as the major factor that influence the quality of honey. The results also indicated that consumers had positive preferences for origin labelling. Indeed, this result corroborates those of (Wu et al., 2015 ;Juma et al., 2016) who found that food and honey labels are important in helping consumers to correctly match with products, enable producers to adapt production to meet consumer demands and expectations, and promote social or political economy objectives .Origin labeling is crucial in avoiding quality honey being offered lower prices in a heterogeneous market setting like unadulterated honey.

The negative and significant coefficient for private inspection indicates that, consumers lack confidence in private inspection of honey quality and safety. This result contradicts Otieno & Nyikal,(2017)where it was noted that consumers had a positive preference for private inspection of artisanal fruit juice. Suffice to note here, the preference pattern for honey attributes is bound to differ from artisanal fruit juice due to variations in targeted consumer segments.

Consumers had a positive preference for joint certification (both public and private certification) as compared to the public certification which is the current status quo. This could be attributed to the current limitations by KEBS, since even though honey users find and use mark of quality as an important indicator of honey quality; there are still issues of honey adulteration, poor packaging and pesticide residue even for those found in supermarkets. Despite this, majority of consumers have adopted in buying honey directly from beekeepers. However, such honey may not be safe since it is not certified, and there is also loss of revenues by the government through avoided taxes. Therefore, these findings are relevant in overcoming the certification crisis in that, the stakeholders may adopt joint certification.

Consumers also revealed positive preference for continuous honey viscosity (flows continuously) to the one that has a breaking viscosity. These results are similar to (Warui et al., 2014 ;Juma et al., 2016) who found that honey viscosity is an important quality cue to all honey consumers and producers. Dark brown was more preferred to light brown color. Often, color preferences is largely related to household consumption preferences, however, consumers may have a perception that dark brown colored honey is of better quality. The coefficient for price is negative and significance as expected, to allows computation of the consumers' WTP for the honey quality attributes.

The standard deviations of all the random coefficients, except for private certification are statistically significant indicating that honey consumers in Nyandarua have heterogeneous preferences for all the attributes considered. The implication is that the preferences for these attributes are influenced by other factors not included in the model. The preference-heterogeneity observed confirms suitability of the RPL model in the analysis. The estimated model exhibits a good explanatory power (pseudo-R2 of 33%); Domenich & McFadden (1975) noted that in discrete choice models, a pseudo-R2 in the range of 20%–40% is robust. The estimated means and standard deviations of the normally distributed parameters also show the probability distribution of the population in terms of whether they placed a positive or negative value on a particular attribute

3.3 Heterogeneity in honey attributes preferences

The standard deviations in Table 4 suggested preference heterogeneity for honey quality attributes, indicating that consumers did not attach equal weights to different attributes. To explore the sources of this heterogeneity, socioeconomic characteristics were introduced into the models as interactions. This was done by re-estimating the model, including the interaction terms between the socioeconomic characteristics and selected attributes, accounting for correlations and multicollinearity. Results are presented in Table 5.

Table 5. Sources of preference heterogeneity

Mean estimate of the main variable	Structural parameter distribution		SD of the parameter	
	Coefficient	SE	Coefficient	SE
Bee flora source label	0.409***	0.125	0.606	0.281
Origin labelling	0.841**	0.099	0.029	0.511
Private Certification	-0.612***	0.181	0.461	0.475
Joint Certification	0.392**	0.098	-0.747**	0.364
Continuous viscosity	0.704***	0.135	1.047***	0.257
Dark Brown color	0.327**	0.201	0.761	0.236
Price	-0.000***	0.000	0.000	0.000
Heterogeneity analysis				
Origin labelling *income	0.080	0.000	-0.000	0.000
Origin labelling* occupation	0.023	0.034	0.049**	0.023
Dark brown*gender	0.427**	0.048	0.683**	0.356
Origin labelling*edu lev	0.014**	0.005	-0.023**	0.007
Bee floral source*elderly	0.331**	0.145	0.613**	0.283
No of respondents	252			
No of observations	3,024			
Log-likelihood	-436.34607			
Pseudo-R^2	0.34			
χ 2 (ρ-value)	728.4(0.0001)			

Note: ***, **, * represent statistically significant at 1%, 5% and 10% level respectively. SE stands for standard errors; SD stands for standard deviations.

The interaction between gender of the respondent and the dark brown colour shifts the preference for dark brown colour of honey by 43%, among the household. Female consumers were more likely to have strong preferences for dark brown color compared to male counterparts.An interaction between the presence of an elderly person (above 50 years old) and bee floral source attribute show that elderly people are more likely to have strong preferences for bee floral source label. This implies that old people worry more for food safety because they are more prone to other old age diseases such as diabetes and blood pressure and the purity of what they consume may improve their health (Prasad, Sung and Aggarwal, 2012). Consumers with high level of education were more likely to have strong preferences for origin labelling. This is consistent with literature that more learned persons have positive preferences for traceability labels (Seetisarn and Chiaravutthi, 2011).

The study has identified gender of the household, education level as well as having an elderly person in the household as significant sources of preference heterogeneity in consumers' preferences for three attributes (dark colour, origin labelling and bee floral source label). However, the derived standard deviations of parameter distributions for joint certification and continuous viscosity, are still highly statistically significant. This indicate that the heterogeneity in the preferences for these attributes is caused by factors other than the socioeconomic characteristics included in the model.

3.4 Willingness to pay for honey quality attributes

The mean values of the parameters in Table 4, were used to estimate consumers' marginal willingness to pay (WTP) for different honey quality attributes. WTP estimates are the derivation of the marginal rate of substitution between significant attributes and significant purchase prices, measuring implicit prices of possible trade-offs across traits conditioned on the choices made by an individual (Hensher and Greene, 2003) . Table 3 contains the WTP matrix estimated in the WTP space following (Train & Weeks, 2005).

Table 6: Willingness to pay (WTP) estimates for honey quality attributes (Kshs)

Variable	WTP(at 95 percent CI)	p-value
Bee flora source label	58.29***	0.002
	(41.703 to 125.873)	
Origin labelling	60.161***	0.001
	(47.715 to 198.61)	
Private Certification	-108.421***	0.000
	(-64.418 to 7.42)	
Joint Certification	45.002**	0.011
	(10.395 to 79.609)	
Continuous viscosity	109.443***	0.000
	(67.969 to 150.917)	
Dark Brown color	40.397***	0.004
	(23.370 to 89.164)	

Note: ***, **, * represent statistically significant at 1%, 5% and 10% level respectively.

Consumers were willing to pay Kshs 109 per 500g of honey for origin labelling; Kshs 60 for continuous viscosity; Kshs 58 for bee flora source; Kshs 45 for joint certification and Kshs 40 for dark brown color, however, were demanding a discount of Kshs 108 to accept certification by private institutions. Compared to the current price per grams of honey, the WTP estimates show that consumers would pay a premium of 15% for bee flora source, 25% for origin labelling, 10% for joint certification, 27% for continuous viscosity and 11% for dark brown color. The negative and significant sign for the coefficient on private certification implies that consumers were demanding for a 27% discount to accept certification by private institutions. Results also show that consumers were willing to pay more for continuous viscosity compared to all the other attributes.

4. Conclusions and recommendations

This study assessed consumers' preferences and willingness to pay for honey quality attributes in Nyandarua County, Kenya. It was noted that more than half of the consumers were aware of honey produced from established bee floral. Results showed that consumers had a strong preference for continuous viscosity than breaking honey viscosity. Origin labelling was preferred to no origin label and bee floral source label was more preferred than no bee floral source label. Consumers also preferred dark brown color to light brown color of the honey. In addition, public- private inspection of honey quality was preferred to public inspection. Moreover, consumers preffered public-private partnership for inspection and certification of honey. However, consumers did not have confidence in inspection and certification by private institutions. Heterogeneity was observed in consumer preferences for the attributes which was explained by gender. Consumers' willingness to pay for the attributes was consistent with their preferences. The most valued attribute was honey viscosity, followed by origin labelling, bee floral source label, joint certification and dark brown color.

The results of this study, provide insights into how consumers value different honey quality attributes. Policy makers would need to consider these results during implementation of interventions in honey value chain. Hence, these recommendations should serve as a starting point in incorporating honey aspects to ensure that honey value chains are responsive to the needs of the society.

Based on the results, certain key interventions are important. First, honey producers should be sensitized on planting bee flora for the bees as this will ensure honey quality and build consumer confidence. Origin labelling of honey is necessary to inform consumers of where the honey is coming from. This would enable consumers to decide which honey to buy. Since consumers preferred public-private inspection and lacked confidence in private institutions, it would be rational to address the weaknesses in the initiatives in private institutions that lead to distrust of these institutions. This would help in implementation of public-private inspection and sharing of value chain responsibilities for greater accountability in inspection and certification of honey quality. This partnership would ensure the pricing of honey is within the affordable range by consumers. Capacity build everyone along the honey value chain. Create consumer awareness of quality honey.

Effective monitoring and enforcement to ensure compliance with these attributes that consumers desire will require participation by the government, Consumer Federation of Kenya and the media. Further research should look at honey markets and preferences of other value chain actors especially honey producers, traders and processors for effective compliance with attributes that consumer desires.

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