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Southeast Brazilian Consumers' Involvement and Willingness to Pay for Quality Cues in Fresh and Cooked Beef

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ABSTRACT

This study evaluates consumer Willingness-to-Pay (WTP) according to preferences for quality-cue attributes offered in two different purchase modes: fresh and cooked meat. The questionnaire was applied and answered by 534 Brazilian meat consumers. Three clusters were defined: Group 1- price conscious consumers; Group 2- quality cues conscious consumers; and Group 3- consumers who were neither price nor quality cues conscious. Different levels of consumer involvement are related to different levels of a purchase intention regarding breed and flavor. Using a logit regression model, the probabilities regarding individual choice and WTP were then calculated. Results indicate significant differences ($p < .01$) between attributes and for both fresh and cooked beef. For fresh meat, the most important quality cue was its bright red color and the least important its marbling. Interestingly, the lowest product price level does not appear to motivate purchase intention. For cooked beef purchase, consumers highly valued tender meat with flavor and aroma. When a consumer evaluates the purchase of fresh meat, WTP starts at a low level, and then increases with the introduction of positive quality-cue attributes. The opposite is true for cooked meat, where WTP starts at a high level and then decreases as negative quality cues are introduced.

KEYWORDS

Brazilian consumer; consumer preference; WTP; quality cues; meat quality

Introduction

There is a diverse range of factors involved in food consumption: attitudes, social-demographic factors, consumption contexts, social contexts, values, norms or social norm messages, and personal factors among them (Christie & Chen, 2018; Furst et al., 1996; Verain et al., 2021). The academic literature has presented many theories and models in this respect, offering different perspectives and insights into the phenomenon (Cadel, 2014).

Consumers are increasingly demanding when it comes to food quality, especially when one considers the agricultural, environmental, social-cultural, and economic determinants involved. In addition, consumers are concerned about food security and accessibility, and their well-being, health, and food and nutrient needs (Food and Agricultural Organization, 2012; Johnston et al., 2014). Meeting consumer expectations requires specific knowledge with respect to consumer purchase behavior and the attributes they most value. Beef can be purchased by consumers in two forms: fresh beef from meat markets and cooked beef in restaurants. In order to make better purchasing decisions, then, consumers need specific product information, known as quality cues (Saeed & Grunert, 2014), which are a combination of intrinsic and extrinsic dimensions presented to consumers, offering guidance on purchase expectation and choice (Grunert, 2006). In each purchase mode,

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beef presents different quality cues. For fresh beef, the main quality cues are color, marbling (Baba et al., 2016; Killinger et al., 2004; Mwashiuya et al., 2018), and breed (Mwashiuya et al., 2018) For cooked beef they are tenderness, flavor, and aroma (Felderhoff et al., 2020; Miller, 2020; Mwashiuya et al., 2018). Price is also a factor that is significant for both purchase modes (Baba et al., 2016).

There are numerous studies in the literature focused on consumer preference for fresh or cooked meat in developed and emerging countries (Ardeshiri & Rose, 2018; Barcellos et al., 2019; Burnier et al., 2021). However, studies about fresh and cooked meat from the perspective of the same consumer are lacking. Our present study has elected to determine which quality cues are decisive when Brazilian consumers purchase beef, and how much they are willing to pay for these attributes. This could provide answers that help improve beef competitiveness in Brazil in relation to the meat of other animal species, offer better guidance for marketing campaigns and public policies, and develop improved products with higher added value.

However, beef quality cues are not equally understood among consumers. Consumers with higher product knowledge ("involvement") and who frequently purchase beef ("heavy users") are able to determine which attributes are better indicators of quality, while consumers with less experience of purchasing beef have more difficulty understanding which attributes are relevant to quality evaluation (Borgogno et al., 2015). What's more, according to the food choice modeling discussed by Christie and Chen (2018), the evaluation and choice of quality attributes may be influenced by other consumers.

The objective of this research was to set three initial goals: firstly, to evaluate how each quality cue influences the probability of beef purchase by the same consumers, based on a discrete choice model; secondly, to evaluate the influence of different consumer behavior, using an involvement scale (Verbeke & Vackier, 2004; Burnier et al., 2019b); and finally, to evaluate consumer Willingness to Pay (WTP) for beef within the context of two different purchase modes: fresh beef from meat markets and beef cooked in restaurants. In this context, we prepared a questionnaire in which meat consumers from the southeast region of Brazil, a region known for its high acquisition potential and significant consumption of beef (IBGE. Instituto Brasileiro de Geografia e Estatística, 2018), were asked about their experience of beef consumption in order to understand how beef quality cues are characterized by consumers and determine their WTP for such characteristics. The questionnaire also sought to evaluate whether people who are more involved with beef tend to evaluate meat color, marbling, breed, flavor, aroma, tenderness and price better, and if the attributes most valued by these consumers tend to increase their WTP for it.

Materials and Methods

Participants and Data collection

As stated above, the research instrument of the current study was a structured online questionnaire, using the Google Forms platform with non-probabilistic sampling by convenience. From the authors' contact networks, participants who declared themselves as meat-eating adults, who regularly consume beef, were identified. The questionnaire was randomly distributed, by e-mail and through social networks, and potential participants were encouraged to forward the research questionnaire link to their contacts. This research methodology is in accord with Boito et al. (2021), who also interviewed a specific group of meat consumers, without inferring that the results obtained in the analysis equate to an entire population.

The questionnaire was pre-tested by twenty-two consumers. This was done to check the adequacy of the vocabulary used, and to identify possible errors of interpretation as well as validation. After validation, the web link of the questionnaire was made available online during the month of April 2020. By the end of the process, a total of 534 interviews via completed questionnaires had been collected.

Data collection met every requirement of Resolution 510/16 of the National Commission for Ethics in Research (CONEP – Conselho Nacional de Saúde (National Health Council), 2016) in respect of the protection of research participants. Participants were fully briefed about the research, were aware that the information collected would be used collectively and exclusively for the purposes of the study, and understood that they could terminate their participation at any time.

Questionnaire

The questionnaire was structured into five different sections, with instructions given for participants at the beginning of each section (see Appendix 1). The language adopted for the questionnaire was Portuguese (native Brazilian language).

The first section of the questionnaire presented a qualifying question: "Do you habitually purchase and consume beef?" to establish whether a potential participant matched the desired research profile. Clearly, if the answer to the question was "yes," the participant could continue with the research, and if "no," participation would be automatically terminated (see Appendix 1).

The questions that followed were designed to evaluate which quality cues were most important for participant consumers, considering two different purchase modes: fresh meat and meat cooked for immediate consumption. This was done by means of the comparison of 9 products created for each purchase situation, structured through an orthogonal matrix (Rose et al., 2008).

The products were based on quality cues for fresh meat, being: color, marbling (Baba et al., 2016; Killinger et al., 2004; Mwashiuya et al., 2018), breed (Mwashiuya et al., 2018) and price (Aboah & Lees, 2020) and on quality cues for cooked meat, being: taste, flavor, and tenderness (Delgado et al., 2006; Felderhoff et al., 2020; Miller, 2020; Mwashiuya et al., 2018) and price. For each attribute – color, marbling, breed, flavor, aroma, tenderness and price – three intensity levels were defined (Table 1), which were presented together with photographs and descriptions with the aim of guiding consumer responses (see Appendix 1).

The products created, for consumer choice according to preference, are described in Table 2 below, but were presented to consumers as given in Figures 1 and 2 (see Appendix 1).

For color, conventional and scientifically consolidated parameters for meat were established, being cherry-red, purple-red and brown. However, the participants evaluated the beef color as either bright red, dark red and brown. Three levels of more general intensity were selected for marbling (little,

Table 1. Quality cue levels used for product creation.

Fresh meat			Cooked meat			Price
Color	Marbling	Breed	Flavor	Aroma	Tenderness	(US$)
Bright red	Little	Angus	Weak	Weak	Tough	3.80
Dark red	Intermediate	Nellore	Intermediate	Intermediate	Tender	5.80
Brown	Much	No breed	Intense	Intense	Very Tender	9.00

Table 2. Products created for the orthogonal matrix.

	Fresh meat				Cooked meat			
Product	Color	Marbling	Breed	(US$)	Flavor	Aroma	Tenderness	(US$)
1	Dark red	Much	No breed	9.00	Intermediate	Intense	Tough	9.00
2	Bright red	Little	Nellore	9.00	Intense	Weak	Tender	9.00
3	Brown	Much	Nellore	5.80	Weak	Intense	Tender	5.80
4	Bright red	Intermediate	No breed	5.80	Intense	Intermediate	Tough	5.80
5	Dark red	Little	Angus	5.80	Intermediate	Weak	Very Tender	5.80
6	Bright red	Much	Angus	3.80	Intense	Intense	Very Tender	3.80
7	Brown	Little	No breed	3.80	Weak	Weak	Tough	3.80
8	Brown	Intermediate	Angus	9.00	Weak	Intermediate	Very Tender	9.00
9	Dark red	Intermediate	Nellore	3.80	Intermediate	Intermediate	Tender	3.80

Figure 1. An example of product presentation in the questionnaire, chosen according to consumer preference.

Figure 2. An example of product presentation in the questionnaire, chosen according to consumer preference.

intermediate, much). Angus and Nellore were selected as they are the most representative breeds in Brazil.

For the attributes of flavor and aroma, more generic terms were also used when defining the levels (weak, intermediate, intense), again to facilitate consumer participant understanding. The prices were defined according to current Brazilian market values, established via an internet search.

Two hypothetical modes, as stated above, were created for participants to evaluate, both of which involved choosing from among nine (9) products presented in pairs. By this method, all the products were compared with each other. For example, product 1 was compared with product 2, product 2 compared with 3 and so on, totaling 18 questions for each purchase mode. The products were presented as "product on the left" and "product on the right"; and all the products appeared in two positions, avoiding any possible favoritism in respect of position.

For each question, participants were required to choose from three options, "neither of the products," "product on the right" or "product on the left," according to preference. At the end of each section participants also indicated the degree of importance of each attribute when buying and consuming meat, adapted from Burnier et al. (2019b), using the Likert seven-point scale.

Section three of the questionnaire referred to the purchase of fresh meat for a barbecue. The responder was invited to imagine that she/he was organizing a get-together with family and friends and needed to purchase pieces of sirloin steak at a place of his/her choice.

At the beginning of "Section 3 – Choosing meat for a BARBECUE" (Appendix 1), we presented the following text to evoke the idea of a real purchase occasion. "Hi! Imagine that you are organizing a barbecue for a get-together with family and friends. You need to purchase cuts of sirloin steak and, on arriving at the meat market, you discover there are 9 product options, presented in pairs. Each product includes information about meat quality cues, such as color, marbling, animal breed and price (considering the value of 1 Kg of sirloin). You are asked to choose between 3 options in the questionnaire for each product 'PRODUCT ON THE LEFT,' 'PRODUCT ON THE RIGHT' or 'NEITHER OF THE PRODUCTS' according to your preference, based on the meat quality cues described. There is no right or wrong choice; we only want to know what your preference is."

On arriving at the establishment, she/he should choose, according to preference, from 18 options that included meat quality attributes such as color, marbling, animal breed and price (Figure 1).

To respond to section four, the participant had to imagine that she/he was at a restaurant commemorating a new achievement with family and friends and was responsible for choosing the sirloin steak dish cooked according to the specifications on the menu.

At the beginning of "Section 4 – Choosing meat to eat in a RESTAURANT" (Appendix 1), we presented the following text to similarly evoke the idea of a real purchase occasion. "Hi! Imagine that you are in a restaurant with your family and friends commemorating a special occasion. You are responsible for choosing the sirloin steak dish and are given a menu with 18 options. Each dish has information about meat quality cues, such as flavor, aroma, tenderness and price (considering the value of 1 Kg of sirloin). For each product, you must choose from 3 options in the questionnaire 'PRODUCT ON THE LEFT,' 'PRODUCT ON THE RIGHT' or 'NEITHER OF THE PRODUCTS' according to your preference for the attributes described. There is no right or wrong choice; we only want to know what your preference is."

The menu offered 18 meat dish options with information regarding aroma, flavor, tenderness and price (Figure 2).

In the same questionnaire we also evaluated the beef purchasing and consumption profile of participants, including the frequency of weekly consumption, the values which they were prepared to pay for meat (highest, lowest and fair) and their degree of involvement with the product, evaluated by means of an involvement scale (Laurent & Kapferer, 1985; Jain & Srinivasan, 1990; Verbeke & Vackier, 2004; Burnier et al., 2019b). This type of scale aids the search for information relevant to studies on consumer behavior. For our study, we devised the following involvement statements: "I am disappointed when I choose poor-quality meat"; "Meat is very important for me," "I prefer meals that include meat to those that don't"; "It is important for me that meat comes from factories properly inspected by public health authorities"; "I prefer beef to meat from other species of animal"; "I am confident that I know how to choose good-quality meat"; "I only choose meats which are source traceable." Responses were given based on the Likert scale of 7 (seven) points, from 1 (totally disagree) to 7 (totally agree).

The objective of the final section of the questionnaire was to determine the socio-economic profile of consumers participating in the research.

Data analysis

For the first goal of this study, to evaluate the attributes in relation to the two different modes, at point of sale and during consumption, information obtained from the 534 interviewees was processed: a total of 9,612 pieces of information (534 participants x 18 questions for two purchase modes) to compose samples for each purchase occasion. For more details, refer to the Appendix 1. We used three types of analysis in this study: discreet choice with the logit statistical model, Involvement scale and WTP.

The study model, carried out through multiple comparisons in which consumers choose the alternative with the greatest benefit based on the attributes presented, is characterized as *discreet choice*. This is according to the theory of value, which states that there is a utility obtained from the component attributes of selected products (Lancaster, 1966), and to the theory of random utility, which states that unobserved variables affect choice and that utility is a construction associated with an unexplained component (Mcfadden, 1973).

For the statistical analysis of discreet choice, logistic regression (logit) was used. It is a linear model using binary dependent variables (Leon et al., 2020; Stock & Watson, 2004), which allows the probability associated with the choice or not of each product to be estimated. In our study, it is presented through a joint analysis of the meat attributes, which are given as explanatory variables.

The model is built on the cumulative logistic statistical probability function, based on equation (1; Campbell et al., 2013):

$$P_i = \frac{1}{1 + e^{-x_{i\beta}}}$$

Pi = occurrence probability of the chosen product;

Xi = explanatory variables

β = unknown parameters, to be estimated

The estimation of β parameters is based on a set of data using the maximum likelihood method, which permits a combination of coefficients to be found that maximize the probability of the sample having been observed (Torres-Reyna, 2014). After the logit model estimate, the marginal effects of each attribute are calculated, thereby finding its percentage in the choice probability variation of an individual. The model was adjusted by the R program.

For our study, a general equation was first established, including all research participants. Then, four further equations were created relating to consumers with less or more product involvement for each purchase mode. The models estimated, presented with explanatory variables, for the purchase mode of fresh meat are:

BRM = Bright red meat

DRM = Dark red meat

MIM = Meat with intermediate marbling

NBM = Nellore breed meat

ABM = Angus breed meat

MP380 = Meat at a price of US$ 3.80 Kg

MP900 = Meat at a price of US$ 9.00 Kg

The models estimated, presented with explanatory variables, for the purchase mode of cooked meat are:

MWF = Meat with a weak flavor

MIF = Meat with an intense flavor

MWA = Meat with a weak aroma

MIA = Meat with an intense aroma

TOM = Tough meat
TEM = Tender meat
MP380 = Meat at a price of US$ 3.80 (per dish of meat)
MP900 = Meat at a price of US$ 9.00 (per dish of meat)

The model was estimated (according to equation (1)), containing data from the two research stages, and the final model presented the estimated coefficients for the variables mentioned above.

We used an involvement scale to determine whether consumers had greater or lesser involvement with beef in each purchase mode. The level of involvement was defined according to the second question of section 2 (see Appendix 1). To measure the calculation of consumer involvement according to the purchase occasion, the Burnier et al. (2019a) scale was used, which is also in the 7-point Likert format. To determine consumers with greater and lesser involvement, the overall average was calculated for all questions on the scale of involvement, in an aggregate manner. From the calculation of the median of this aggregate average, consumers above the median were considered to be more involved and consumers below the median less involved (4.00 for fresh meat and 5.75 for cooked meat). The central data, that is values equal to the median, were disregarded for the purpose of the analysis.

The study also evaluated WTP for the different meat quality attributes (Gao & Schroeder, 2009; Janßen & Langen, 2017; Zanoli et al., 2012) in respect of fresh meat and cooked meat, as described by the products created for the orthogonal matrix. The WTP was calculated based on the works of Belluzzo Junior (1999) and Van Loo et al. (2015), wherein the value is obtained by adding the intercept and the sum of the multiplication of the coefficients estimated in the logit model, with the average values of the variables being in the sequence divided by the price estimated coefficient. The value is obtained through the sum of the intercept and the sum of the multiplication of the coefficients estimated by the logit model (Torres-Reyna, 2014), together with the median values and the division of estimated coefficient of price.

Cluster Analysis

The research participants were grouped in clusters based on the importance attributed to each quality cue for the two purchase modes, fresh and cooked meat. The association between cluster and participant was determined by responses to questions included in the questionnaire: "How important are meat attributes (price, color, marbling and breed) at the MOMENT OF PURCHASE?" and "How important are meat attributes (price, flavor, aroma and tenderness) DURING CONSUMPTION?."

Through K-means clustering method, groups with similar averages were allocated to the same cluster according to the degree of similarity between purchase and consumption attributes variables (Segaran, 2007). In this way, three clusters were defined: Group 1- price conscious consumers; Group 2- quality cues conscious consumers; and Group 3- consumers who were neither price nor quality cues conscious. After defining the clusters, each group was described by their personal characteristics (Table 3).

Results and Discussion

Profiling of participants

A key aspect of the questionnaire was participant profiling. We included a section at the end of the questionnaire to this effect (see Appendix 1). A summary of the socio-demographic profile of participants is presented below, in Table 4.

Totaling the percentage of participants with either university graduate or post-graduate education, as an example, reveals that 52% (277 participants) have studied at this higher level. Regarding profession, the majority of participants were professionals from the food and agriculture areas, with a total of 52% (268 consumers).

Table 3. Cluster characteristics.

		Price conscious (N = 201) 38%	Quality conscious (N = 258) 48%	Neither conscious of price nor quality (N = 75) 14%
Frequency of weekly consumption	≤ ONCE A WEEK	17,00	11,00	13,00
	2 OR 3 TIMES A WEEK	37,00	44,00	36,00
	> 3 TIMES A WEEK	46,00	45,00	51,00
Gender	WOMEN	50,00	52,00	52,00
	MEN	50,00	48,00	48,00
Average income (monthly in US$)	200 TO 600	70,00	61,00	53,00
	601 TO 1.000	12,00	14,00	13,00
	>1.000,00	18,00	24,00	33,00
Age range	17–29	80,00	64,00	63,00
	>29	14,00	17,00	21,00
Profession*	AGRICULTURE AND FOOD	59,00	46,00	40,00
	OTHERS AREAS	41,00	54,00	60,00

*Note: To calculate the percentage of participants in each profession an N difference was used, in accordance with the valid responses from the questionnaire applied. N "price conscious" = 68; N "quality conscious = 116; N "neither conscious of price nor quality" = 47.

Table 4. The socio-demographic profile of participants.

Information	Description	%	N
Gender	Female	51	272
	Male	49	261
Education	High School completed	48	256
	University completed	23	123
	Postgraduate	29	154
Profession	Agriculture and Food	53	282
	Other Areas	47	250
Age range	17–20	20	107
	21–29	50	267
	30–39	17	90
	>40	13	69
Average individual income (monthly in US$)	< 200	15	80
	200 to 600	48	256
	601 to 1,000	13	70
	1,001 to 1,400	8	42
	> 1,400	16	85

The participants were also divided into age groups. As detailed in Table 4, 50% (266) of research participants were in the age group 21 to 29 years. Although 70% of consumers participating in the survey were young, which may represent a biased emphasis on youth, we believe that this emphasis is relevant to the objective of the study, in that such participants represent the Brazilian consumers of the future.

Research participants were also questioned about the frequency of their weekly consumption of beef (Table 5).

As can be seen in Table 5, most of the research participants frequently consume meat during a typical week. Adding those who consume meat between 2 and 3 times to those who consume meat 4

Table 5. The weekly beef consumption frequency of the research participants.

Information	Description	%	N
Frequency of weekly consumption	≤ once a week	14	75
	2 to 3 times a week	40	213
	4 to 5 times a week	35	186
	Every Day	11	59

Table 6. Averages and standard deviations obtained through the scale of consumer involvement with beef.

	Scale of involvement	Average	SD
1	I am disappointed when I choose poor-quality meat	5.38	1.78
2	Meat is very important for me	5.21	1.80
3	I prefer meals that include meat to those that don't	5.05	1.93
4	It is important for me that meat comes from factories properly inspected by public health authorities	4.58	2.06
5	I prefer beef to meat from other species of animal	4.54	1.97
6	I am confident that I know how to choose good-quality meat	4.25	1.76
7	I only choose meats which are source traceable	3.07	1.82

*Note: N = 534 consumers.

to 5 times a week, accounts for 75% of the total participants (399 consumers). The high frequency of weekly consumption is in accord with the study carried out in Brazil by Schlindwein et al. (2006). Additionally, high beef consumption may be due to the lower price of beef in Brazil in comparison to other countries: a result of Brazil's higher production volume.

The research participants were also questioned about their involvement with beef, in accord with Laurent and Kapferer (1985), Jain and Srinivasan (1990), and Verbeke and Vackier (2004); Burnier et al. (2019a). The responses were scored from 1 (totally disagree) to 7 (totally agree) on the Likert scale, according to the level of consumer agreement (see Appendix 1). The results are presented in Table 6.

One significant feature of Table 6 is that the highest average score was statement 1, suggesting that most consumers agree with this statement. However, the average for statement 6 was the second lowest (4.25). This shows that, even though consumers consider they have significant involvement with beef, uncertainties might lead them to consult a third party, such as a butcher or a waiter, at the moment of choosing (Barcellos et al., 2019; Font-I-Furnols & Guerrero, 2014; Grunert et al., 2004). Certainly, a lack of consumer experience with regard to the choice of meat can be offset by the presentation of adequate quality cues.

Statement 7 returned the lowest average, that is, the least agreement from consumers. From this it can be seen that either consumers from the southeast region of Brazil are not concerned with traceability or they do not possess enough product information to make a decision.

Greater or lesser product involvement

The main meat quality cues selected for the study were evaluated in terms of their relevance to purchase probability. The comparison was initially made considering the general model, and then for consumers with greater or lesser involvement according to purchase mode (Tables 7 and 8). Table 7 presents the results from the combined analysis of quality cues with tradeoffs between attributes and quality. Table 8 presents an individual analysis for each attribute, according to the importance given by consumers, as a form of validation for the results of the combined analysis.

The bright red meat color represents a 36% increased consumer purchase probability compared to the dark red meat color, which represents a 20% increased purchase probability; the brown meat color (results not presented) is given as a characteristic that decreased purchase probability. For the group with greater involvement, the bright red meat color represents the biggest impact on purchase probability, at 41% in relation to 33% for the group with less involvement.

These results are in accord with various other studies on the theme. Carpenter et al. (2001), for example, found that a bright red meat color positively influenced consumer purchase probability. Additionally, Baba et al. (2016), suggested color as one of the principle attributes that affect purchase decisions, and Troy and Kerry (2010), Banović et al. (2012), Borgogno et al. (2015), and Aboah and Lees (2020), found that consumers with greater familiarity and involvement with meat tend to see color as the principal intrinsic suggestion of quality. Clearly, color is a key attribute of visual appearance and affects purchase decisions. It is also the first meat quality cue that consumers encounter at the point of sale. In the present study, we noted that meat with a bright red color, as

Table 7. The combined analysis of meat choice probability according to quality cues and product involvement.

		General (N = 534)		Less involvement			More involvement		
	Variables	Prob. Choice	P value	Prob. Choice	P value		Prob. Choice	P value	
Fresh Meat	BRM	0.3686	0.0000***	0.3340	0.0000***	N = 257	0.4162	0.0000***	N = 174
	DRM	0.2049	0.0000***	0.1821	0.0000***		0.2326	0.0000***	
	MIM	0.0310	0.0143*	0.0470	0.0109**		0.0160	0.5156 ns	
	NBM	0.0857	0.0000***	0.0892	0.0000***		0.0840	0.0023**	
	ABM	0.0945	0.0000***	0.0448	0.0042**		0.1649	0.0000***	
	MP380	−0.1017	0.0000***	−0.0866	0.0004***		−0.1448	0.0000***	
	MP900	−0.1989	0.0000***	−0.1808	0.0000***		−0.2434	0.0000***	
Cooked Meat	MWF	−0.1654	0.0000***	−0.1898	0.0000***	**N = 120**	−0.1411	0.0000***	**N = 338**
	MIF	0.0530	0.0002***	0.0197	0.5575 ns		0.0751	0.0000***	
	MWA	0.0257	0.0227**	0.0419	0.1136 ns		0.0350	0.0130**	
	MIA	0.0292	0.0272**	0.0357	0.2216 ns		0.0285	0.0947*	
	TOM	−0.5966	0.0000***	−0.5820	0.0000***		−0.6053	0.0000***	
	TEM	0.0240	0.0448**	0.0053	0.8494 ns		0.0287	0.0656*	
	MP380	0.0500	0.0000***	0.0279	0.3462 ns		0.0596	0.0000***	
	MP900	−0.0600	0.0002***	−0.0923	0.0173**		−0.0315	0.1157 ns	

*p < 0.10; **p < 0.05 e ***p < 0.01 Prob. Choice = Choice probability. BRM = Bright red meat; DRM = Dark red meat; MIM = Meat with intermediate marbling; NBM = Nellore breed meat; ABM = Angus breed meat; MP380 = Meat at a price of US$ 3,80 Kg (Fresh Meat); MP900 = Meat at a price of US$ 9,00 Kg (Fresh Meat); MWF = Meat with a weak flavor; MIF = Meat with an intense flavor; MWA = Meat with a weak aroma; MIA = Meat with an intense aroma; TOM = Tough meat; TEM = Tender meat; MP380 = Meat at a price of US$ 3,80 (per dish of Cooked Meat); MP900 = Meat at a price of US$ 9,00 (per dish of Cooked Meat).

Table 8. An individual analysis of the importance of quality cues for consumers.

		General (N = 534)		Low involvement			High involvement		
	Attributes	Average	SD	Average	SD	N = 257*	Average	SD	N = 174***
Fresh meat	Price	5.45	1.38	5.43	1.35		5.45	1.49	
	Color	5.98	1.32	5.86	1.50		6.04	1.22	
	Marbling	4.92	1.51	4.68	1.59		5.20	1.37	
	Breed	3.57	1.71	3.13	1.62		4.11	1.7	
Cooked meat	Price	5.48	1.37	5.20	1.54	**N = 120****	5.53	1.34	**N = 338*****
	Flavor	5.90	1.13	5.42	1.32		6.17	0.96	
	Aroma	4.77	1.43	4.38	1.59		5.07	1.31	
	Tenderness	6.42	0.98	6.09	1.32		6.55	0.81	

*N = 257 refers to the lower involvement group for fresh meat; **N = 120 refers to the lower involvement group for cooked meat; ***N = 174 refers to the higher involvement group for fresh meat; ****N = 338 refers to the higher involvement group for cooked meat.

much for consumers with lesser involvement as those with greater involvement, increased purchase probability. However, we also noted that the biggest effect was an increase in purchase probability among consumers with greater involvement.

Meat with intermediate marbling offered insignificant results in the general equation, considering $p < .01$ for groups with greater involvement. However, we noted its significance, ($p < .05$), for groups with lesser involvement, with an increase of 4% in purchase probability. These results show the relative unimportance of marbling content in the choice of products for Brazilian consumers, since, when inserted in the model, the quantity of marbling had a negative effect (results not presented). One possible reason for these results is that Brazilian consumers are accustomed to consuming low fat beef, as the production of beef in Brazil is predominantly Nellore on pasture, resulting in meat with less marbling (Ferraz & Felício, 2010). Interestingly, our results with Brazilian consumers are different to the results of Egan et al. (2001), Ressurreccion (2004), and Aboah and Lees (2020), which unilaterally identified the effect of marbling as the best classified intrinsic suggestion. As pointed out by Ardeshiri and Rose (2018), the lower preference for this attribute may be related to a lack of knowledge about the relevance of fat content, nutritional aspects and health. Alternatively, it may be related to different cultures and eating habits.

Regarding the Nellore breed meat and Angus breed meat quality cues, both the greater and lesser involvement groups presented an increase of 8% for the probability to purchase the Nellore meat breed. Possibly, the Brazilian consumers studied had better knowledge of the Nellore breed due to its predominance in Brazilian herds and its widespread promulgation through popular media. Although the group of lesser involvement presented an increase of 4% for the probability to purchase meat from the Angus breed, the greater involvement group presented an increase of 16%. Although it has been identified in the literature that *Bos indicus* have innately tougher beef than *Bos taurus* (Highfill et al., 2012), the results in our study, based on consumer perception, may be an indication of the fact that this breed is little known by the lesser involvement group and better known by the greater involvement group and, for this reason, the contribution to purchase probability is different. The breeds need to be better known by consumers.

Studies with Chilean consumers identified breed as one of the most valued quality cues for product choice (Fernández et al., 2019). Other studies considered breed an important factor with respect to meat quality (Bernués et al., 2003; Troy & Kerry, 2010). In the present study, we found that the biggest increase in purchase probability for the Angus breed meat was within the greater involvement group and, comparing products with a specific breed to those without, consumers clearly preferred meat from an established breed (results not presented).

In terms of price, as expected, for the lowest (US$ 3.80) and highest (US$ 9.00), the probability of purchasing fresh meat differed according to involvement level. The lowest price (US$ 3.80) decreases the probability of purchase by 14% for the group with greater involvement; the highest price (US$ 9.00) reduces the purchase probability of the group with greater involvement by 24% and by 18% for the group with lower involvement. Additionally, the highest and lowest prices had negative impacts on purchase probability. Possibly a low price may indicate a perception of low quality and a high price as not having sufficient added value, or at least product quality was not perceived or valued at the point of sale.

However, the same low and high prices (US$ 3.80 and US$ 9.00), reflected different consumer behavior in terms of the purchase of cooked meat. In this case, the lowest value, which previously reduced purchase probability, increased purchase probability by 5% in the general equation and for the consumer group with greater involvement. However, the highest price value reduced the purchase probability in the general equation by 6% ($p < .01$) and by 9% for consumers with lower involvement ($p < .05$). For cooked meat, the increase in purchase probability for the lowest-priced product may be associated with greater consumer confidence when purchasing cooked meat, and may also be related to consumer confidence in the choice of eatery.

Price may also be used as a quality cue when there is insufficient information available to evaluate a product (Merlino et al., 2018). These authors found that for consumers from the North of Italy, price was a key element and color was of secondary importance for purchase decisions. In the present study, we found that southeast Brazilian consumers saw color as a key purchase-decision quality cue for fresh meat, and tenderness as a key purchase-decision quality cue for cooked meat. It is possible that this result is because the products studied included appropriate information for consumers.

Brunsø et al. (2002) point to exasperation among meat suppliers that consumers are not willing to pay for better quality. On the other hand, consumers habitually discredit food quality, often as a result of communication failures between meat producers and consumers. The results of our study demonstrate that consumers do not necessarily choose the lowest price. This is clearly evident for the purchase of fresh meat, in which the lowest value reduced purchase probability, and may indeed be an indication that consumers are willing to pay a fair price for products. However, a fair price is not necessarily the most expensive.

For the cooked meat quality cues, weak flavor decreased purchase probability by 16% in the general equation, 19% in the group of lesser involvement and 14% in group of greater involvement; and meat with an intense flavor increased purchase probability by 5% in the general equation ($p < .05$) and 7% for the group with greater involvement ($p < .01$). These results are in accord with Brunsø et al. (2002) and Borgogno et al. (2015), who found that flavor is an important experiential characteristic, even

though expectations may or may not be confirmed during consumption. One explanation for the results found is that consumers who look for the other attributes described in the questionnaire may have created a lower expectation for weak-flavored products and a higher expectation for intense-flavored products, or even may have been influenced by previous experiences.

The tenderness of meat is a very important attribute, so much so that the tough meat quality cue decreased purchase probability by 60% for the groups of both greater and lesser involvement. These results are in line with those of Font-I-Furnols and Guerrero (2014) and partially in accord with Bonny et al. (2016), who related tenderness and flavor as characteristics judged by consumers to be similar to quality. The authors found that the negative qualities of flavor and tenderness were of high relevance to the probability of purchasing cooked meat. This contrasts with the study by Merlino et al. (2018), who suggest that flavor and tenderness are less important characteristics for consumers in the northern region of Italy. Our results may indicate that southeast Brazilian consumers are reluctant to buy tough meat, due to previous undesirable purchase experiences.

As a means of validating the data obtained through the combined analysis (Table 6), at the end of sections 3 and 4 of the questionnaire (see Appendix 1) consumers gave scores from 1 (totally disagree) to 7 (totally agree), on the Likert scale, to indicate their opinions of each attribute when purchasing both fresh meat and cooked meat. These results are presented in Table 8.

By comparing averages, we can see that the highest-scored quality cues for fresh meat are color followed by price. This is true for both the greater involvement and lesser involvement groups. Furthermore, although the breed and marbling quality cues clearly show a better score in the greater involvement group, breed was the quality cue classified of least importance across the scale. These results reinforce the findings of the combined analysis (Table 6), and also demonstrate a lack of consumer knowledge about the tradeoffs offered by quality cues.

For cooked meat, the main attributes for the lesser and greater involvement groups are tenderness and flavor, respectively. For both groups, price appears as the third most important attribute, with aroma being the least important. These results also reinforce the findings of the combined analysis (Table 6).

Willingness to pay (WTP)

The main meat quality cues selected for the study were evaluated in the general equation of the logit model. From this equation, WTP was calculated for the two different purchase modes, fresh meat and cooked meat (Table 9).

The WTP calculations reveal that when meat is defined as a base product, the initial willingness of consumers to pay for it is very low. However, as quality cues are added, this value tends to increase or decrease in different proportions, according to how the attribute is viewed by a given consumer. As consumers have different levels of involvement with meat, such differences bring varied quality

Table 9. Table with base products, to calculate the WTP of fresh meat and cooked meat.

Fresh meat			Cooked meat		
Attribute	WTP (US$)	Difference (US$)	Attribute	WTP (US$)	Difference (US$)
Base Product*	0.02	Base	Base Product*	17.73	Base
MIM	1.42	1.40	MWF	11.07	−6.66
BRM	21.38	21.36	MIF	20.46	2.73
DRM	12.45	12.43	MWA	19.02	1.29
NBM	4.52	4.50	MIA	19.00	1.27
ABM	5.08	5.06	TOM	0.77	−16.96
			TEM	18.86	1.13

Considering US$ 1 = R$ 5.00. *Base product = product without attributes. WTP = Willingness to pay. BRM = Bright red meat; DRM = Dark red meat; MIM = Meat with intermediate marbling; NBM = Nellore breed meat; ABM = Angus breed meat; MWF = Meat with a weak flavor; MIF = Meat with an intense flavor; MWA = Meat with a weak aroma; MIA = Meat with an intense aroma; TOM = Tough meat; TEM = Tender meat.

perceptions and food choice standards that equally result in varying levels of WTP (Brunsø et al., 2002).

For fresh meat, the initial WTP is US$0.02. However, WTP increases as quality cues are added. The attribute which consumers consider increases WTP the most is bright red meat US$ 21.38, confirming the view that color is a key characteristic of meat quality for consumers (Ardeshiri & Rose, 2018). Conversely, meat with intermediate marbling US$ 1.42 lowers WTP. These results, which agree with those of Fernández et al. (2019), are possibly due to the specific eating habits of Brazilian consumers.

For cooked meat, the initial WTP is high at US$ 17.73. When the weak flavor and tough meat attributes are added, there is a reduction in WTP of US$ 6.66 and US$ 16.96 respectively. However, when the other attributes are included, there is an increase in WTP. The attribute that most contributes to a reduction in WTP is tough meat, and the attribute that most contributes to an increase in WTP is intense flavor. These results are in agreement with Gao and Schroeder (2009), who identified a change in WTP when additional information about products were offered.

Clearly, the trade-off between price and quality is an important aspect in the choice of foods by consumers. A low WTP for a certain quality does not necessarily mean a lack of interest, but does suggest a lack of knowledge regarding how the objective characteristics of products can meet subjective consumer expectations (Brunsø et al., 2002).

For cooked meats, it is also important to consider attributes that may reduce WTP, particularly tough and weak-flavored meat. In relation to attributes that increase WTP, meat with an intense flavor, meat with a weak aroma, and tender meat with an intense aroma can be highlighted.

According to Font-I-Furnols and Guerrero (2014), the location where meat is purchased is as a key factor in relation to consumer expectations. Although purchase modes were created in the current study for both cooked and fresh meat, the hedonic purchase perception shows higher evidence for cooked meat, that is, meat served in a restaurant. Hedonic quality is a characteristic experience of food, since this dimension, principally flavor, can only be established after consumption. Thus, consumers need to pre-form the hedonic quality expectations of a food product in order to make a purchase decision (Brunsø et al., 2002). For this reason, the WTP for cooked meat has a higher initial base product value than that of fresh meat.

The WTP calculation for aroma suggests that there may be confusion on the part of consumers. This is a point of interest for restaurants and steak houses. Morquecho-Campos et al. (2020) argue that odor related to protein influences both appetite and flavor. Their results demonstrate consumer preference for protein foods, compared to other foods, due to an amenable release of aromas.

In the current study, we observed that WTP is higher for flavor and aroma when compared to tenderness. In absolute terms, the Brazilian consumers who participated in the questionnaire indicated that they would pay more to avoid tough meat, a conceptual point of view from which a preference for tender meats can be concluded. Considering this, in terms of marketing strategies, it seems to be more important to communicate to consumers that "this meat is not tough" rather than "this meat is tender."

Our research has also identified that when consumers purchase fresh meat, the expectation created and the WTP for it is lower. After consumption, these expectations may be confirmed, exceeded or not met. However, the expectation regarding cooked meat and the WTP for it is higher. And yet, after consumption, the probability of expectations not being met may be even higher still.

Cluster Analysis

The participants were separated into 3 clusters: price conscious, quality conscious and neither price nor quality conscious, grouped according to average proximities. Considering the total sample of 534 participants, 48% (N = 258) were allocated to the "quality conscious" cluster, 38% (N = 201) were allocated to the "price conscious" cluster, and 14% (N = 75) allocated to the "neither price nor quality conscious" cluster. These results are presented in Table 10.

Table 10. Clusters.

	Questions used to group participants in clusters	Cluster		
		Price conscious (N = 201) 38%	Quality conscious (N = 258) 48%	Neither price nor quality conscious (N = 75) 14%
1	How important are meat attributes at the MOMENT OF PURCHASE? Give a score from 1 (not important) to 7 (extremely important). [Price]	6,09	5,53	3,56
2	How important are meat attributes at the MOMENT OF PURCHASE? Give a score from 1 (not important) to 7 (extremely important). [Color]	5,81	6,48	4,49
3	How important are meat attributes at the MOMENT OF PURCHASE? Give a score from 1 (not important) to 7 (extremely important). [Marbling]	4,49	5,76	3,13
4	How important are meat attributes at the MOMENT OF PURCHASE? Give a score from 1 (not important) to 7 (extremely important). [Breed]	2,40	4,87	2,33
5	How important are meat attributes DURING CONSUMPTION? Give a score from 1 (not important) to 7 (extremely important) [Price]	6,18	5,47	3,65
6	How important are meat attributes DURING CONSUMPTION? Give a score from 1 (not important) to 7 (extremely important) [Flavor]	5,72	6,34	4,75
7	How important are meat attributes DURING CONSUMPTION? Give a score from 1 (not important) to 7 (extremely important) [Aroma]	4,40	5,45	3,35
8	How important are meat attributes DURING CONSUMPTION? Give a score from 1 (not important) to 7 (extremely important) [Tenderness]	6,49	6,74	5,13

When questioned about the importance of price at the moment of purchase (fresh meat), the group of consumers in the "price conscious" cluster, presented a greater average (6.09) compared to the other clusters. The same group when questioned about the importance of price at the moment of consumption (cooked meat) also presented a higher average (6.18) than the other groups. This demonstrates that within the quality cues studied, price was the most determining factor on the decision to purchase meat, whether fresh or cooked, for this cluster.

The consumers forming the "quality conscious" cluster attributed more importance to the quality cues of fresh meat (color = 6.48, marbling = 5.76, breed = 4.87) and cooked meat (tenderness = 6.74, flavor = 6.34, aroma = 5.45), with the exception of price. The presence of quality cues was decisive for this cluster at the moment of purchase choice.

The consumers belonging to the "neither conscious of price nor quality" cluster did not consider price or any of the other quality cues, and presented the lowest average in both situations as well as demonstrating that the quality cues made no difference to their decision to purchase.

Considering the frequency of weekly consumption, the greater proportion of consumers (17%) that consume beef at least once per week are allocated to the "price conscious" cluster, having in mind the exponential increase in the price of beef in Brazil and around the world (Hestermanna et al., 2020); a possible explanation for this result is that such consumers may opt for cheaper meats from other animal species (Zhu et al., 2021).

For the consumption frequency of 2 to 3 times per week, the greater proportion (44%) is allocated to the "quality conscious" cluster, and those who consume beef more than 3 times a week have the greatest percentage (51%) allocated to the "neither price nor quality conscious." A possible explanation for this latter result might be indecision at the moment of purchase, since such an individual does not consider price or other quality cues as a determining factor of choice. Another possible explanation is the lack of standardization of meat cuts in retail outlets, in so much as that even an individual

who frequently consumes meat and, consequently, frequently purchases it, has choice difficulties. Further studies are required to better understand the issues involved.

Regarding gender, the proportion of men and women were similar across the clusters.

A significant proportion (70%) of consumers with a lower monthly salary, US$ 200.00 to US$ 600.00 was allocated to the "price conscious" cluster. This result makes sense, since a lower monthly income inevitably means that price is an important deciding factor for purchase choice (Zhu et al., 2021).

Taking the age of participants into consideration, the age group 17–29 had a greater representative allocation (80%) in the "price conscious" cluster. Bearing in mind that, generally, this age group is at the outset of a career lower salary range is one possible explanation.

The professions in which consumers worked were separated into agriculture or food and other areas. This division sought to bring together professionals who have technical information with respect to animal production (agriculture) and food. Around 60% of the participants working in other professional areas were allocated to the "neither price nor quality conscious" cluster. A possible explanation for this could be choice difficulties arising from the lack of standardization of meat cuts and no clear quality indicators to guide the food choices of purchasers. Further studies are needed.

Conclusion

The lack of consumer knowledge regarding quality cues, demonstrates the need to improve communication between the production sector and consumers, seeking to improve customer service and involvement with beef, whether in its fresh state or cooked for immediate consumption. Our results offer meat processors and retail outlets suitable indicators for quality cues that help consumers make informed choices about the products made available to them, indicators which could help to reduce doubts arising at the moment of purchase. We have identified, for example, that there are quality cues that increase purchase probability for fresh and cooked meat, such as bright red color and intense flavor, respectively. Information related to these attributes may be better explored on product labels used in retail stores, making use of beef quality guarantee labels or other such substantive claims.

As well as the difference found in the levels of attributes, we found that the perception of value and valorization of the attributes described vary according to the degree of consumer involvement. In this case, establishments that commercialize fresh and cooked meat should ensure that communication is focused on their target public.

The lack of official and consumer understandable quality cues information regarding breed for fresh meat and information and quality cues regarding tough for cooked meat could be an investment opportunity for government agencies, certification companies, restaurants, butchery and meat industries.

Our results suggest that the all players from meat value chain could explore three different segments of consumers. Meat brands could position their products with different quality cues for the same groups of segments. The same or others segments could be found in different markets. For instance, price sensitive segments could be a group that only exist in non-developed countries.

Our results also suggest that consumers are willing to pay a fair price for the perception of meat quality. However, further studies would clearly contribute to a better understanding of the purchase behavior of consumers of fresh and cooked beef in other regions, analyzing the varying cultural aspects of such regions in particular. Other types of meat that are fresh and cooked purchase could be evaluated by their quality cues.

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