

AperTO - Archivio Istituzionale Open Access dell'Università di Torino

Beef meat preferences of consumers from Northwest Italy: Analysis of choice attributes

This is the author's manuscript

Original Citation:

Availability:

This version is available <http://hdl.handle.net/2318/1679018> since 2022-01-24T14:18:19Z

Published version:

DOI:10.1016/j.meatsci.2018.04.023

Terms of use:

Open Access

Anyone can freely access the full text of works made available as "Open Access". Works made available under a Creative Commons license can be used according to the terms and conditions of said license. Use of all other works requires consent of the right holder (author or publisher) if not exempted from copyright protection by the applicable law.

(Article begins on next page)

1 **Beef meat preferences of consumers from Northwest Italy: analysis of choice attributes**

2 **MERLINO V.M., BORRA D., GIRGENTI V., DAL VECCHIO A. MASSAGLIA S.***

3 Department of Agricultural, Forest and Food Sciences, University of Turin, Largo Paolo Braccini 2, 10095 Grugliasco
4 (TO) Italy

5 *Corresponding author: Tel.: +39 0116708622; fax: +39 0112368622, E-mail address: stefano.massaglia@unito.it

6
7 **ABSTRACT**

8 In this research the importance of several choice attributes of beef for Piedmontese consumers was
9 examined. The survey was conducted on a sample of consumers in sixteen meat stores in Piedmont,
10 Northwest Italy. A choice experiment (Best-Worst scaling methodology) was used to identify
11 consumer preferences and five clusters of purchaser. The responses were also analyzed on the basis
12 of two variables, the frequency of meat consumption and the place of purchase. Piedmontese
13 consumers considered “price” as the most important factor in meat purchasing, but “animal
14 welfare” considerations played some part too.

15

16

17 *Keywords:* choice factors, consumer, beef meat, Best Worst Analysis, price, animal welfare

18

19 **1. INTRODUCTION**

20 The analysis of the consumer perception of meat attributes is important to understand and predict its
21 behavior (Grunert *et al.*, 2004). Meat experience-consumption characteristics and quality attributes
22 determine purchasing decisions (Becker, 2000; Curtis *et al.*, 2006). Moreover, consumer attitudes
23 are influenced by the values and social rules which are determined by multiple aspects of everyday
24 life for individuals or groups of people (Knight and Barnett, 2008; Boogaard *et al.*, 2006; Toma *et*
25 *al.*, 2012).

26 In a study conducted by Loureiro and Umberger (2007) experiments were carried out to analyze the
27 consumer willingness to pay (WTP) a premium for a product guaranteed for meat attributes such as
28 labels, traceability, origin, tenderness and certifications. The results underline how consumers
29 would prefer to pay a premium, in the first place for a safe and certified meat, then for a traceable
30 meat, a guaranteed origin meat and, finally, for a tender meat. The organoleptic quality of the
31 product, therefore, assumes less importance compared to the guarantees of safety of the product.
32 Bonny *et al.* (2016, 2017) reported that tenderness, flavor liking and overall liking had similar
33 weights when consumers score eating quality. However, much of the literature indicates that
34 tenderness is the most important factor in determining consumer satisfaction (Huffman *et al.*, 1996;
35 Alfnes *et al.*, 2008; Verbeke *et al.*, 2010a). This is confirmed especially when it is submitted in a set
36 of quality attributes ascertained on the basis of the actual experience-consumption of the product
37 (tenderness, juiciness, flavor desirability and overall palatability (Bernues *et al.*, 2003; Aalhus *et al.*,
38 2004; Morgan *et al.*, 1991; Curtis *et al.*, 2006). It is also demonstrated that a classification scheme
39 for tenderness as well as meat quality would be appreciated by European consumers (Verbeke *et al.*,
40 2010a). If the set of quality attributes submitted to consumer includes those relating to organoleptic
41 characteristics and credence quality attributes of meat - those that cannot be ascertained even after
42 the normal use of the product (e.g. animal feeding guarantee, environmentally friendly production,
43 respect for the animal welfare, etc.) (Becker, 2000), consumer considers safety as the most
44 important attribute for beef meat choice (Cicia and Colantuoni, 2010).

45 Also meat color was studied in different works as a choice attribute: the red color of beef positively
46 influenced consumer likelihood to purchase (Carpenter *et al.*, 2001). However, the use of color as a
47 cue in the quality perception process not always added to the accuracy of the prediction of quality
48 beef aspects (Grunert *et al.*, 2001; Grunert, 2004).

49 In an American research of Curtis *et al.* (2006), from the analysis of 18 beef meat qualities analysis,
50 a classification in function of attributes importance was made: “extremely important” (freshness,
51 taste/flavor, safety guaranteed meat, tenderness, leanness and price), “very important” (cut type,
52 humane treatment, environmentally friendly, marbling, naturally raised, feed type, packaging,
53 organic label, muscle texture, sale/promotion) and “important” (origin and brand). This latter trend
54 is opposite to the European consumers’ opinion for whom the indication of meat origin- mandatory
55 in the EU- takes on significant importance and is associated to product safety (Ehmke, 2006;
56 Schupp and Gillespie 2001), and to traceability guarantee (Ehmke, 2006; Verbeke and Ward, 2006;
57 Giraud and Halawany, 2006). In particular, consumers have a positive willingness-to-pay for their
58 own country of origin meat products (Ehmke, 2006; Umberger *et al.*, 2002; Loureriro and
59 Umberger 2003).

60 In addition, European quality certifications as the Protected Designation of Origin (PDO) and the
61 Protected Geographical Indication (PGI) are meat choice attributes that relate to the quality and
62 safety of products, especially for Italian consumers (Aprile *et al.*, 2012).

63 The voluntary certification of meat can concern the good farming practices related to animal
64 welfare (Faucitano *et al.*, 2017). Consumer attention towards animal welfare was confirmed by
65 several studies conducted at European level (Boogaard *et al.*, 2006; Vanhonacker *et al.*, 2008; Troy
66 & Kerry, 2010; Toma *et al.*, 2012). The concept is, moreover, being closely linked to increased
67 meat quality and influenced the WTP of consumers for certified animal friendly products (Toma *et*
68 *al.*, 2012; Napolitano *et al.*, 2010): so it becomes important for both the agents operating in the meat
69 supply-chain and the consumer the use of trademarks or labels, for example, certifying a farming
70 system respectful of the animal's well-being (Gracia *et al.*, 2009; Harper and Henson, 2001;

71 McEachern *et al.*, 2007; Napolitano *et al.*, 2010). In this regard, they are recognized as an added
72 value of voluntary labeling product certifications that guarantee the provision of additional
73 information on the product to the consumer that facilitate meat traceability (Loureiro and Umberger,
74 2007; Angulo and Gil, 2007; Villalobos *et al.*, 2010).

75 In our study, in order to understand which meat attributes influence the Nord-West Italy consumer
76 behavior, preferences and beef meat consumption have been analyzed employing Best Worst
77 Scaling.

78 This methodology, below BW, was introduced by Finn and Louviere (1992) in the early 1990s of
79 the last century and, given the growing use in the scientific context, Marley and Louviere (2005)
80 summarized earlier theoretical work and developed an integrative theoretical approach of the
81 methodology. A choice experiment was conducted in this research to analyze the importance of 12
82 attributes of beef and understand if the place of purchase and the meat consumption frequency
83 affect preference structure and the meat-buying habits in Piedmont. The Best Worst analysis was
84 also used to understand if within the sample could be identified clusters with homogeneous
85 preferences. Currently no known published research compares consumers beef meat purchase habit,
86 behavior and preferences relating to the considered meat attributes in function of meat consumption
87 frequency and point of purchase.

88

89 **2. MATERIALS AND METHODS**

90 ***2.1 Data collection***

91 To investigate on Piedmontese consumers purchasing behavior, attitudes and preference about beef
92 an *ad hoc* questionnaire was developed. A total of 401 individuals participated in the study, which
93 was conducted at sixteen points of sale of meat (8 familiar points of sales of fresh cutting meat
94 (trusted butchers, TB), 6 meat points of sale of two mass retail channels where packaged, fresh and
95 processed meat were sold (MS) and 2 farm butchers (B)).

96 Face-to-face interviews were made using paper questionnaires (see Appendix A) from April to July
 97 2015, from Monday to Sunday, in two time slots (9 a.m. to 1 p.m. and 4 p.m. to 8 p.m.). The
 98 questionnaire was subdivided in three main sections. The first section included questions related to
 99 socio-demographical characteristics: age (under 30, from 31 to 45, from 46 to 55 and over 55),
 100 gender (female or male), educational status (primary school, lower secondary school, upper
 101 secondary school, bachelor or master's degree - first stage of tertiary education - 3 or 5 years
 102 degree) and employment (employed, retired, entrepreneur, student, unemployed and housewife).
 103 The second section of the questionnaire was on meat purchasing behavior and consumption.
 104 Quantitative and qualitative consumption of meat, and in particular of beef meat, were examined,
 105 asking about the weekly consumption of meat and beef, the habitual meat point of sale, which cut
 106 types of beef were usually consumed and the beef trend consumption in the last five years. The
 107 preferences of Piedmontese consumers were analyzed in the third section which focused on the
 108 meat attributes chosen for the Best Worst scaling.

109

110 **2.2 Meat attributes**

111 The choice of 12 meat attributes (Table 1) was made after an in-depth review of articles published
 112 in international journals.

113 *Table 1. Meat attributes used for the Best Worst analysis*

<i>Meat qualitative attributes</i>		
Price	Brand	Animal welfare
Country of origin	Color	Taste/flavor
Traceability	Nutritional information	Tenderness
Animal breed	Organic label	Quality certifications

114

115 The attributes chosen were:

116 *1. Price.* Price is a key element in purchasing decisions. In general, it is used as an indicator of
 117 quality when not enough information is available to evaluate the product and in situations of risk.
 118 Generally the purchase of cheaper products reduces the financial risk, while a particularly high

119 price represents a protection from poor quality product (Simon H., *et al.*, 2013; Panza R., 2013;
120 Imami *et al.*, 2011; Aalhus *et al.*, 2004; Villalobos *et al.*, 2010; Girgenti *et al.*, 2016).

121 2. *Country of origin*. Evidence from numerous marketing studies indicate that the assessments made
122 by consumers are significantly influenced by the origin of the products. For the consumer the
123 information on geographical origin can serve both to identify the product and to assess its quality
124 (Curtis *et al.*, 2006; Pencin E., 2014; Loureiro *et al.*, 2007; Erdem *et al.*, 2010; Villalobos *et al.*,
125 2010; Al-Sulaiti *et al.*, 1998).

126 3. *Traceability*. The traceability increases the certainty and safety of the product, even in case of
127 risk for the consumer (Loureiro *et al.*, 2007; Troy & Kerry, 2010; Erdem *et al.*, 2010; Villalobos *et*
128 *al.*, 2010).

129 4. *Animal breed*. Animal breed is usually associated to the animal origin. The breed is an important
130 factor in obtaining a quality meat product and the meat industry uses this attribute as a grading
131 indicator of quality (Bernues *et al.*, 2003; Troy and Kerry, 2010).

132 5. *Brand*. The brand is an indicator of quality, because it allows the consumer to identify the
133 product and to link it with past experiences or information about the manufacturer (or seller)
134 (Villalobos *et al.*, 2010).

135 6. *Color*. Color is one of the attributes that most influence the choice at the time of purchase.
136 Indeed, large retail outlets and traditional retailers in local markets perform rigorous selections
137 based on visual criteria before putting the product on sale or use commercial lights to promote
138 expensive red meat (Troy and Kerry, 2010).

139 7. *Nutritional information*. Some of meat attributes linked with human health, such as fat and
140 cholesterol content, influence especially beef meat consumption (Troy and Kerry, 2010; Curtis *et*
141 *al.*, 2006).

142 8. *Organic label*. Organic certification is recognized in various studies as an attribute that influences
143 positively consumer choices at the time of purchase (Gaviglio *et al.*, 2013; Troy & Kerry, 2010;
144 Sackett *et al.*, 2011; Villalobos *et al.*, 2010). The consumer generally expresses a negative view of

145 excessive manipulation and lack of naturalness in the production and processing of beef products
146 (Verberke *et al.*, 2010); so, the organic label attribute can represent an added value for beef meat.

147 9. *Quality certifications*. Certain retail suppliers require quality certifications related to process and
148 product ethics, and also on the environmental impact of the products (Angulo and Gil, 2007;
149 Loureiro and Umberger, 2007; Sackett *et al.*, 2011; Villalobos *et al.*, 2010). For example, carbon
150 footprint label (voluntary certification) is perceived by consumers as an indication of quality and
151 sustainability of businesses because it certifies the product's environmental sustainability (among
152 others objectives, it requires the analysis and accounting of CO2 emissions) (MATTM – Italian
153 Ministry of the Environment and Protection of Land and Sea).

154 10. *Animal welfare*. Consumers are influenced by information about animal welfare regarding
155 ethical aspects due to the link between animal welfare and meat quality. The consumer is also
156 willing to pay a premium for an animal friendly product (Toma *et al.*, 2012; Napolitano *et al.*, 2010;
157 Verbeke and Viaene, 1999; Troy and Kerry, 2010; Sackett *et al.*, 2011; Villalobos *et al.*, 2010). The
158 link made between animal welfare and meat quality by the consumer can have different meanings.
159 It can be considered only the ethical aspect of the animal welfare concept, but it can also be based on a
160 more anthropocentric interpretation of the same. In this regard, for example, the animal suffering is
161 associated with animal disease (Gregory and Granding, 1998), and thus also with pharmacological
162 treatments which are harmful to humans. On the other hand, the animal reared in free range, with
163 high welfare standards, is seen as a healthier animal that will give a high quality product.

164 11. *Tenderness*. This organoleptic attribute was extensively studied and considered an important
165 attribute for meat choice by consumers (Curtis *et al.*, 2006; Troy & Kerry, 2010; Aalhus *et al.*,
166 2004).

167 12. *Taste / flavor*. With tenderness, taste and flavor of meat were attributes that can be directly
168 influenced by livestock producers through breeding and diet. (Curtis *et al.*, 2006; Troy and Kerry,
169 2010; Aalhus *et al.*, 2004).

170

171 2.3 Data analysis using Best-Worst Scaling

172 Best-Worst methodology consists of a measuring technique in which respondents are asked to
 173 choose their most favorite attribute (the best) and their least favorite attribute (the worst) from a set
 174 of attributes (Cohen & Markowitz, 2002; Girgenti *et al.*, 2016). BW score can be considered an
 175 extension of the pairwise comparison method, since it offers similar benefits and more information
 176 with fewer questions (Cohen and Orme, 2004). This methodology provides a more discriminating
 177 way of measuring the degree of importance that respondents attach to each factor (for example, if
 178 compared with the Likert scale), since the respondents can choose only two attributes, which they
 179 consider as respectively the most and least important for each set of choice. Other benefits of using
 180 this method are related to the fact that avoids problems of distortion of the scores, since there is
 181 only one way to choose the most and the least important attribute, regardless of the cultural
 182 background of the interviewee. To choose how many times each attribute should be presented to
 183 respondents, as well as the number of attributes included in each set of choices, Orme (2012)
 184 recommendations was implemented. A range of 3–5 attributes should be included in each set of
 185 choices, and that each attribute should be presented to the respondent between 3 and 5 times.
 186 According to these recommendations, we chose to include 4 attributes per subset (Table 2), and to
 187 present each attribute 3 times within the questionnaire.

188

189 *Table 2. Example of attributes subset. Respondents had to indicate which of the four presented*
 190 *attributes was considered the best and which worst.*

MOST INFLUENTIAL	ATTRIBUTES	LEAST INFLUENTIAL
○	Tenderness	○
○	Certifications	○
○	Brand	○
○	Animal welfare	○

191

192 MaxDiff designer (v.2.0.2; Sawtooth Software, Orem, UT, USA) was used to distribute each of the
 193 12 chosen attributes into 4 different versions of the questionnaire. Each of these versions consisted
 194 of nine subsets, each including four attributes.

195 Following Orme (2012) multiple factors were considered by the algorithm in the BW analysis:
196 single frequency count (how many times each factor appears within the experimental design),
197 double frequency count (how many times a specific couple of factors appears in the same
198 experimental design), connectivity (all the directly connected factors) and ranking frequency (it
199 reports how many times each factor was placed first, second, third or fourth in the table).

200 The experimental design (done prior to data collection) obtained by using MaxDiff designer
201 considers the effect of the alternative ranking that lead, for this precise reason, to the creation of 4
202 different versions of the experimental design itself. The experimental scheme was generated from
203 the program in a way to obtain a balanced design, where each factor appears in equal amount. A
204 two-way balance was also favoured in the design, which meant that the design was directed towards
205 how often paired combinations of the attributes appeared together, and each pair of attributes
206 appeared together (Lagerkvist, 2013). As the average B–W scores take positive and negative values,
207 and therefore sum to zero, they are often perceived as difficult to interpret. For instance, in the case
208 of importance measurement, a negative B–W value does not indicate negative importance, but
209 rather low (below average) importance. According to the aim of this study the software Sawtooth
210 MaxDiff Web 8.4.6 (SSI-version 8.4.6; www.sawtoothsoftware.com) was used. The total responses
211 for each best and worst attribute were calculated by using by the software using a cyclical algorithm
212 $k(k-1)/2$ possible paired comparisons. An estimation analysis of the scores was made using the
213 Hierarchical Bayes Estimation (HB) technique performed in SPSS, version 21.1. for Windows. The
214 samples were divided into clusters according to the weight that the individual respondent assigned
215 to the different attributes as per the Latent Class Clustering technique. The Sawtooth software by
216 default creates 4 segmentations, each containing the division of the sample from 2 to 5 clusters
217 respectively. To identify the most appropriate segmentation for our case study, some indicators
218 were taken into consideration, such as Log-Likelihood (LL), Consistent Akaike Information
219 Criterion (CAIC) and Bayesian Information Criterion (BIC). The confidence limit applied in the
220 estimation of the attribute scores was set at 95% and the standard deviation was used as a raw

221 indicator of variability present within the sample. In order to understand whether one attribute is
222 preferred to another within the same sample of respondents, we applied the Repeated Measures T-
223 Test with 2 tailed by comparing the rescaled scores for the attribute of each individual respondent,
224 which was obtained from the HB calculation. For segmentation into clusters, the p-value for each
225 attribute was calculated following a homogeneity of variance test. The software used for the
226 quantitative analysis was SPSS.21.0 for Windows.

227 Therefore, the segmentation hypothesis that required the lowest number of BIC among the 4
228 produced by the Software, was chosen as the best representation (www.sawtoothsoftware.com,
229 Dekhili S. *et al.*, 2011).

230 The weight of each attributes, obtained thanks to the HB and IClass analysis, are reported in the raw
231 score section. The raw scores represent the weight of each attribute and they are calculated for each
232 person interviewed by the Logit Multinomial (MNL) method, which is an option in the Sawtooth
233 software.

234 Preferences of meat attributes by the considered consumer sample were analyzed by gender, age,
235 educational level, employment and mean of weekly meat consumption, as well as the point of meat
236 purchase. In particular data analysis was carried out considering four subsets of consumers: A
237 (which consume meat 1-2 times in the week), B (3-5 times in the week), C (up to 10 times for
238 week) and D (more than 10 times).

239

240

241

242

243

244

245

3. RESULTS

The socio-demographic characteristics of the 401 respondents are reported in Table 3.

Table 3. Socio- demographic characteristics of the considered sample.

<i>Sample (n=401)</i>		
Gender	Women	61%
	Men	39%
Age	≤30 years old	16%
	Between 31 and 45 years old	34%
	Between 46 and 55 years old	18%
	>55 years old	32%
Educational Status	Primary School	4%
	Lower Secondary School	24%
	Upper Secondary School	54%
	Bachelor or Master's Degree	18%
Employment	Housewife	9%
	Unemployed	2%
	Employed	45%
	Entrepreneu	18%
	Retired	23%
	Student	3%

In this study the majority of survey respondents were female (61%) and people with an age between 31 and 45 years old (34%). Respondents were not equally distributed in regard to social aspects as age, educational level and employment. Bachelor or Master's degrees represented 18% of the sample, while 24% had a lower secondary school certificate and 4% of considered consumers were characterized by a primary school certificate. The majority of interviewed were represented by qualified consumers (54%) with upper secondary study certificate. According to ISTAT (National Institute for Statistics), the main supplier of official statistical information in Italy. The educational level of the components of the considered sample deferred little or correspond (in the case of graduates) to the national one (Table 4).

Table 4. Comparison between educational levels of the considered sample (Piedmont) and the Italian population

Educational level	Sample	Italy ¹
Primary School	4%	7%
Lower Secondary School	24%	33%
Upper Secondary School	54%	42%
Bachelor or Master's Degree	18%	18%

¹Source: www.istat.it, data of 2016

263

264 Regarding occupation, 45% of respondents was represented by employees and 23% of retirees.
 265 Unemployed and students were poorly represented in the considered sample, covering respectively
 266 2% and 3% of the total. Housewives were 9%, while a 17% of the interviewed was represented by
 267 entrepreneurs. 48% of the considered sample consumed weekly meat from 3 to 5 times (consumers
 268 B), 37% of interviewed consumed meat 1-2 times in a week (consumers A), while 12% up to 10
 269 times weekly (C). A small part of the sample (3%) consumed meat more than 10 times a week
 270 (consumers D). Differences of beef with respect to generally meat weekly consumption emerged
 271 from data elaboration (Table 5).

272

273 *Table 5. Weekly meat and beef consumption of interviewed consumers.*

Weekly consumption		
	Meat	Beef meat
1-2 times	37%	70%
3-5 times	48%	25%
Up to 10 times	12%	4%
More than 10 times	3%	1%

274

275 Among the interviewed, beef was hardly consumed in the diet of consumers C and D. For all
 276 considered consumer subsets, the beef meat consumption was inversely proportional to that of meat
 277 in general. Interviewees preferences of the points of meat purchase were reported in Table 6.

278

279

280

281

282 *Table 6. Points of meat purchase chosen by consumers interviewed.*

<i>Point of meat purchase</i>	
Trusted butcher	60%
Supermarket	30%
Butcher randomly chosen	4%
Farm butcher	4%
Discount store	1%
Farmer's market	1%

283

284 The consumers interviewed at the trusted butchers (TB) confirmed their loyalty to the place of meat
285 purchase, which was not occasional, but routine. In fact, 62% of them bought meat only at the
286 butcher of the interview location. 20% of consumers interviewed in the TB frequented both these
287 places and the supermarkets. 8% was only there by chance and normally they preferred to buy meat
288 at the large retail chains, while 10% of these respondents bought meat at any butchers (butcher
289 randomly chosen), discount stores, farm butchers and farmer’s markets. The respondents at MS
290 considered in the study claimed to bought meat at the place of the interview (66%) or they preferred
291 to buy meat at the butcher of their trust (43%). 54% of respondents in the B point of purchase
292 declared that habitually bought meat at the place of the interview. 15% of respondents from this
293 store also bought meat at the large retail chains, while 10% of these consumers only bought meat at
294 the supermarket. 4% of these consumers chose any butcher as point of meat purchase.

295

296 **3.1 Data elaboration**

297 The BW analysis allowed to identify the most important meat attributes considered by consumers
298 during purchase decision. The number of times that a parameter was chosen as the Best or the
299 Worst (count report) and the average raw score for each factor, considered the sample in general
300 terms, are reported in Table 7.

301

302

303

304 *Table 7. Best Worst Scaling count report (number of BEST and number of WORST) and BW*
 305 *average raw score considering the entire sample.*

<i>Attributes</i>	<i>Number of Best</i>	<i>Number of Worst</i>	<i>Number of B-W</i>	<i>BW average raw score</i>
Animal welfare	435	177	258	0,740
Brand	330	224	106	0,320
Color	264	369	-105	-0,307
Country of origin	196	412	-216	-0,581
Nutritional information	238	472	-234	-0,673
Organic label	301	233	68	0,178
Price	480	179	301	0,892
Quality certifications	241	279	-38	-0,147
Animal breed	357	170	187	0,532
Taste/flavour	291	303	-12	-0,052
Tenderness	282	284	-2	-0,018
Traceability	194	507	-313	-0,884

306

307 Considering the entire sample, consumer choices were influenced especially by price with an
 308 highest average raw score equal to 0,892. The second most significant quality factor for beef meat
 309 purchase was animal welfare (average raw score equal to 0,740). A negative means raw score
 310 linked with a factor signifies that it was not commonly chosen as the Best factor. The worst values
 311 were attributed to traceability (-0,884) and nutritional characteristics (-0,673).

312 Only five factors (price, animal welfare, animal breed, brand and organic label) were effectively
 313 important for Piedmontese consumers in the meat purchase decision considering the mean BW raw
 314 scores. On the other hand, the less important beef meat characteristics were: tenderness, flavor,
 315 quality certification, color, animal origins, nutritional characteristics and traceability.

316 The sample classification by means of the lClass analysis method was performed choosing the
 317 clustering which had the lowest BIC value (Table 8): between the 4 different choices (from 2 to 5
 318 groups) the 5 groups clustering was therefore adopted and chosen as the most representative method
 319 to represent the different meat purchase behaviours.

320

321 *Table 8. lClass analysis results: comparison between the considered indicator (LL -Log-Likelihood,*
322 *CAIC - Consistent Akaike Information Criterion and BIC - Bayesian Information Criterion).*

Groups	LL ¹	CAIC ²	BIC ³
2	-9339,852	18907,043	18884,043
3	-9198,325	18742,602	18707,602
4	-9123,730	18712,024	18665,024
5	-9068,848	18720,872	18661,872

¹LL : Log-Likelihood. ²CAIC: Consistent Akaike Information Criterion.
³BIC: Bayesian Information Criterion (BIC).

323
324
325

326 The sample division in clusters with different numerosities is reported in Table 9. There are
327 important differences in term of preferences expressed between the 5 groups. Only three meat
328 attributes had the same sign in all the clusters (negative of the traceability, positive for brand and
329 animal breed). On the other hand, all the other 9 beef meat attributes were differently considered
330 into the different clusters. In this group of attributes, two of them (country of origin and price) have
331 the same sign (respectively positive and negative in 4 clusters and both differ in the cluster of
332 “undecided consumer”).

333 In order to classify more comprehensively the characteristics of respondents belonging to the five
334 selected clusters each group has been named in function of the most influential meat attributes.

335 The main group (32,5%), called "Price sensitive" gathered consumers more attentive to price during
336 meat purchase, but not indifferent to animal welfare. The second largest group (26,3% of the
337 respondents) belongs to the cluster "Undecided consumer" (all the 12 raw scores are next to zero).

338 The third group in numerical terms (17,5%) was called "Territorial", and its major interest was
339 focused on the beef meat color, on animal breed and on the brand. The cluster "Animal welfare
340 sensitive consumers" with 12,9% of the total respondents collects inside the biggest supporters of
341 animal welfare, not at all interested in the nutritional information on the label. In conclusion, the
342 smaller group (10,8%) called "Health conscious consumers", was the one in which the preferences
343 expressed by consumers were of difficult interpretation: though in absolute terms the main attribute
344 chosen in the group is that of price, this is still lower than that of “price sensitive”, and the meat

color is significantly positioned in second place. Moreover, major importance was assigned to the “nutrition information” attribute in this cluster where assume a net positive relevance unlike what happens in other clusters.

Table 9. Mean BW Raw score for the five clusters representative of considered consumers sample: price sensitive, undecided, territorial animal welfare sensitive, health conscious.

	<i>Price sensitive</i>	<i>Undecided</i>	<i>Territorial</i>	<i>Animal welfare sensitive</i>	<i>Health conscious</i>
Cluster dimension	32,5%	26,3%	17,5%	12,9%	10,8%
<i>Attributes</i>	<i>Raw score</i>				
Traceability	-1,245	-0,002	-0,974	-1,039	-1,602
Price	1,835	-0,141	0,310	0,925	1,348
Brand	0,323	0,040	0,380	0,570	0,624
Animal breed	0,721	0,006	0,696	0,334	0,624
Color	-0,674	-0,389	1,310	-1,276	1,219
Animal welfare	1,185	0,375	-0,078	1,535	-0,420
Country of origin	-0,636	0,023	-1,180	-0,251	-1,340
Organic label	0,659	-0,028	0,183	-0,582	0,026
Nutritional information	-1,678	-0,244	0,180	-1,475	1,103
Tenderness	0,227	0,186	-0,505	0,299	-0,921
Quality certifications	-0,494	0,086	0,209	-0,001	-0,374
Taste/flavour	-0,224	0,088	-0,531	0,961	-0,268

The number in which each factor was qualified as the Best or the Worst considering the entire sample was analyzed in function of the weekly beef meat consumption frequency (Table 10). The Raw score for all the meat factors were showed.

The distribution of the preferences expressed by the consumers concerning the previously described factor does not change among A, B and C/D meat consumers groups. The price and the animal welfare were always, respectively, the most and the second most important attribute that a customer evaluates. Between these latter factors, the biggest gap can be found in the meat consumers group B (which consumed meat from 3 to 5 times per week), while for the group A of consumers, these two values were comparably equal followed shortly by meat tenderness. Nutritional characteristics and traceability were considered of lowest importance by A consumers. Similar values can be found for the B and C/D groups of consumers. Furthermore, for this latter group meat color plays a remarkable role during meat purchase.

364 Table 11 reports the Mean Raw Score for each meat attribute concerning the sample population
365 segmentation in function of the point of meat purchase. The general term “other place of purchase”
366 includes farmer markets, butchers randomly chosen, farm butchers and discount stores. The
367 consumers that usually buy meat from the large retail sales were remarkably interested to the meat
368 color. The least important factors were animal origin, traceability and nutritional information.

369 Table 10. Best Worst Count and Mean Raw score in function of weekly frequency of meat consumption in the considered consumers groups (A, B, C
370 and D¹)

Consumers groups	A				B				C				D			
Attributes	<i>n.</i> <i>Best</i>	<i>n.</i> <i>Worst</i>	<i>n.</i> <i>B-W</i>	<i>BW mean</i> <i>raw score</i>	<i>n.</i> <i>Best</i>	<i>n.</i> <i>Worst</i>	<i>n.</i> <i>B-W</i>	<i>BW mean</i> <i>raw score</i>	<i>n.</i> <i>Best</i>	<i>n.</i> <i>Worst</i>	<i>n.</i> <i>B-W</i>	<i>BW mean</i> <i>raw score</i>	<i>n.</i> <i>Best</i>	<i>n.</i> <i>Worst</i>	<i>n.</i> <i>B-W</i>	<i>BW mean</i> <i>raw score</i>
Animal welfare	168	67	101	0,738	185	91	94	0,606	62	14	48	1,197	18	6	12	0,991
Brand	108	77	31	0,233	168	113	55	0,371	44	21	23	0,645	10	10	0	0,034
Color	92	131	-39	-0,283	138	164	-26	-0,192	28	55	-27	-0,747	6	19	-13	-1,052
Country of origin	82	155	-73	-0,477	84	200	-116	-0,682	20	52	-32	-0,821	10	8	2	0,066
Nutritional information	77	192	-115	-0,897	109	215	-106	-0,653	34	48	-14	-0,361	19	17	2	0,159
Organic label	111	89	22	0,123	144	102	42	0,255	35	34	1	0,097	10	9	1	0,206
Price	168	74	94	0,677	234	75	159	1,052	71	19	52	1,395	9	9	0	-0,051
Quality certifications	99	106	-7	-0,056	92	133	-41	-0,291	30	27	3	0,014	20	12	8	0,746
Animal breed	115	78	37	0,310	181	70	111	0,678	41	17	24	0,654	19	5	14	1,058
Taste/flavour	107	107	0	0,004	150	140	10	0,018	23	46	-23	-0,666	12	9	3	0,239
Tenderness	118	91	27	0,206	135	137	-2	-0,025	25	37	-12	-0,289	5	20	-15	-1,282
Traceability	87	165	-78	-0,578	81	261	-180	-1,137	19	62	-43	-1,117	6	20	-14	-1,113

371
372 ¹ Consumers were classified in function of weekly frequency of meat consumption: A= which consume meat 1-2 times in the week; B = 3-5 times in the week; C= up to 10 times for week; D= more
373 than 10 times.
374

376 *Table 11. Best Worst Count and Mean Raw score for the meat attributes: differences in function of declared meat point of purchase (supermarkets,*
377 *trusted butcher, other places of purchase).*

Place of purchase	Large scale retail distribution				Trusted butcher				Other places of purchase			
	Attributes	n. Best	n. Worst	n. B-W	BW mean raw score	n. Best	n. Worst	n. B-W	BW mean raw score	n. Best	n. Worst	n. B-W
Animal welfare	59	49	10	0,167	255	89	166	0,859	112	39	73	0,887
Brand	58	54	4	0,039	189	115	74	0,383	84	46	38	0,452
Color	78	53	25	0,462	115	227	-112	-0,579	69	85	-16	-0,213
Country of origin	41	89	-48	-0,720	114	212	-98	-0,477	38	114	-76	-0,837
Nutritional information	58	84	-26	-0,404	98	292	-194	-1,002	78	92	-14	-0,153
Organic label	52	67	-15	-0,216	159	104	55	0,251	90	62	28	0,316
Price	73	41	32	0,468	293	76	217	1,170	111	59	52	0,663
Quality certifications	56	52	4	0,022	123	156	-33	-0,198	61	67	-6	-0,139
Animal breed	53	30	23	0,335	213	94	119	0,623	84	44	40	0,495
Taste/flavour	59	64	-5	-0,070	163	159	4	0,017	64	76	-12	-0,212
Tenderness	62	41	21	0,286	159	166	-7	-0,058	61	74	-13	-0,165
Traceability	44	69	-25	-0,369	108	299	-191	-0,989	39	133	-94	-1,094

378 4. DISCUSSION

379

380 In this study the consumer beef meat preferences were studied by means of the Best Worst scaling
381 methodology in order to identify the most relevant factors in meat purchase behavior in the
382 Piedmontese region.

383 The BW method concerns the analysis of all data focusing on the consumer behavior as a function
384 of beef meat point of purchase as well as the weekly meat consumption. Face-to-face interviews
385 were conducted using paper questionnaires and an intercept survey method choosing people
386 randomly: the interviewer's presence allowed to assist consumers during form filling, especially in
387 the BW section.

388 Five of the 12 considered factors related to product description (price, animal welfare, animal breed,
389 brand, organic label) were selected by the respondents as most important. The remaining factors
390 were considered less relevant by consumers during meat purchase. Among the above mentioned 5
391 meat attributes, the most relevant ones were price and then animal welfare. Already in Curtis *et al.*
392 (2006) consumers considered the price as an "extremely important" attribute during meat choice.
393 Also Davidson *et al.* (2003) and Lagerkvist (2013) confirmed our results, which justify the price
394 consideration first of all other meat characteristics such as origin or nutritional aspects. In this
395 regard, note how from the clusters' segmentation of the sample has been identified the "Price
396 sensitive" group as the one most represented by the respondents. However, this latter result is in
397 contrast with the declarations reported in other researches in which price attribute is less important
398 than origin, information regarding animal treatment and organoleptic aspects (Verbeke *et al.*,
399 2010b; Schnettler *et al.*, 2009; Glitsch, 2000). In our research, the high quality of the considered
400 product (in many cases of Piedmontese cattle breed) (Brugiapaglia *et al.*, 2014; Wheeler *et al.*,
401 2001; Destefanis *et al.*, 1993; Tatum *et al.*, 1990) probably reduces the importance of the evaluation
402 of some aspects (organoleptic quality, certifications, origin), making the meat price as the
403 discriminating attribute during purchase. Currently, the economic crisis induces consumers to focus

404 their attention on product prices and on quality-price correlation. Food demand is in any case driven
405 by the price, but evaluation of price sensitivity is also increasingly driven by more complex and
406 heterogeneous attributes (Grunert, 2001; Wakefield and Inman, 2003). This is confirmed also for
407 meat and, in particular, for beef meat (Schnettler *et al.*, 2009; Bernabéu and Tendero, 2005). In our
408 study the importance of price is always associated with other attributes that were put to the
409 interviewed at the same time.

410 Animal welfare is the second most relevant attribute considered during meat purchase by
411 Piedmontese consumers. If in Schnettler *et al.* (2009) the price importance by the consumer during
412 meat purchase was confirmed, animal welfare is perceived as a desirable condition, but consumers
413 are not willing to pay significantly more when buying meat in order to gain information about
414 animal handling. Some other studies indicate that animal welfare is relatively less important than
415 other attributes, such as animal feeding or origin (Bernués *et al.*, 2003). On the contrary, Napolitano
416 *et al.* (2007) concluded that if the meat is acceptable in terms of sensory properties, information
417 about animal welfare allows the consumers to gain a more positive perception of the product and
418 increase meat acceptability in Italy. In our study, the cluster of "Animal welfare sensitive", which
419 accounted for 12,9% of the sample, was represented by consumers with preferences in accordance
420 to Napolitano *et al.* (2007). Then, animal welfare conditions are of high relevance (Tonsor and
421 Wolf, 2011) and represent a wise approach to some of meat quality aspects (colour, tenderness,
422 nutritional properties) and food safety, since it is strictly related to the animal growth and life style
423 (Lagerkvist, 2013; Schwartzkopf-Genswein *et al.*, 2012; Castellini *et al.*, 2002). The ever-growing
424 interest of part of the consumers toward animal welfare has been clearly seen from the answers
425 collected during the interviews. Recent studies focusing on EU indicated that consumers are willing
426 to eat animal friendly meat because they associate it with higher quality and health (Special
427 Eurobarometer, 2007; Borra and Tarantola, 2015). However, in Miele (2010) differences of animal
428 welfare importance by consumers emerged in a comparison works included Southern and
429 Scandinavian European countries (seven in total): across the involved countries, French and Dutch

430 consumers were the less interested, the British were at the center, while Hungarian, Swedish ,
431 Norwegian and Italian consumers were the most interested at the animal welfare issue. This interest
432 is also expressed in Kjærnes and Lavik (2008).

433 In our research emerges as animal breed information is a discriminant attribute during meat
434 purchase in Piedmont and may also influence consumer expectations. Information about production
435 systems can be a determinant of beef preference (Napolitano *et al.*, 2010), thus providing a potential
436 tool for meat differentiation (Morales *et al.*, 2013). The breeding of Piedmontese cattle breed is of
437 great importance in Piedmont and consumer recognizes this farming system, typically managed
438 outdoors and based on pasture for part of beef production systems, as a discriminating factor during
439 meat purchasing (Colombino and Giaccaria, 2015). In our research, meat from Piedmontese cattle
440 breed was bought in one of the considered mass retail channel, in both the farm butchers and in four
441 of the trusted butchers. Pasture grazing system is also perceived by consumers as a lower
442 environmental impact system, as natural and animal friendly (Hersleth *et al.*, 2012; Schnettler *et al.*,
443 2010).

444 Also the brand, in our study, was mostly associated with the mark of the Italian Consortium of
445 Piedmontese beef. Brand may be placed on the packaging, in the case of packaged meat, or, in the
446 case of trusted butchers, at the place of meat purchase (e.g. the brand of certified meat of the
447 Piedmont breed). Much of the information that consumers receive regarding meat is provided
448 through adverts, information campaigns, labels or brands (Font-i-Furnols and Guerrero, 2014). In
449 any event, the brand presence on meat is synonymous with a guarantee of wholesomeness,
450 traceability and authenticity of the product (Bredahl, 2004; Grunert *et al.*, 2004 ; Van Wezemael *et*
451 *al.*, 2010). Brands are more interesting for consumers who also use them to infer expected beef
452 quality (Verbeke and Ward, 2006).

453 Attributes related to organoleptic characteristics as tenderness, taste/flavor and color were
454 considered less important for the sample considered as a whole. This result is in contrast to the
455 literature (Glitsch, 2000), but without considering the geographical context of our research; in fact,

our results probably depend by the fact that almost 70% of interviewed bought Piedmont beef meat, which is characterized by the widely spread double muscled phenotype, associated with light red colour, very low content of intramuscular fat and high tenderness (Brugiapaglia *et al.*, 2014; Wheeler *et al.*, 2001; Destefanis *et al.*, 1993). So, there are good probabilities that a large part of the sample (60% of them bought meat by trusted butchers) considered the organoleptic quality as a precondition of the meat that they usually buy. However, meat color plays a remarkable role during purchase for interviewed who consume a lot of meat during the week and buy especially at supermarkets. A different perception of the color attribute has been previously evidenced by Kubberød (2002) who highlights how the socio-economic environment influences the consumer behavior.

In the case of the organic label, other authors recognize consumer interest in organic production. The information contained in the labels are becoming increasingly important in consumer preferences (Napolitano *et al.* 2010, Janssen and Hamm 2012). The interpretation of “organic” characteristic of meat is well explained in Grunert *et al.* (2004) in which organic production was associated by consumer with healthy meat, animal welfare and environment sustainability, and also with good taste; because in addition to being a credence characteristic, the "organic" attribute is also partly an experience characteristic (Grunert and Andersen, 2000).

The two attributes that Piedmontese consumers considered less important when purchasing meat were traceability and nutritional characteristics. This result is surprising if compared with what is reported in literature (Morales *et al.*, 2013; Stranieri and Banterle, 2015); however, as mentioned before in this analysis, it probably derives from the particular product type that is being evaluated in our research: consumers, especially in Piedmont, considered these meat attributes a precondition during Piedmontese breed beef purchase (Colombino and Giaccaria, 2015). Information about traceability was not perceived as an important quality cue to consumers, as reported also in Lagerkvist (2013).

481 Previous research is in contrast with our results about the importance of the country of origin
482 (Hoffman, 2006), which is normally linked with safety (Ehmke, 2006; Schupp and Gillespie 2001)
483 and a guarantee of traceability (Ehmke, 2006; Verbeke and Ward, 2006; Giraud and Halawany,
484 2006) during meat choice. The meat origin knowledge by the consumer of the considered sample
485 probably was not important because the meat of Piedmont breed is, in the major of cases, certified
486 in terms of origin (Colombino and Giaccaria, 2015).

487 The clusters' analysis evidenced that a third of respondents was characterized by preferences
488 equally distributed among the proposed attributes of meat and therefore were defined as "Undecided
489 consumers"; this group was followed, in terms of group dimension, from those who give more
490 attention to the territorial nature of the product (defined as "Territorial"); residual categories were
491 the most sensitive to the issue of animal welfare.

492 Meat attributes, if considered together, can compensate, one the consequence of the other, or in
493 other cases be opposed, and all contribute to generating the quality of the global product: in a recent
494 work emerged that the combination of the various complementary approaches seems promising
495 improve the forecast of global quality of beef, especially for consumers, but also for all supply
496 chain stakeholders (Hocquette *et al.*, 2014). in particular, the quality concept of beef meat contain
497 all characteristics of the product itself (e.g. in terms of tenderness, palatability, nutritional value,
498 safety) but also all extrinsic qualities more or less associated with beef (such as e.g. livestock
499 practices, animal welfare, carbon footprint, price for consumers, income for producers). all these
500 aspects are more or less mutually linked (Hocquette *et al.*, 2014; 2012).

501 The analysis in function of the two variables "weekly consumption" and "point of purchase"
502 provide different results. Different consumption frequencies substantially do not modify the rank of
503 preferences: the groups A, B and C have the same three most important attributes (price, animal
504 welfare and animal breed) and the two least important (country of origin, nutritional information
505 and traceability). However, the results of Barrena and Sanchez (2009) study highlighted that meat
506 abstracted attributes (especially the attributes of beliefs) during meat choice were high relevant for

507 individuals at high frequency of meat consumption. This result is confirmed in our study, in which
508 emerged the importance of brand and of organic label for consumers C and of quality certifications
509 for consumers D. Meat purchasers who consume a lot of meat during the week included in the worst
510 attributes of meat even the organoleptic characteristics of the product.

511 In our choice experiment, several differences of consumer behavior in function of point of meat
512 purchase emerged from the analysis. Consumers that usually bought meat in supermarket focused
513 their attention on meat price and color. Secondly, these consumers have focused their attention on
514 animal breed, tenderness, brand and animal welfare. Finally, meat traceability and nutritional
515 characteristics were evaluated as the least important attributes during the purchase. Indeed,
516 confident Piedmontese meat consumers purchased at supermarket and considered their acquired
517 products as guaranteed from the point of view of traceability. This result is conforming to other
518 research in which consumers like to assume that all food on sale in supermarkets has a safety
519 guarantee (Grunert *et al.*, 2004; Colombino and Giaccaria, 2015). Nutritional characteristics when
520 analyzed only in the beef choice were not perceived by consumers as discriminating characteristics
521 during the purchase: probably this is do as the consumer does not perceive substantial differences,
522 especially for the considered sample which is accustomed to a high quality standard of meat of
523 Piedmontese cattle breed (Brugiapaglia *et al.*, 2014).

524 As resulted in Goodman (2009), large scale retailers give always more space to “organic”,
525 “typical” or “traditional” products. This process of convergence between local production and
526 commercial spaces of large scale retailers directly involves the protection and enhancement of
527 Piedmontese meat.

528 In our research, if the meat price remains at the first place of importance and animal breed ranks
529 third, animal welfare emerges as the second most important choice attribute for consumers that
530 habitually buy meat from butchers. The importance of animal welfarte as an attribute for beef meat
531 choice emerges also in a recent study conducted by Slow Food (Borra and Tarantola, 2015).

532 Nutritional information, traceability, color and country of origin are the less important attributes
533 chosen by these consumers at the butcher level. Despite the less positive assessment for these last
534 attributes is surprising, considering the behavior of meat choice in general (Pethick *et al.*, 2011),
535 these results can demonstrate how the evaluation of the attributes in question is important to
536 discriminate a wide choice of products, with different characteristics. Contextualizing the attitude of
537 the consumers described in our study, which bought meat from the trusted butchers, who sold a
538 specific product with peculiar characteristics, such as the meat of Piedmontese cattle (well-defined
539 nutritional characteristics and certified origin), the evaluation of nutritional characteristics, origin or
540 traceability, probably passed second, almost obvious.

541 The result related to color attribute evaluation during meat purchase at a trusted butcher is
542 according to Grunert *et al.* (2004) in which the high degree of importance attached to buying from a
543 butcher shows that consumers prefer to entrust the purchase decision to an expert, who would be
544 more capable of predicting the outcome of the meal than themselves.

545 Consumers interviewed by “Other places of purchase” assumed price and animal welfare as the
546 most important attributes for meat choice, while country of origin as the worst. 70% of these
547 interviewed bought meat in discount store or in butcher randomly chosen by the consumer giving
548 little attention to the place of meat purchase; therefore, it is not surprising the little relevance that
549 these consumers showed with respect to the origin of the product. The other part of this category of
550 consumers chose as a place of meat purchase farm butchers or farmer markets. In general, apart
551 from the two constants concerning price and animal welfare, the place of purchase of the meat
552 emerges as a factor in relation to consumer expectations. these latter changing in function of the
553 information available at the shopping place (e.g., the product itself, its package, appearance, label,
554 context, advertising or price) that generate new expectations (Font-i-Furnols and Guerrero, 2014).

555

556

557

58 5. CONCLUSIONS

59 The Best–Worst methodology proved to be a useful tool to evaluate consumer preferences in
60 function of the frequency of meat consumption and the meat place of purchase. From the presented
61 work a discrimination between the importance of each meat choice-attribute was made;
62 furthermore, from our research the differences of preferences in subsets of the sample characterized
63 by a typical behavior during meat purchase. In our choice experiment, the high quality of the
64 product expected by the consumer probably reduces the importance of attributes that, in other
65 contexts, would be carefully assessed (traceability, organoleptic and nutritional characteristics),
66 increasing the consumer focus on price and animal welfare. Future research should focus on the
67 analysis of meat consumption comparing Piedmonts breed with other breeds (for example with
68 Garonnaise and Limousine breeds which are traditionally raised and consumed in Italy) (Hanus,
69 2000; Cozzi, 2007) and extend the current research in the national - international context.

70

71 REFERENCES

- 72 Aalhus J.L., Jeremiah L.E., Dugan M.E.R., Larsen I.L., & Gibson L.L., 2004. Establishment of
73 consumer thresholds for beef quality attributes. *Can. J. Anim. Sci.* 84: 631-638.
- 74
- 75 Alexander D.D., Miller A.J., Cushing C.A., Lowe K.A., 2010. Processed meat and colorectal
76 cancer: A quantitative review of prospective epidemiologic studies. *European Journal of Cancer*
77 *Prevention*, 19 (2010), pp. 328–341.
- 78
- 79 Alfnes F. , Rickertsen K. , Ueland Ø., 2008. Experimental evidence of risk aversion in consumer
80 markets: the case of beef. *Applied Economics*, 40, 3039-3049.
- 81
- 82 Al-Sulaiti K.I., Baker M.J., 1998. Country of origin effects: A literature review. *Mark. Intell. Plan.*
83 16, 150–199.

584

585 Angulo A. M., Gil J. M., 2007. Risk perception and consumer willingness to pay for certified beef
586 in Spain. *Food Quality and Preference* 18 (8), 1106-1117.

587

588 Aprile M. C., Caputo V., Nayga Jr. R. M., 2012. Consumers' valuation of food quality labels: the
589 case of the European geographic indication and organic farming labels. *International Journal of*
590 *Consumer Studies* 36 (2), 158-165.

591

592 Barrena R., Sánchez M., 2009. Consumption frequency and degree of abstraction: A study using the
593 laddering technique on beef consumers. *Food Quality and Preference* 20 (2), 144-155.

594

595 Becker T., 2000. Consumer perception of fresh meat quality: a framework for analysis. *British Food*
596 *Journal* 102(3), 158 – 176.

597

598 Bernabéu R., Tendero A., 2005. Preference structure for lamb meat consumers. A Spanish case
599 study. *Meat Science*, 71(3), 464-470.

600

601 Bernues A., Olaizola A., Corcoran K., 2003. Extrinsic attributes of red meat as indicators of quality
602 in Europe: an application for market segmentation. *Food Qual. Prefer.* 14: 265-276.

603

604 Bonny S. P. F., Gardner G. E., Pethick D. W., Allen P., Legrand I., Wierzbicki J., Farmer L. J.,
605 Polkinghorne R.J., Hocquette J.-F., 2017. Untrained consumer assessment of the eating quality of
606 European beef: 2. Demographic factors have only minor effects on consumer scores and willingness
607 to pay. *Animal*, Published online: 13 February 2017, pp. 1-13.

608 DOI: <https://doi.org/10.1017/S1751731117000076>

609

610 Bonny S. P. F., Hocquette J.-F., Pethick D. W., Legrand I., Wierzbicki J., Allen P., Farmer L. J.,
611 Polkinghorne R. J., Gardner G. E., 2016. Untrained consumer assessment of the eating quality of
612 beef: 1. A single composite score can predict beef quality grades. *Animal*, Published online: 10
613 November 2016, pp. 1-10.
614 DOI: <https://doi.org/10.1017/S1751731116002305>
615
616 Boogaard B.K., Oosting S.J., Bock B.B., 2006. Elements of societal perception of farm animal
617 welfare: A quantitative study in The Netherlands. *Livest. Sci.* 104: 13-22.
618
619 Borra D., Tarantola M., 2015. Il consumatore europeo e il benessere animale. Indagine di Slow
620 Food sui consumi e le abitudini di acquisto della carne in funzione della percezione dell'animal
621 welfare. Franco Angeli Editore.
622
623 Bredahl L., 2004. Cue utilisation and quality perception with regard to branded beef. *Food quality*
624 and preference, 15(1), 65-75.
625
626 Brugiapaglia A., Lussiana C., Destefanis G., 2014. Fatty acid profile and cholesterol content of beef
627 at retail of Piemontese, Limousin and Friesian breeds. *Meat science*, 96(1), 568-573.
628
629 Carpenter C. E., Cornforth D.P., Whittier D., 2001. Consumer preferences for beef color and
630 packaging did not affect eating satisfaction. *Meat Science* 57, 359-363.
631
632 Castellini C., Mugnai C. A. N. D., Dal Bosco A., 2002. Effect of organic production system on
633 broiler carcass and meat quality. *Meat science*, 60(3), 219-225.
634

635 Cicia G., Colantuoni F., 2010. WTP for traceable meat attributes: A Meta-analysis. Proceedings in
636 Food System Dynamics, 678-690.
637

638 Clemens R., Babcock B.A., 2002. Meat traceability: its effect on trade. Iowa Ag Review Online.
639 8(1). Iowa State University Center for Agricultural and Rural Development.
640 http://www.card.iastate.edu/iowa_ag_review/winter_02/IAR.pdf.
641

642 Cohen S.H., 2003. Maximum Difference Scaling: Improved Measures of Importance and
643 Preference for Segmentation. Sawtooth Software Inc. 1-17.
644

645 Cohen S.H., Markowitz P., 2002. Renewing Market Segmentation: Some New Tools to Correct Old
646 Segmentation. Sawtooth Software Inc. 1-17.
647

648 Cohen S.H., Orme B., 2004. What's Your Preferences?. Market. Res. 16: 32-37.
649

650 Colombino A., Giaccaria P., 2015. Breed contra Beef. Political Ecologies of Meat, 161.
651

652 Cozzi G., 2007. Present situation and future challenges of beef cattle production in Italy and the role
653 of the research. Italian Journal of Animal Science, 6(sup1), 389-396.

654 Curtis K. R., Cowee M.W., Lewis S.R., Harris T.R., 2006. Consumer preferences for meat
655 attributes. Internal publication of University of Nevada, USA.
656

657 Davidson A., Schröder M.J.A., Bower J.A., 2003. The importance of origin as a quality attribute for
658 beef: Results from a Scottish consumer survey. International Journal of Consumer Studies 27, 91–
659 98.
660

661 Dekhili S., Sirieix L., Cohen E., 2011. How consumers choose olive oil: The importance of origin
662 cues. *Food Qual. Prefer.* 22 (8), 757-762.

663

664 Destefanis G., Brugiapaglia A., Barge M.T., 1993. The influence of breed type on texture and
665 sensory characteristics of beef meat. *Proceedings 39th International Congress of Meat Science and*
666 *Technology*, S2P06.WP. 1-6 August 1993, Calgary, Alberta, Canada.

667

668 Ehmke, M. T., 2006. International differences in consumer preferences for food country-of-origin: a
669 meta-analysis. In *American Agricultural Economics Association Meeting*, Long Beach CA, 23-26.

670

671 Enneking U., 2004. Willingness to pay for safety improvements in the German meat sector: the case
672 of the Q&S label. *Eur. Rev. Agric. Econ.* 31(2): 205-223.

673

674 Erdem S., Rigby D., Wossink A., 2010. Who is most responsible for ensuring the meat we eat is
675 safe? *Food Safety and Nutrition Track Session Summary*. AAEE, CAES, & WAEA Joint Annual,
676 July 25-27. Denver, Colorado (USA).

677

678 European Commission, 2009. Feasibility study on animal welfare labelling and establishing a
679 Community Reference Centre for Animal Protection and Welfare. Part 1. Animal Welfare
680 Labelling. Final Report Framework Contract for evaluation and evaluation related services. Lot 3.
681 Food Chain. Brussels, Belgium: European Commission. Directorate General for Health and
682 Consumer Protection.

683

684 Faucitano L., Martelli G., Nannoni E., Widowski T., 2017. Chapter 21 - Fundamentals of Animal
685 Welfare in Meat Animals and Consumer Attitudes to Animal Welfare. In *Woodhead Publishing*

686 Series in Food Science, Technology and Nutrition, edited by Peter P. Purslow, Woodhead
687 Publishing, 2017, Pages 537-568, New Aspects of Meat Quality.
688 <https://doi.org/10.1016/B978-0-08-100593-4.00021-7>.

689
690 Finn A., Louviere J.J., 1992. Determining the Appropriate Response to Evidence of Public
691 Concern: The Case of Food Safety. *J. Public Policy Mark.* 11(1): 12-25.

692
693 Font-i-Furnols M., Guerrero L., 2014. Consumer preference, behavior and perception about meat
694 and meat products: An overview. *Meat Science* 98, 361–371.

695
696 Gaviglio A., Pirani A., Demartini E., 2013. Il valore aggiunto dell'attributo "biologico": Il caso dei
697 salumi, Bovolenta S., Lolli S. (a cura di) *Sistemi agro-zootecnici biologici ed ecocompatibili in*
698 *ambiente montano*. 39-52.

699
700 Giraud G., Halawany R., 2006. Consumers' perception of food traceability in Europe. In
701 *Comunicación presentada al 98 th EAAE Seminar, Greece*.

702
703 Girgenti V., Massaglia S., Mosso A., Peano C, Brun F., 2016. Exploring Perceptions of Raspberries
704 and Blueberries by Italian Consumers. *Sustainability* 8, 1027.

705
706 Glitsch K., 2000. Consumer perceptions of fresh meat quality: cross-national comparison, *British*
707 *Food Journal* 102 (3), 177-194, doi: 10.1108/00070700010332278.

708
709 Goodman D., Goodman M. K., 2009. Food Networks, Alternative. In *Kitchin, R. e Thrift, N. (a*
710 *cura) International Encyclopedia of Human Geography*, Elsevier, Amsterdam, 208-220.

711

712 Gracia A., Loureiro M.L., Nayga R.M. Jr., 2009. Valuing animal welfare labels with experimental
713 auctions: what do we learn from consumers?. Contributed Paper. International Association of
714 Agricultural Economists Conference, 16-22 August, 2009, Beijing, China.

715

716 Gregory, N. G., Grandin, T., 1998. Animal welfare and meat science. CABI Pub..

717

718 Groot E., Albisu L.M., 2009. Best Worst Choice Experiment Designs for Consumer Buying
719 Decisions for PDO Calanda Peaches: Attributes and Levels. VII International Peach Symposium
720 962: 307-314.

721

722 Grunert, K. G., Brunsø, K., Bredahl, L., Bech, A. C., 2001. Foodrelated lifestyle: A segmentation
723 approach to European food consumers. In L. J. Frewer, E. Risvik, H. N. J. Schifferstein, & R. von
724 Alvensleben (Eds.), Food choice in Europe (pp. 211–230). Heidelberg: Springer.

725

726 Grunert K. G., Andersen S., 2000. Purchase decision, quality expectations and quality experience
727 for organic pork. 9th Food Choice Conference, Dublin, Trinity College, 28–31 July.

728

729 Grunert K.G., Bredahl L., Brunsø K., 2004. Consumer perception of meat quality and implications
730 for product development in the meat sector—a review. Meat Science 66(2), 259–272.

731

732 Hanus G., 2000. Viande bovine en Italie et positionnement des filières françaises. Rencontres
733 autour des recherches sur les ruminants, 39-42.

734

735 Harper G., Henson S. J., 1999. Consumer concerns about animal welfare and the impact on food
736 choice. Overview of Focus Groups in the UK, Ireland, Italy, France and Germany. Project Report
737 EU Fair CT98-3678. UK: Department of Agricultural and Food Economics, University of Reading.

738

739 Hersleth M., Næs T., Rødbotten M., Lind V., Monteleone E., 2012. Lamb meat Importance of
740 origin and grazing system for Italian and Norwegian consumers. *Meat Science* 90, 899-907.

741

742 Hocquette J. F., Botreau R., Legrand I., Polkinghorne R., Pethick D.W., Lherm M., Picard B.,
743 Doreau M., Terlouw E.M.C., 2014. Win-win strategies for high beef quality, consumer satisfaction,
744 and farm efficiency, low environmental impacts and improved animal welfare. *Animal Production*
745 *Science*, 54(10), 1537-1548.

746

747 Hocquette J.F., Botreau R., Picard B., Jacquet A., Pethick D.W., Scollan N.D., 2012. Opportunities
748 for predicting and manipulating beef quality. *Meat science*, 92(3), 197-209.

749

750 Hoffmann R., 2000. Country of origin – a consumer perception perspective of fresh meat. *British*
751 *Food Journal* 102 (3). 211-229, doi: 10.1108/00070700010332304.

752

753 Huffman K.L., Miller M.F., Hoover L.C., Wu C.K., Brittin H.C., Ramsey C.B., 1996. Effect of beef
754 tenderness on consumer satisfaction with steaks consumed in the home and restaurant. *Journal of*
755 *Animal Science* 74, 91–97.

756

757 Kjærnes U., Lavik R., 2008. Opinions on animal welfare and food consumption in seven European
758 countries. In U. Kjærnes, B. B. Bock, E. Roe and J. Roex. eds., *Consumption, Distribution and*
759 *Production of Farm Animal Welfare. Welfare Quality Reports No.7*, Cardiff: Cardiff University.

760

761 Knight S., Barnett L., 2008. Justifying attitudes towards animal use: a qualitative study of people's
762 views and beliefs. *Anthrozoos*. 21 (1): 31-42.

763

764 Kubberød E., Ueland O., Rødbotten M, Westad F., & Risvik E.,2002. Gender specific preferences
765 and attitudes towards meat. *Food Qual. Prefer.* 13 (5), 285-294.

766 Imami D., Chan-Halbrendtb C., Zhange Q., Zhllimad E., 2011. Conjoint Analysis of Consumer
767 Preferences for Lamb Meat in Central and Southwest Urban Albania. *Int. Food Agribus Man.* 14
768 (3), 111-126.

769

770 Janssen M., Hamm U., 2012. Product labelling in the market for organic food: Consumer
771 preferences and willingness-to-pay for different organic certification logos. *Food Quality and*
772 *Preference* 25(1), 9-22.

773

774 Lagerkvist C.J., 2013. Consumer preferences for food labelling attributes: Comparing direct ranking
775 and best-worst scaling for measurement of attribute importance, preference intensity and attribute
776 dominance. *Food Quality and Preference* 29, 77–88.

777

778 Loureiro M.L., Umberger W.J., 2007. A choice experiment model for beef: What US consumer
779 responses tell us about relative preferences for food safety, country-of-origin labeling and
780 traceability. *Food Policy*, 32: 496-514.

781

782 Loureiro M.L., Umberger W.J., 2004. A choice experiment model for beef attributes: what
783 consumer preferences tell us. paper presented at American Agricultural Economics Association
784 annual meetings, 1-4 August, Denver, Colorado.

785

786 Marley A.A., Louviere J.J., 2005. Some Probabilistic Models of Best, Worst and Best-Worst
787 Choices. *J. Math. Psychol.* 49(6), 464-480.

788

789 McEachern M. G., Schroder M. J. A., Willock J., Whitelock J., Mason R., 2007. Exploring ethical
790 brand extensions and consumer buying behavior. The RSPCA and the “Freedom Food” brand. J.
791 Prod. Brand Manag. 16 (3), 168-177.
792

793 Miele M., 2010. Report concerning consumer perceptions and attitudes towards farm animal
794 welfare. European Animal Welfare Platform: Brussels, Belgium. Ministry of the Environment and
795 Protection of Land and Sea. <http://www.minambiente.it/>
796

797 Morales R., Aguiar A.P.S., Subiabre I., Realini C.E., 2013. Beef acceptability and consumer
798 expectations associated with production systems and marbling. Food Quality and Preference 29,
799 166–173.
800

801 Morgan J.B., Savell J.W., Hale D.S., Miller R.K., Griffin D.B., Cross H.R., Shackelford S. D.,
802 1991. National beef tenderness survey. J. Anim. Sci. 69, 3274-3283.
803

804 Napolitano F., Girolami A., Braghieri A., 2010. Consumer liking and willingness to pay for high
805 welfare animal based products. Trends Food Sci. Tech. 21, 537-543.
806

807 Napolitano F., Caporale G., Carlucci A., Monteleone E., 2007. Effect of information about animal
808 welfare and product nutritional properties on acceptability of meat from Podolian cattle. Food
809 Quality and Preference 18, 305–312.
810

811 Orme B. (2012). S.S.I Web V.8.1, Sawthoot Software, 558-561, 571-572.
812

813 Panza R., 2013. “Manuale di progettazione per la grande distribuzione. Strategie, immagine e
814 format per nuovi consumatori.” Franco Angeli. Milano, Italy.

815

816 Pecin E., 2014. Il consumatore europeo e il controllo di origine dei prodotti. Thesis, Università degli
817 Studi di Padova.

818

819 Pethick D. W., Ball A. J., Banks R. G., Hocquette J. F., 2011. Current and future issues facing red
820 meat quality in a competitive market and how to manage continuous improvement. *Animal*
821 *Production Science*, 51(1), 13-18.

822 Purslow P.P., 2017. *New Aspects of Meat Quality. From Genes to Ethics*. 1st Edition, Woodhead
823 Publishing.

824

825 Sackett H., Shupp R., Tonsor G., 2011. Consumer Perceptions of Sustainable Farming Practices: A
826 Best-Worst Scenario. Selected Paper prepared for presentation at the Agricultural and Applied
827 Economics Association's. 2011 AAEA and NAREA Joint Annual Meeting, July 24-26. Pittsburgh,
828 Pennsylvania, USA.

829

830 Simon H., Simon Z., Zatta D., Fassnacht M., 2013. Price management. I: Strategia, analisi e
831 determinazione del prezzo. FrancoAngeli. Milano. Italy. 29, 1-343.

832

833 Schupp A., Gillespie J., 2001. Consumer Attitudes toward Potential Country-of-Origin Labeling of
834 Fresh and Frozen Beef. *Journal of Food Distribution Research*, 34-44.

835

836 Schnettler B., Vidal R., Silva R., Vallejos L., Sepúlveda N., 2009. Consumer willingness to pay for
837 beef meat in a developing country: The effect of information regarding country of origin, price and
838 animal handling prior to slaughter. *Food Quality and Preference* 20 (2), 156-165.

839

840 Schwartzkopf-Genswein K. S., Faucitano L., Dadgar S., Shand P., González L. A., Crowe T. G.,
841 2012. Road transport of cattle, swine and poultry in North America and its impact on animal
842 welfare, carcass and meat quality: A review. *Meat science*, 92(3), 227-243.

843

844 Special Eurobarometer, European Commission, 2007. Attitudes of EU citizens toward animal
845 welfare (p. 82).

846

847 Stranieri S., Banterle A., 2015. Consumer Interest in Meat Labelled Attributes: Who Cares?.

848 *International Food and Agribusiness Management Review* 18 (4), 21-38.

849

850 Tatum J. D., Gronewald K. W., Seideman S. C., Lamm W. D., 1990. Composition and quality of
851 beef from steers sired by Piedmontese, Gelbvieh and Red Angus bulls. *Journal of Animal*
852 *Science*, 68(4), 1049-1160.

853

854 Toma L., Stott A.W., Revoredo-Giha C., Kupiec-Teahan B., 2012. Consumers and animal welfare.

855 A comparison between European Union countries. *Appetite*. 58, 597-607.

856

857 Tonsor G. T., Wolf C. A., 2011. On mandatory labelling of animal welfare attributes. *Food Policy*,
858 36, 430–437.

859

860 Troy D.J, Kerry J.P., 2010. Consumer perception and the role of science in the meat industry. *Meat*
861 *Sci.* 86: 214-226.

862

863 Van Wezemael L. W., Verbeke W., de Barcellos M. D., Scholderer J., Perez-Cueto F., 2010.

864 Consumer perceptions of beef healthiness: Results from a qualitative study in four European

865 countries. BMC Public Health, 10 (342), 1–10. (Retrieved from:
866 <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2893462/>, February 2014).

867

868 Vanhonacker F., Verbeke W., Poucke E.V., Tuytens F.A.M., 2008. Do citizens and farmers
869 interpret the concept of farm animal welfare differently?. *Livest. Sci.* 116, 126-136.

870

871 Verbeke W., Viaene J., 1999. Beliefs, attitude and behaviour towards fresh meat consumption in
872 Belgium: empirical evidence from a consumer survey. *Food Qual. Prefer.* 10: 437-445.

873

874 Verbeke W., Ward R. W., 2006. Consumer interest in information cues denoting quality,
875 traceability and origin: An application of ordered probit models to beef labels. *Food quality and*
876 *preference* 17(6), 453-467.

877

878 Verbeke W., Van Wezemael L., de Barcellos M. D., Kügler J. O., Hocquette J. F., Ueland Ø.,
879 Grunert K. G., 2010. European beef consumers' interest in a beef eating-quality guarantee: insights
880 from a qualitative study in four EU countries. *Appetite*, 54(2), 289-296.

881

882 Verbeke W., Pérez-Cueto F.J.A., de Barcellos M.D., Krystallis A., Grunert K.G., 2010. European
883 citizen and consumer attitudes and preferences regarding beef and pork. *Meat Sci.* 84(2): 284-292.

884

885 Villalobos P., Padilla C., Ponce C., Rojas A., 2010. Beef consumer preferences in chile: importance
886 of quality attribute differentiators on the purchase decision. *Chil. J. Agr. Res.* 70(1), 85-94.

887

888 Wakefield K. L., Inman J. J., 2003. Situational price sensitivity: the role of consumption occasion,
889 social context and income. *Journal of Retailing* 79 (4), 199-212.

890

891 Wheeler T. L., Shackelford S. D., Casas E., Cundiff L. V., Koohmaraie M., 2001. The effects of
892 Piedmontese inheritance and myostatin genotype on the palatability of longissimus thoracis, gluteus
893 medius, semimembranosus, and biceps femoris. Journal of Animal Science, 79(12), 3069-3074.