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Farm animal welfare influences on markets and consumer attitudes in Latin America: The cases of Mexico, Chile and Brazil --Manuscript Draft--

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Abstract:	<p>In recent years, animal welfare has become an important element of sustainable production that has evolved along with the transformation of animal production systems. Consumer attitudes towards farm animal welfare are changing around the world, especially at emerging markets of Asia, Africa and Latin America. Survey-based research on consumer attitudes towards farm animal welfare has increased. However, the geographical coverage of studies on consumer attitudes and perceptions about farm animal welfare has mostly been limited to Europe, and North America. Until now, Latin American consumers' attitudes towards animal welfare have not been well studied. Despite the fact that Mexico, Chile and Brazil belong to the same region (according to international organizations), there are marked differences between these countries in terms of their economical and geographical characteristics among other factors. Those differences potentially have an impact on consumer attitudes towards animal welfare and livestock production systems in general. Given the evidence from the literature review, it seems advisable that Latin American producers and food industry who engage in animal welfare-enhancing practices should clearly label their products with information on the type of husbandry system to reach those consumers who want to make an informed choice. Therefore, there are some aspects that need to be studied and cannot be worked separately in order to promote and understand consumer attitudes towards dairy and beef systems, such as geography, economic development, and politics.</p>	
Response to Reviewers:	JAGE-S-17-00097 Consumer attitudes and perceptions towards livestock welfare in Mexico, Chile and Brazil: A perspective	

First of all we apologize for the delay. The authors appreciate all valuable comments made by the referees that were useful and pertinent. It actually took us more time than we expected in order to accurately review this paper. We finally made an extensive revision of the text. Several citations were added to support the new text, and were consequently inserted in the reference list. All suggestions were taken into account and they were highlighted in red font along the manuscript. Several parts of the discussion were rewritten in order to improve readability and quality.

Reviewer:

1. The title is on "consumer attitudes and perceptions towards livestock welfare", but more than half of the article is not directly related to this issue. If animal welfare is the major focus of this study, the authors should discuss more details on this. Moreover, the authors should specify their contributions and what makes this review article useful.

Response: We would like to thank to the reviewer for their comments and suggestions. According with referee suggestion we decide re-focusing the manuscript to animal welfare influence on markets and consumers attitudes and change the title from:

Consumer attitudes and perceptions towards livestock welfare in Mexico, Chile and Brazil: A perspective

To:

Farm animal welfare influences on markets and consumer attitudes in Latin America: The cases of Mexico, Chile and Brazil

2. I would like to see a clear definition of animal/livestock welfare in this study. The standards of animal welfare vary cross animals and countries, so it's important to specify the standards before discussing livestock welfare. If there are different standards in Latin America, it might help to provide a table of summarized standards in interested countries. It seems confined intensive systems and pasture systems are used in the article as an example of livestock welfare, then I would like to see some clear definitions and sources.

Response: We add more information and definitions of animal welfare and develop a new Table (see table 2) about law enforcements of the three countries (See lines 35-41, 60-62, 68-75, 155-156, 162-167).

3. The authors provided many information on livestock production, economic and political aspects in Latin America. While they are good information, I think the authors might spend too much time on this. Do the authors believe these are major drivers for consumer's preferences and attitudes towards animal welfare? If so, please provide a more comprehensive review or more evidences. For example, the authors argued that "Mexican empathy towards animal welfare could be a strategy for redirecting the frustration for solving inequity justice and social exclusion." Is there a reference for this?

Response: We add more evidences about the animal welfare phenomenon in Latin America (See line 176-178, 220-225, 234-239). Additionally, we add the reference solicited by the reviewer (See line 168-170).

4. I believe the section "consumer's attitudes towards farm animal welfare" is the key part of this article. If so, I expect the authors to discuss more in detail about relevant studies, because as mentioned in the article, not many animal welfare studies focused on Latin America. For major studies, I would like to see some discussion like the samples if they use survey instrument, methods, and key findings (e.g., major drivers they found). Again, a summary table might help.

Response: We improve these aspects (see lines 237, 241-266), and develop a new Table (see table 3).

5. It's not surprising to see countries different in economy and politics. The major goal of this article should be about how consumer's attitudes and perceptions about livestock welfare are different across countries or regions, and further to identify or summarize the key drivers behind those differences. In this sense, I hope to see more discussions and reviews on these aspects.

Response: We add more information about differences across countries or regions of

Mexico, Chile and Brazil (See lines 6-7, 14-17, 322-325).

Farm animal welfare influences on markets and consumer attitudes in Latin America: The cases of Mexico, Chile and Brazil

Running title: Consumer attitudes and perceptions towards farm animal welfare in Latin America

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1 **Farm animal welfare influences on markets and consumer attitudes in Latin America: The cases of**
2 **Mexico, Chile and Brazil**

3
4 **Abstract**

5 In recent years, animal welfare has become an important element of sustainable production that has evolved
6 along with the transformation of animal production systems. **Consumer attitudes towards farm animal welfare**
7 **are changing around the world, especially at emerging markets of Asia, Africa and Latin America.** Survey-
8 based research on consumer attitudes towards farm animal welfare has increased. However, the geographical
9 coverage of studies on consumer attitudes and perceptions about farm animal welfare has mostly been limited
10 to Europe, and North America. Until now, Latin American consumers' attitudes towards animal welfare have
11 not been well studied. Despite the fact that Mexico, Chile and Brazil belong to the same region (according to
12 international organizations), there are marked differences between these countries in terms of their
13 economical and geographical characteristics among other factors. Those differences potentially have an
14 impact on consumer attitudes towards animal welfare and livestock production systems in general. **Given the**
15 **evidence from the literature review, it seems advisable that Latin American producers and food industry who**
16 **engage in animal welfare-enhancing practices should clearly label their products with information on the type**
17 **of husbandry system to reach those consumers who want to make an informed choice.** Therefore, there are
18 some aspects that need to be studied and cannot be worked separately in order to promote and understand
19 consumer attitudes towards dairy and beef systems, such as geography, economic development, and politics.

20
21 **Key words:** Farm animal welfare; Livestock production; Consumer attitudes; Latin America.

30 **Introduction**

31 Sustainability of food production systems and consumption, as well as the role of ethical labels, such as
32 organic, fair trade and animal welfare, have received a lot of attention in both the public domain and in
33 research (de Jonge et al. 2015; von Keyserlingk and Hötzel 2015). Actually, animal welfare has become an
34 important item of sustainable production that has evolved along with the transformation of animal production
35 systems (Miranda de la Lama et al., 2013). **Animal welfare can be defined as ‘the state of the individual as
36 regards its attempts to cope with its environment’ (Broom, 1991), this definition lies at the heart of debates on
37 how animals should be bred, kept, used, transported and slaughtered (Woods, 2012). Historically, increased
38 awareness of livestock production systems has been associated with society becoming more involved in
39 demanding and promoting changes in livestock production systems (Yunes et al., 2017). Consequently animal
40 welfare requires a multidisciplinary approach and a balance of science with philosophical components. In that
41 sense, animal welfare is a mixture of science and values (Marie, 2006).**

42

43 A diverse group of stakeholders, including citizens, farmers, public authorities, and the food industry, are
44 increasingly confronted, interested, or concerned with the welfare of farm animals (Verbeke 2009). Many
45 studies related to this topic have focused on the end user of the chain, both in their role as citizens and
46 consumers. The public can influence the marketing and sale of premium welfare products by acting as citizens
47 and as consumers (de Graaf et al. 2016). Recently, survey-based research in consumer attitudes towards farm
48 animal welfare has increased. However, the geographical coverage of studies on consumer attitudes and
49 perceptions about farm animal welfare has mostly been limited to Europe [e.g. María (2006); Vanhonacker et
50 al. (2008); Vanhonacker et al. (2009); Vanhonacker et al. (2011); Vecchio and Annunziata (2012)] and North
51 America [e.g. Kendall et al. (2006); Tonsor et al. (2009); McKendree et al. (2014)]. Few studies have been
52 done in Latin America, and it is an emerging topic especially in those countries that trade with Europe or the
53 United States of America. Livestock producers as well as veterinary services related to ministries of
54 agriculture are aware that international commercial agreements apply them to meet animal health regulations,
55 but also other requirements of traders and consumers (Gallo 2008).

56

57 Recent scientific evidence in the region indicates that Latin American consumers are becoming more
58 concerned about animal welfare and husbandry systems, and in many cases, animal welfare is considered as a
59 quality assurance of food of animal origin (Webster 2001; Queiroz et al. 2014; Vargas-Bello-Pérez et al.
60 2017; Miranda-de la Lama et al. 2017). *Urbanization and media, influences of civil society organizations and
61 increase in society's education and economic level are the reasons for an increased interest in animal welfare
62 (Koknaroglu and Akunal, 2013).* Furthermore, as the average income and overall wealth is generally
63 associated to increased expectations regarding livestock husbandry conditions and animal welfare (Verbeke
64 2009), it can be expected that social demand regarding animal welfare and the associated products will
65 increase in Latin American countries. On the other hand, there are many differences (i.e., geography, socio-
66 demographics, politics, and economic situation) among Latin American countries, which have a great
67 potential to interfere on the opinion of consumers and their attitudes towards animal production systems.
68 *Mexico, Chile and Brazil are all member countries of the World Organisation for Animal Health (OIE) and
69 adhered to the animal welfare definition provided in the Terrestrial Animal Health Code: “Animal welfare
70 means how an animal is coping with the conditions in which it lives. An animal is in a good state of welfare if
71 it is healthy, comfortable, well nourished, safe, able to express innate behaviour, and if it is not suffering from
72 unpleasant states such as pain, fear and distress” (OIE 2016).* Similarly they have become referents in the
73 *Latin American region in terms of productivity of scientific publications, being the three in the top five for the
74 region and Brazil in the 6th place worldwide. Despite the high scientific productivity in the animal welfare
75 topic, only few studies have included consumers’ attitudes and perceptions.* In this context, we described
76 some production aspects related to livestock production, consumer preference, and some political aspects of
77 Mexico, Chile and Brazil (the most stable countries in terms of livestock industry). This perspective paper
78 aims to discuss these aspects and associate them with the results of published studies on consumer attitudes
79 towards livestock production and welfare. The conclusions should allow policy makers and different
80 stakeholders of the animal production chains to adapt their animal welfare strategy to the situation
81 encountered in the different countries.

82

83

84

85 *Livestock production and consume*

86 Latin America is an important region for livestock production and global trade of animal products. According
87 to FAO (2014), Brazil and Mexico have the greatest numbers of livestock among Latin American countries.
88 Brazil has around 213 million, while Mexico reported 39 million heads of cattle and Chile has over 3.7
89 million heads of cattle (ODEPA 2015). In addition, Brazil is the top meat producer in Latin America and
90 shares with Mexico the first positions in milk production (United Nations, 2015). In a recent publication, beef
91 and veal consumption in Brazil is reported as 24.2 kg/capita, while it is 15.0 kg/capita in Chile and 8.8
92 kg/capita in Mexico (OECD 2017). Between these three countries, Brazil is also the highest milk consumer
93 (124.6 kg/capita), followed by Mexico (115.2 kg/capita) and Chile (93.0 kg/capita) (FAO 2011). These
94 consumptions might be related to living standards, diet, livestock production and consumer prices (OECD
95 2017). Land and agricultural areas (Table 1) are important factors needed to be considered for consumer
96 perception studies since they have a deep impact on animal production systems, especially because these
97 conditions may influence the type of production (i.e., grazing vs. confinement), which will be preponderant in
98 each country according to their geography and land distribution. Millman (2009) suggested that attitudes
99 towards farm animals from people living in urban areas could be different since they have less direct
100 experience with agriculture. Another important aspect in Latin America and the Caribbean region is that the
101 *per capita* gross annual income (GNI) was doubled between 2000 and 2012 (United Nations 2015; FAO
102 2014). An interesting point that deserves some attention is the external funding that Latin American countries
103 received. The percentage of Official Development Assistance (ODA) to agriculture, forestry and fisheries to
104 the entire region is about 8.5% according to FAO (2014). For example in Brazil, more than 1.9% of ODA
105 went to agriculture whereas Chile and Mexico received 1 and 0.2% respectively. As the general global trend,
106 Latin America is becoming more urban. According to FAO (2014), over the past 50 years, the rural
107 population in this region has gradually declined mainly due to the persistent economic inequality between
108 urban and rural areas.

109

110 With a population of approximately 112 million, Mexico per capita annual consumption of cattle products
111 consists of 17 kg of beef and 97 kg of milk (42% fluid milk and 58% milk products). Large scale production
112 in Mexico has increased the availability of affordable dairy and meat products, such “benefit” has contributed

113 to rising rates of obesity and diseases related to obesity. As a result, a growing number of Mexican consumers
114 are pursuing lifestyles that include and buying more “natural” and healthier food (Salcido, 2011). Mexican
115 consumers, particularly from the middle, upper-middle and higher-income strata’s (23, 16, and 6.7 million of
116 people, respectively) purchase high quality milk (Nahed-Toral et al., 2013) and meat (Huerta-Leidenz et al.,
117 2014) to satisfy their preference. On the other hand, rapid changes in domestic consumer preferences and
118 increases in population have led to dynamic changes in its meat industry. The population and the general
119 economic growth in this country have hastened changes in the quantity and quality of meat demanded. In the
120 past decade, significant numbers of cattle have been exported from Mexico to the United States (their
121 consumer prefer fat deposition), and this has led to a shift from grass-fed beef to grain-feed beef. The
122 implications of increased production intensity reach far beyond the characteristics of the beef (Mexican
123 consumers prefer lean meat with minimal fat) (Méndez et al., 2009). Probably in a short- to mid-term,
124 Mexican consumers will be aware that the beef production systems are in confinement and not in grazing
125 systems as it used to be. These changes in beef production systems are most likely to affect beef consumers
126 perception.

127

128 The geographic complexity of Chile makes it a country with important demographic differences among
129 regions, which can define habits and changes in meat consumption. Most beef and milk production is
130 concentrated in the southern regions of Chile (ODEPA 2015). Beef production is concentrated in the southern
131 regions of the country, mainly in outdoor extensive systems, so although the production system might be
132 animal welfare friendly, in many situations cattle needs to be transported for long distances before arriving to
133 the slaughter houses (Gallo and Tadich 2008). Chilean consumers have a positive perception of the cattle
134 production related to the fact that the meat that they consume comes from pasture-fed animals (Schnettler et
135 al. 2008) and they have increased acceptability ratings for beef with low marbling levels and beef from
136 grazing animals (Morales et al. 2013). With regard to milk, the main aspects considered by Chilean
137 consumers before purchasing dairy products are fat content and price. Also they associate animal welfare
138 mainly to responsible pet ownership followed by farm animal care (Vargas-Bello-Pérez et al. 2017).

139 Brazil is one of the largest producers and exporters of animal origin products in the world (FAO 2014), which
140 involves the country to adapt some quality standards required by internal and external consumers and clients

141 to stay competitive at world level. The importance of animal production on the economic performance and
142 towards generating jobs is irrefutable. Brazilian beef production in 2023 is estimated in 10,935 million tons of
143 meat, representing an increase of almost 29% relative to 2013, and 20% of the global market share (Lobato et
144 al. 2014). Brazilian beef cattle production can be considered as “grass-based systems”, since all breeding and
145 rearing are made on pastures, and only 7.5%, or even less, of the slaughtered cattle are finished on feedlots,
146 and for a short period of time (Lobato et al. 2014). Brazilian consumers prefer products with a label that
147 ensure tenderness of the meat (Saab 1999) and are willing to pay more to buy those products (Velho et al.
148 2009). Brazil is the fourth largest milk-producing country in the world (FAO 2013). In the south of the
149 country, milk is mainly produced in small holding farms (IBGE 2009), where milk production may be
150 essential for the maintenance of family farming in the region (Balcão et al. 2016). Interestingly, in recent
151 years there has been an increase in the number of large-scale dairy farms which are characterized by a large
152 number of animals in milk production (IBGE 2009).

153

154 *Farm animal welfare in all three countries*

155 All three countries have undertaken scientific research in order to support local policy, which is aligned with
156 OIE farm animal welfare standards for local animal welfare laws and regulations (Table 2). Mexico has the
157 second largest economy in Latin America, behind Brazil. Mexico has significant beef production and is one of
158 the highest eleven beef exporters in the world (USDA, 2016). The implementation of The North American
159 Free Trade Agreement (NAFTA), along with a series of open macroeconomic policies during the late 90’s
160 and 2000’s, led Mexico’s economy into steady growth. However, the dependence of Mexico on trade with the
161 United States of America has a large impact in the animal production sector, reflecting in an intensification of
162 animal production systems. Since the late 1990s, Mexico has developed a series of comprehensive laws,
163 regulations, and standards and signed many international agreements concerning animal welfare issues. Yet
164 for all their existence and despite government efforts, the regulations continue to lack effective enforcement
165 and surpassed by the productive reality (Norman and Hernández, 2005). Mexico has been slow to update its
166 legal regulations on farm animal welfare, which includes some guidelines on animal transport, stunning and
167 slaughter throughout the pre-slaughter supply chain (Miranda-de la Lama et al., 2012). Nevertheless, Mexican
168 citizens are currently developing a sense of growing concern about the protection and welfare of animals

169 (Aguirre and Orihuela 2010). Additionally, Mexican empathy towards animal welfare could be a strategy for
170 re-directing the frustration for solving issues of inequity justice and social exclusion (see Sandoval-Cervantes,
171 2016). The latter could be related to security issues; since Mexico is facing one of the worst security crisis,
172 institutional credibility and impunity of the contemporary history, in which corruption and the apparent
173 governmental indolence have deteriorated the social confidence towards Mexican government (Bailey 2006).
174 In the face of a possible increasing demand in Mexico for products that take into account animal welfare and
175 higher quality products, the supply chain (i. e., farmers, abattoirs, dairy and meat industries, retailers) should
176 guarantee the origin of the products by certification. However, debeaking, detoeing, tail-docking, tooth
177 pulling, castration, and dehorning of livestock without anaesthetic are legal in Mexico, as is confinement in
178 gestation crates and battery cages (WAP, 2014). Therefore, it is essential to develop own methods based in
179 Mexican reality for assessing farming systems and certifying organizations that guarantee the authenticity of
180 animal welfare friendly products. At the same time, it will be necessary to inform consumers and convince the
181 meat and dairy industry that the ethical value of a product is an element of growing economic importance and
182 a business opportunity (Miranda-de la Lama et al. 2014).

183

184 Chile was the first neoliberal policy experiment in Latin America, with privatization, deregulation and export-
185 orientation (Harvey 2007). With only a small domestic market, often cited as one of the most open and free
186 market economies in the world, it has been argued that market actors have been central in the recent raise of
187 ethical consumption (Kane et al. 2007). Previous publications stated that, during the military coup in 1973,
188 the regime de-regulated the national economy and sought to integrate Chile into global trade (Cademartori
189 1998) as well as banned unions, discouraged co-operatives and policed civic political expression. This context
190 has led to a limited extend of civil society activity in Chile even today, which can explain why Chilean
191 consumers are recently demanding for changes not only in their politics but also in their productive sectors
192 such as livestock production (Ariztía et al. 2014). Since 2009, Chile has an Animal Protection Law
193 (Ministerio de Salud 2009), which provides a frame work for the welfare of various species involved in
194 different activities (i.e., education, research, entertainment and animal production systems). Later on in 2013,
195 three complementary regulations for animal production systems arose from this law: 1) the protection of farm
196 animals within an industrial system; 2) the protection of animals destined for human consumption during

197 slaughter; and 3) the protection of farm animals during transport (Law 20.380; decree laws 28, 29 and 30)
198 (Ministerio de Salud 2009). In general, these regulations are in accordance with the animal welfare strategies
199 of the World Organization for Animal Health (OIE) and have facilitated compliance with international
200 markets requirements, considering that the country exports beef to the European Union. On the other hand,
201 they respond to an increasing demand from consumers for accessing products of animal origin with “animal
202 welfare standards”, or produced under “ethical management” (Schnettler et al. 2008).

203

204 Compared to Chile, Brazil, with its large domestic market, active civil society and successive centre-left
205 governments, has been carving out a different set of institutional contexts that favored the development of
206 ethical consumption (Ariztía et al. 2014). These regulations were implemented by the Ministry of Agriculture,
207 Livestock and Food Supply in 2008, and complemented in 2011 by the establishment of the “Permanent
208 technical committee in animal welfare”. However, as recently mentioned in the von Keyserlingk and Hötzel
209 (2015) review, the Brazilian government effort to implement such regulations has been limited and has also
210 failed to consider societal attitudes towards animals. The relatively little information and poor understanding
211 of consumers attitudes regarding animal welfare in production systems in developing countries may be related
212 to the aforementioned failure of adoption of regulations. Effectively, von Keyserlingk and Hötzel (2015)
213 emphasised the importance of public concerns consultations as a key practice prior to the industrial or
214 governmental development of farm animal welfare related solutions and posterior success in their adoption.
215 Furthermore, the engagement of the different sector stakeholders such as farmers, consumers, agricultural
216 technicians, government and industry personal are crucial to attain a consensus in animal welfare related
217 issues (Poletto and Hötzel 2012).

218

219 *Consumer’s attitudes towards farm animal welfare*

220 Individuals may have different attitudes depending on whether they are acting in their role as a citizen or a
221 consumer. As citizens, they report a high level of concern about modern production systems, and having
222 welfare friendly production systems, as important. However, as consumers they have other priorities when it
223 comes to purchasing products (Clark et al., 2016). Over the past years, various accounts of ethical
224 consumption have been the central to mediating the ethical relationship between the consumer and the

225 consumed (Manyukhina, 2017). Many studies especially from Europe have demonstrated a strong consumer
226 interest in farm animal welfare. This interest has influenced consumer attitudes, especially in terms of their
227 willingness to pay and purchase behaviour. For example, in the Netherlands the differentiation in terms of
228 animal welfare standards and price in the meat sector play an important role in satisfying consumer
229 expectations (de Jonge et al. 2015). It has been shown that European consumers are willing to pay more for
230 food produced under animal welfare standards (Zander and Hamm 2010). However, differences are also
231 found between consumers from different countries, indicating that consumer behaviour regarding animal-
232 friendly products is affected by cultural differences and consumers' trust in farmers, which can show, for
233 example, differences between northern European and southern European countries (Nocella et al. 2010).
234 Therefore, consumer attitudes towards welfare-friendly products are changing around the world, especially at
235 emerging markets of Asia, Africa and Latin America. Furthermore, there are currently no national specific
236 regulations governing the essential requirements for certification of welfare friendly products that could meet
237 the higher expectations of Latin American consumers (Table 3). Although some food industries and
238 supermarket chains have developed voluntary codes of practice and animal welfare standards, our revision
239 suggests that consumer demand for these products is not always being satisfied.

240

241 In Mexico, there are some recent publications reporting consumer opinions and attitudes towards animal
242 welfare. Healthy food and environmental protection are attributes more valued than animal welfare (Santurtún
243 Oliveros et al., 2012) probably due to the change of Mexican consumer lifestyle, which includes healthier
244 eating and interest for “natural” products (Salcido, 2011). However, it is expected that Mexican consumers
245 concerns toward animal welfare will increase with the knowledge about the intensification of the food
246 production systems, as previous mentioned. For example, a recent study of Miranda de la Lama et al. (2017),
247 Mexican consumers appear to be interested in farm animal welfare, this tendency is more evident in women
248 and the more educated. The respondents had a high level of empathy for animal needs and had a good
249 working knowledge of the living conditions of farm animals. The 68% of respondents said they would pay for
250 properly certified welfare friendly products, but mostly based on the benefits in terms of product quality and
251 human health (not animal welfare *per se*). Surveyed consumers also demanded more information and more
252 regulations about animal welfare. Furthermore, women and those consumers higher educated show more

253 concern regarding animal welfare issues and they are more likely to purchase products labelled “not tested on
254 animals” (Faver and Muñoz, 2014). In a latest study of Miranda-de la Lama et al. (2018), using a multivariate
255 analysis reported the existence of three consumer profiles labeled “skeptical”, “concerned” and “ethical”,
256 which help to explain the association between farm animal welfare attitudes, some demographic variables and
257 willingness to pay for welfare friendly products. Results from this study may be useful in order to include
258 animal welfare as an extrinsic quality attribute of animal food products in Mexico and to define a market-
259 oriented strategy including animal welfare. This study is one of the first to address consumer profiling in
260 Mexico and Latin America and the findings could have implications for the commercialization of welfare
261 friendly products in the region. Despite the low demand for animal welfare friendly products in Mexico it is
262 likely to increase, the main difficulty is that the supply of these products is still limited and is currently
263 restricted to products with other attributes that includes animal welfare as organic label. In this context, we
264 need to develop a reliable and effective certification system to properly inform consumers about the welfare
265 conditions at farm level. On the other hand, it shows that the certifications have gradually become a
266 mechanism of credibility (Miranda-de la Lama et al., 2018).

267

268 In the case of Chile, previous findings have shown that only 23% of a survey participants admitted to have
269 sufficient knowledge about products of animal origin, and only 30% declared to be concerned about how
270 these products were obtained, which are lower percentages than those found in Brazil (56%) and Mexico
271 (62%) (WAP,2017). Other studies have detected that price was the least important attribute in beef consumers
272 decision-making process, while quality assurance attribute was the most important (Villalobos et al. 2010),
273 with an important percentage of people considering that animal welfare can improve quality of products
274 (WAP, 2017). On the other hand, origin and information regarding animal treatment prior to slaughter are
275 considered more important than price (Schnettler et al. 2009). But the source of information does not affect
276 their opinion toward management practices in beef production (Sánchez et al. 2016a). In contrast, beef
277 consumers are not willing to pay more for such information about animal handling (Schnettler et al. 2009).
278 The fact is that the purchase decision of Chilean beef consumers is highly influenced by quality assurance
279 aspects but, meat produced under protocols that consider animal welfare are also highly attractive for this
280 population (Villalobos et al. 2010). Chilean consumers are opposed to controversial management practices in

281 beef production (Sánchez et al. 2016a) and they are willing to pay a higher price for meat produced under
282 animal welfare principles (Schnettler et al. 2008). Such management practices includes the lack of pasture
283 access in confined systems (Sánchez et al. 2016a), which reinforces that they have a positive perception of
284 meat that comes from animals reared in pasture-based systems (Schnettler et al. 2008). In relation to milk
285 production, part of the Chilean industry is located in the central region, using mainly confined intensive
286 systems, while most systems in the south region of the country are based on pasture. The Chilean milk
287 consumer could show a preference for milk produced in the pasture systems, but it is important to consider
288 that they might not be aware about potential animal welfare problems, such as lameness, that can be more
289 present in indoors housed systems (Tadich et al. 2010; Green et al. 2010). The main aspects considered before
290 purchasing dairy products are fat content and price, but information about the conditions of milk production
291 and animal welfare are also considered to be important aspects to be included in dairy products (Vargas-
292 Bello-Pérez et al. 2017).

293

294 In Brazil, recent studies have been suggesting a lack of knowledge of Brazilian citizens about animal
295 production systems and animal welfare (Bonamigo et al. 2012; de Barcellos et al. 2011; Yunes et al. 2017;
296 Sánchez et al. 2016b; Hötzel et al. 2017). For example a recent study developed by World Animal Protection
297 showed that half of a study population (n=1200) declared that they did not read labels of the products they
298 purchase which includes animal welfare labels (WAP 2017). However, societal concerns regarding the ethical
299 treatment of animals have raised the interest in the welfare of livestock animals in Brazil (Poletto and Hötzel
300 2012). Despite Brazilians citizens affirm that they know little about animal production systems, they have
301 preference for farm animal production systems that provide greater freedom of movement, based on their
302 perception that this is better for the animal (Yunes et al. 2017). In addition, they reject practices of zero-
303 grazing and cow-calf separation due to the potential negative effect of such practices on farm animal welfare,
304 product quality and loss of naturalness (Hötzel et al. 2017). In a recent study, the most cited characteristics of
305 an "ideal dairy farm" by Brazilians not affiliated with the dairy industry were product quality and animal
306 management, which included quality of treatment given to animals (Cardoso et al. 2015).

307

308

309 **Conclusions and future implications**

310 Since several studies in Latin America have indicated that consumers consider animal welfare when buying
311 products, a new concept of food quality could be developed that includes the ethical component of production
312 systems, as an added value. Despite the fact that Mexico, Chile and Brazil belong to the same geographical
313 region and continent, there are marked differences between these countries in terms of their economical and
314 geographical characteristics among other factors that characterize their dairy and beef production systems.
315 Those differences have also a deep impact in the consumer attitudes towards animal production systems.
316 Quality assurance is still the most important attribute for consumers of the three countries considered in this
317 review while other attributes such as animal welfare might differ in level of importance. National legislations,
318 scientific research, education and economic development are aspects that need to be studied and cannot be
319 worked separately in order to promote and improve consumer attitudes towards animal welfare on dairy and
320 beef systems. Policy makers and the different stakeholders of the animal production chain should integrate the
321 knowledge on the different perceptions of consumers in order to adapt their strategy to the different countries.
322 **It is possible that the improvements in the welfare of farm animals in Latin America (which are a combination**
323 **of both lawmaking and market-based options) would appear to offer the most viable solution for consumers**
324 **concerns, with the latter offering those with the highest concern to express their purchasing decisions above**
325 **the minimum governmental standards implemented.** Further studies that integrate the multi-attribute and the
326 hierarchical approaches to quality are needed to verify how much more consumers are willing to pay for
327 welfare friendly products and whether that amount covers the extra costs associated with animal welfare
328 standards.

329

330 **References**

- 331 Acevedo-Rojas, N. I., Dávalos-Flores, J. L., & Torres-Torres, F. (2015). Importancia de la calidad certificada
332 de la leche bovina para consumidores del área metropolitana de la Ciudad de México. *Agrociencia*,
333 49(1), 101-112.
- 334 Aguirre, V., & Orihuela, A. (2010). Assessment of the impact of an animal welfare educational course with
335 first grade children in rural schools in the state of Morelos, Mexico. *Early Childhood Education*
336 *Journal*, 38(1), 27-31.

337 Ariztía, T., Kleine, D., Maria das Graças, S., Agloni, N., Afonso, R., & Bartholo, R. (2014). Ethical
338 consumption in Brazil and Chile: Institutional contexts and development trajectories. *Journal of*
339 *Cleaner Production*, 63, 84-92.

340 Bailey, J. (2006). Perceptions and attitudes about corruption and democracy in Mexico. *Mexican*
341 *Studies/Estudios Mexicanos*, 22(1), 57-57.

342 Balcão, L. F., Longo, C., Costa, J. H., Uller-Gómez, C., Machado Filho, L. C., & Hötzel, M. J. (2016).
343 Characterisation of smallholding dairy farms in southern Brazil. *Animal Production Science*.

344 Bonamigo, A., Bonamigo, C. B. d. S. S., & Molento, C. F. M. (2012). Broiler meat characteristics relevant to
345 the consumer: Focus on animal welfare. *Revista Brasileira de Zootecnia*, 41(4), 1044-1050.

346 Broom, D.M. (1991). Animal welfare: concepts and measurement. *Journal of Animal Science*, 69(10), 4167-
347 4175.

348 Cademartori, J. (1998). *Chile: el modelo neoliberal*: Ediciones ChileAmérica CESOC.

349 Clark, B., Stewart, G. B., Panzone, L. A., Kyriazakis, I., & Frewer, L. J. (2016). A systematic review of
350 public attitudes, perceptions and behaviours towards production diseases associated with farm
351 animal welfare. *Journal of Agricultural and Environmental Ethics*, 29(3), 455-478.

352 de Barcellos, M. D., Krystallis, A., de Melo Saab, M. S., Kügler, J. O., & Grunert, K. G. (2011). Investigating
353 the gap between citizens' sustainability attitudes and food purchasing behaviour: empirical evidence
354 from Brazilian pork consumers. *International Journal of Consumer Studies*, 35(4), 391-402.

355 de Graaf, S., Van Loo, E. J., Bijttebier, J., Vanhonacker, F., Lauwers, L., Tuytens, F. A., et al. (2016).
356 Determinants of consumer intention to purchase animal-friendly milk. *Journal of Dairy Science*,
357 99(10), 8304-8313.

358 de Jonge, J., van der Lans, I. A., & van Trijp, H. C. (2015). Different shades of grey: Compromise products to
359 encourage animal friendly consumption. *Food Quality and Preference*, 45, 87-99.

360 FAO (2011). Milk consumption - excluding butter (total). In F. S. Division (Ed.).

361 FAO (2013). Food and agriculture data. In F. a. A. O. o. t. U. N. FAOSTAT (Ed.).

362 FAO (2014). International Year of Family Farming. In F. a. A. O. o. t. U. Nations (Ed.). Rome, Italy.

363 Faver, C. A., & Muñoz, J. D. (2014). Orientations to nonhuman animal welfare: A view from the border.
364 *Society & Animals*, 22(4), 372-389.

365 Gallo, C. (2008). Using scientific evidence to inform public policy on the long distance transportation of
366 animals in South America. *Vet Ital*, 44(1), 113-120.

367 Gallo, C., & Tadich, T. (2008). South America. In *Long distance transport and welfare of farm animals* (pp.
368 261-287): CABI, Wallingford, UK.

369 Green, L. E., Borkert, J., Monti, G., & Tadich, N. (2010). Associations between lesion-specific lameness and
370 the milk yield of 1,635 dairy cows from seven herds in the Xth region of Chile and implications for
371 management of lame dairy cows worldwide. *Animal Welfare*, 19(4), 419-427.

372 Harvey, D. (2007). *A brief history of neoliberalism*: Oxford University Press, USA.

373 Hötzel, M. J., Roslindo, A., Cardoso, C. S., & von Keyserlingk, M. A. G. (2017). Citizens' views on the
374 practices of zero-grazing and cow-calf separation in the dairy industry: Does providing information
375 increase acceptability? *Journal of Dairy Science*.

376 Huerta-Leidenz, N., Ruíz-Flores, A., Maldonado-Siman, E., Valdéz, A., & Belk, K. E. (2014). Survey of
377 Mexican retail stores for US beef product. *Meat science*, 96(2), 729-736.

378 IBGE (2009). Censo Agropecuário 2006. In I. B. d. G. e. Estatística (Ed.).

379 Kane, T., Holmes, K. R., & O'Grady, M. A. (2007). *Index of economic freedom: The link between economic
380 opportunity and prosperity*. Washington, DC: Heritage Foundation.

381 Kendall, H. A., Lobao, L. M., & Sharp, J. S. (2006). Public concern with animal well-being: place, social
382 structural location, and individual experience. *Rural Sociology*, 71(3), 399-428.

383 Koknaroglu, H., & Akunal, T. (2013). Animal welfare: An animal science approach. *Meat Science*, 95(4),
384 821-827.

385 Lobato, J., Freitas, A., Devincenzi, T., Cardoso, L., Tarouco, J., Vieira, R., et al. (2014). Brazilian beef
386 produced on pastures: Sustainable and healthy. *Meat science*, 98(3), 336-345.

387 Marie, M. (2006). Ethics: The new challenge for animal agriculture. *Livestock Science*, 103(3), 203-207.

388 María, G. (2006). Public perception of farm animal welfare in Spain. *Livestock Science*, 103, 250-256.

389 Manyukhina, Y. (2017). Consumer Food ethics: considerations of vulnerability, suffering, and harm. *Journal
390 of Agricultural and Environmental Ethics*, <https://doi.org/10.1007/s10806-017-9689-0>

391 McKendree, M., Croney, C., & Widmar, N. O. (2014). Effects of demographic factors and information
392 sources on United States consumer perceptions of animal welfare. *Journal of Animal Science*, 92(7),
393 3161-3173.

394 Méndez, R., Meza, C., Berruecos, J., Garcés, P., Delgado, E., & Rubio, M. (2009). A survey of beef carcass
395 quality and quantity attributes in Mexico. *Journal of Animal Science*, 87(11), 3782-3790.

396 Millman, S. T. (2009). Animal welfare—Scientific approaches to the issues. *Journal of Applied Animal*
397 *Welfare Science*, 12(2), 88-96.

398 Ministerio de Salud (2009). Ley N° 20.380 sobre Protección de animales. In Ministerio de Salud -
399 Subsecretaría de Salud Pública (Ed.). Santiago, Chile.

400 Miranda-de la Lama, G.C., Leyva, I.G., Barreras-Serrano, A., Pérez-Linares, C., Sánchez-López, E., María,
401 G.A. & Figueroa-Saavedra, F. (2012). Assessment of cattle welfare at a commercial slaughter plant
402 in the northwest of Mexico. *Tropical Animal Health and Production*, 44, 497-504.

403 Miranda-de la Lama, G. C., Sepúlveda, W. S., Villarroel, M., & María, G. A. (2013). Attitudes of meat
404 retailers to animal welfare in Spain. *Meat Science*, 95, 569-575.

405 Miranda-de la Lama, G., Villarroel, M., & María, G. (2014). Livestock transport from the perspective of the
406 pre-slaughter logistic chain: a review. 2014. *Meat Science*, 98, 9-20.

407 Miranda-de la Lama, G., Estévez-Moreno, L., Sepúlveda, W., Estrada-Chavero, M., Rayas-Amor, A.,
408 Villarroel, M., et al. (2017). Mexican consumers' perceptions and attitudes towards farm animal
409 welfare and willingness to pay for welfare friendly meat products. *Meat Science*, 125, 106-113.

410 Miranda-de la Lama, G.C., Estévez-Moreno, L.X., Sepúlveda, W., Rayas-Amor, A.A., Villarroel, M., María,
411 G.A., (2018). Consumer attitudes towards animal welfare friendly products and willingness to pay:
412 An exploration of Mexican market segments. *Journal of Applied Animal Welfare Science*.

413 Morales, R., Aguiar, A., Subiabre, I., & Realini, C. (2013). Beef acceptability and consumer expectations
414 associated with production systems and marbling. *Food Quality and Preference*, 29(2), 166-173.

415 Nahed-Toral, J., Sanchez-Muñoz, B., Mena, Y., Ruiz-Rojas, J., Aguilar-Jimenez, R., Castel, J. M., et al.
416 (2013). Feasibility of converting agrosilvopastoral systems of dairy cattle to the organic production
417 model in southeastern Mexico. *Journal of Cleaner Production*, 43, 136-145.

418 Nocella, G., Hubbard, L., & Scarpa, R. (2010). Farm animal welfare, consumer willingness to pay, and trust:
419 Results of a cross-national survey. *Applied Economic Perspectives and Policy*, 275-297.

420 Encuesta de ganado bovino 2015 (2015). Oficina de Estudios y Políticas Agrarias.

421 Norman, E. R., & Hernández, N. C. (2005). “Like Butter Scraped over Too Much Bread”: Animal Protection
422 Policy in Mexico. *Review of Policy Research*, 22(1), 59-76.

423 OECD (2017). Meat consumption (indicators). In O. f. E. C.-o. a. Development (Ed.).

424 Peel, D. S., Mathews Jr, K. H., & Johnson, R. J. (2012). Trade, the expanding Mexican beef industry, and
425 feedlot and stocker cattle production in Mexico. *Journal of Current Issues in Globalization*, 5(4),
426 475.

427 Poletto, R., & Hötzel, M. J. (2012). The Five Freedoms in the global animal agriculture market: challenges
428 and achievements as opportunities. *Animal Frontiers*, 2(3), 22-30.

429 Queiroz, M. L. d. V., Barbosa Filho, J. A. D., Albiero, D., Brasil, D. d. F., & Melo, R. P. (2014). Consumer
430 perception about welfare of livestock in Fortaleza, Ceará, Brazil. *Revista Ciência Agronômica*, 45(2),
431 379-386.

432 Salcido, V. (2011). Organic foods find growing niche in Mexico. In G. A. I. N. USDA Foreign Agricultural
433 Service (Ed.).

434 Sánchez, C., Teixeira, D. L., Hötzel, M. J., & Larraín, R. (2016a). *Opinions and attitudes of the Chilean
435 public regarding cattle husbandry for beef production*. Paper presented at the XLI Congreso Anual
436 de la Sociedad Chilena de Producción Animal, Termas de Catillo, Chile.

437 Sánchez, C., Teixeira, D. L., Larraín, R., & Hötzel, M. J. (2016b). *Opinions and attitudes of the Chilean
438 public regarding hen husbandry for egg production*. Paper presented at the XLI Congreso Anual de
439 la Sociedad Chilena de Producción Animal, Puerto Varas, Chile.

440 Sandoval-Cervantes I. (2016) Semi-Stray Dogs and Graduated Humanness: The Political Encounters of Dogs
441 and Humans in Mexico. In: Pręgowski M. (eds) Companion Animals in Everyday Life. Palgrave
442 Macmillan, New York.

443 Santurtún Oliveros, E., Tapia Pérez, G., González-Rebeles, C., & Galindo Maldonado, F. (2012). Actitudes y
444 percepciones de consumidores en la Ciudad de México, hacia atributos de la producción sustentable
445 de alimentos de origen animal. *Veterinaria México*, 43(2), 87-101.

446 Schnettler, B., Vidal, R., Silva, R., Vallejos, L., & Sepúlveda, N. (2008). Consumer perception of animal
447 welfare and livestock production in the Araucania Region, Chile. *Chilean Journal of Agricultural*
448 *Research*, 68(1), 80-93.

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

452 Tadich, N., Flor, E., & Green, L. (2010). Associations between hoof lesions and locomotion score in 1098
453 unsound dairy cows. *The Veterinary Journal*, 184(1), 60-65.

454 Tonsor, G. T., Olynk, N., & Wolf, C. (2009). Consumer preferences for animal welfare attributes: The case of
455 gestation crates. *Journal of Agricultural and Applied Economics*, 41(03), 713-730.

456 United Nations (2015). World Population Prospects: The 2015 Revision, Key Findings and Advance Tables.
457 Working Paper No. ESA/P/WP.241. Department of Economic and Social Affairs, Population
458 Division.

459 USDA. Foreign agricultural service: Market and trade data. production, supply and distribution online.
460 (2016). Retrieved from <https://apps.fas.usda.gov/PSDOnlinev2/app/index.html#/app/home> (web
461 archive link, 18 November 2016) (accessed 3 November September) .

462 Vanhonacker, F., & Verbeke, W. (2011). Consumer response to the possible use of a vaccine method to
463 control boar taint v. physical piglet castration with anaesthesia: a quantitative study in four European
464 countries. *animal*, 5(07), 1107-1118.

465 Vanhonacker, F., Verbeke, W., & Tuytens, F. (2009). Belgian consumers' attitude towards surgical castration
466 and immunocastration of piglets. *Animal Welfare*, 18(4), 371-380.

467 Vanhonacker, F., Verbeke, W., Van Poucke, E., & Tuytens, F. A. (2008). Do citizens and farmers interpret
468 the concept of farm animal welfare differently? *Livestock science*, 116(1), 126-136.

469 Vargas-Bello-Pérez, E., Riveros, J. L., Köbrich, C., Álvarez-Melo, P. A., & Lensink, J. (2017). Chilean
470 consumers' perception about animal welfare in dairy production systems: short communication.
471 *Animal Production Science*, 57(1), 147-151.

472 Vecchio, R., & Annunziata, A. (2012). Italian consumer awareness of layer hens' welfare standards: a cluster
473 analysis. *International Journal of Consumer Studies*, 36(6), 647-655.

474 Velho, J. P., Barcellos, J. O. J., Lengler, L., Elias, S. A.-A., & Oliveira, T. E. d. (2009). Disposição dos
475 consumidores porto-alegrenses à compra de carne bovina com certificação. *Revista Brasileira de*
476 *Zootecnia*, 38(2), 399-404.

477 Verbeke, W. (2009). Stakeholder, citizen and consumer interests in farm animal welfare. *Animal Welfare*,
478 18(4), 325-333.

479 Villalobos, P., Padilla, C., Ponce, C., & Rojas, Á. (2010). Beef consumer preferences in Chile: importance of
480 quality attribute differentiators on the purchase decision.

481 von Keyserlingk, M. A., & Hötzel, M. J. (2015). The ticking clock: addressing farm animal welfare in
482 emerging countries. *Journal of Agricultural and Environmental Ethics*, 28(1), 179-195.

483 WAP (2014). World Animal Protection (November 2, 2014). "Mexico". Retrieved July 10, 2016.

484 WAP (2017). Consumo às cegas - Percepção dos consumidores sobre bem-estar animal. World Animal
485 Protection.

486 Woods, A. (2012). From cruelty to welfare: the emergence of farm animal welfare in Britain, 1964–71.
487 *Endeavour*, 36(1), 14-22.

488 Webster, A. (2001). Farm animal welfare: the five freedoms and the free market. *The Veterinary Journal*,
489 161(3), 229-237.

490 Yunes, M. C., von Keyserlingk, M. A., & Hötzel, M. J. (2017). Brazilian citizens' opinions and attitudes
491 about farm animal production systems. *Animals*, 7(10), 75.

492 Zander, K., & Hamm, U. (2010). Consumer preferences for additional ethical attributes of organic food. *Food*
493 *quality and preference*, 21(5), 495-503.

Table 1. Population aspects and land characteristics of Mexico, Chile and Brazil

	Mexico	Chile	Brazil
Area (km ²)	1,972,550	756,096	8,515,767
<i>Population characteristics</i>			
Population	122,435,500	17,948,000	205,573,000
Population density (per km ²)	57.0	23.0	23.6
Rural (%)	21.9	10.8	15.4
Urban (%)	78.1	89.2	84.6
<i>Age composition</i>			
0 – 14 years %	29.1	22.1	25.5
>65 years %	6.3	9.3	7.0
<i>Land area</i>			
Agricultural %	53.1	21.2	32.5
Forest %	33.3	21.9	61.2
Other %	13.7	56.9	6.3
<i>Agricultural area</i>			
Total 1000 ha	103,166	15,798	275,030
Arable %	24.7	8.3	26.2
<i>Permanent</i>			
Crops %	2.6	2.9	2.6
Meadows and pastures %	72.7	88.8	71.3

Source: United Nations (2015).

Table 2. Local policies on animal welfare available in Brazil, Chile and Mexico.

<i>Country</i>	<i>Law/Regulation number</i>	<i>Law/Regulation issue</i>
Mexico	Ley Federal de Sanidad Animal	Federal Animal Health Act 2007. A number of provisions concerning the welfare of animals used in farming appear at Articles 19 to 23.
	NOM-033-ZOO-1995	Humanitarian care and animal protection during slaughter operations.
	NOM-033-SAG/ZOO-2014	Methods to slaughter domestic and wild animals (including animals for food supply)
	NOM-045-ZOO-1995	Operation of establishments where animals gather for fairs, expositions, auctions, small markets and similar events.
	NOM-051-ZOO-1995.	Ethical standards for the movement and transport of animals.
Chile	Ley N° 20.380 (2009)	Animal Protection Act
	Decreto N° 28 (2013)	Regulation on the protection of animals that provide meat, fur, feathers and other products at the moment of slaughter at industrialized establishments
	Decreto N° 29 (2013)	Regulation on the protection of animals during breeding, commercialization and at other places where animals are maintained.
	Decreto N° 30 (2013)	Regulation on the protection of animals during transport.
Brazil	Decreto N°24.645/1934	Establishes measures for the protection of animals
	Instrução Normativa N° 3 (2000)	Technical regulation on animal stunning methods for humane slaughter of animals destined for human consumption.
	Instrução Normativa N° 56 (2008)	Recommendations on good animal welfare practices for production animals during breeding and transport.

Table 3. Scientific literature on consumer attitudes and perceptions towards farm animal welfare in Mexico, Chile and Brazil.

<i>Authors</i>	<i>Title</i>	<i>Methodology</i>	<i>Main results</i>
<i>Mexico</i>			
Santurtún et al. (2012)	Consumers attitudes and perceptions towards sustainable animal production attributes in Mexico City	Questionnaire with 8 closed questions and 26 questions to assess attitudes and perceptions. The questionnaire was applied at markets in one Mexican delegation.	Consumers perceived in first place that local production generates safer products, that it improves animal welfare, and that it protects the environment.
Miranda-de la Lama et al. (2017)	Mexican consumers' perceptions and attitudes towards farm animal welfare and willingness to pay for welfare friendly meat products	Questionnaire with likert type scale responses, which was first validated.	Consumers showed interest in farm animal welfare issues, and their ethical, sociological and economic implications and willing to pay for animal friendly products.
Miranda-de la Lama et al. (2018)	Consumer attitudes towards animal welfare friendly products and willingness to pay: An exploration of Mexican market segments	Questionnaire with likert type scale responses, which was first validated.	Mexican consumers can be profiled as sceptical, concerned and ethical, based in how they perceive animal welfare and their willingness to pay for welfare friendly products.
<i>Chile</i>			
Schnetler et al. (2008)	Consumer perception of animal welfare and livestock production	Personal interviews, closed questions questionnaire.	Consumers show a high willingness to pay for animal welfare attributes

Schnettler et al. (2009)	in the Araucania Region, Chile Consumer willingness to pay for beef meat in a developing country: The effect of information regarding country of origin, price and animal handling prior to slaughter	Personal interviews, closed questions questionnaire.	Animal welfare is perceived as a desirable condition, but consumers are not willing to pay significantly more when buying meat in order to gain information about animal handling.
Morales et al. (2013)	Beef acceptability and consumer expectations associated with production systems and marbling	Panel with 204 consumers from two Chilean cities	Three types of consumers were identified, 'lean beef lovers', 'high expectation consumers' and 'grass-fed beef lovers'
Vargas-Bello-Pérez et al. (2017)	Chilean consumers' perception about animal welfare in dairy production systems: short communication	Face-to-face interview	Most participants were interested in receiving more information on animal welfare, and that labelling of dairy products should include information on animal welfare and production conditions. Willingness to pay more for animal friendly products was also observed.

Brazil

Velho et al. (2009)	Disposition to buy certificated beef by consumers from Porto Alegre	Application of questionnaires as interviews at one supermarket chain in Porto Alegre	Willingness to pay for certifications (i.i. type of production system, organic, among other) of beef products is low probably associated to income ranges
Maysonnave et al. (2014)	Quality perception of beef with brand in the south of Brazil	Structured questionnaire applied to consumers, butchers, managers	Different stakeholders had similar understanding about meat quality. Meat aspect and meat surveillance information were most associated

Queiroz et al. (2014)	Consumer perception about welfare of livestock in Fortaleza, Ceará, Brazil	and farmers. Survey with closed questions	with product quality Most consumers do not have sufficient knowledge on issues related to animal welfare, but believe that different rearing methods can result in improvements in the final product.
Bruhn et al. (2015)	Socio-economic factors associated with perception and attitude of consumers of meat with certification of origin	Interviews with a structured questionnaire (36 questions)	Consumers with higher education and income were more knowledgeable about beef traceability certification.
Hotzel et al. (2017)	Citizens' views on the practices of zero-grazing and cow-calf separation in the dairy industry: does providing information increase acceptability?	Surveyed a convenience sample. Use of closed questions	Citizens reject zero grazing and cow-calf separation in dairy systems. The main reasons were the reduction in welfare, product quality and naturalness.
Yunes et al. (2017)	Brazilian citizens' opinions and attitudes about farm animal production systems.	Survey with closed and open questions. Each participant was shown pictures representing two of five possible major food animal industries.	Respondents preferred production systems that provide greater freedom of movement, which aligned with their perception that these systems are better for the animal.
<i>Mexico, Chile and Brazil</i>			
World Animal Protection (2017)	Blind consumption: Consumer perceptions on animal welfare.	Survey with closed questions applied to consumers at supermarkets.	Growing consumer concern in terms of animal welfare issues and market implications.

JAGE-S-17-00097 Consumer attitudes and perceptions towards livestock welfare in Mexico, Chile and Brazil: A perspective

First of all we apologize for the delay. The authors appreciate all valuable comments made by the referees that were useful and pertinent. It actually took us more time than we expected in order to accurately review this paper. We finally made an extensive revision of the text. Several citations were added to support the new text, and were consequently inserted in the reference list. All suggestions were taken into account and they were highlighted in red font along the manuscript. Several parts of the discussion were rewritten in order to improve readability and quality.

Reviewer:

1. *The title is on "consumer attitudes and perceptions towards livestock welfare", but more than half of the article is not directly related to this issue. If animal welfare is the major focus of this study, the authors should discuss more details on this. Moreover, the authors should specify their contributions and what makes this review article useful.*

Response: We would like to thank to the reviewer for their comments and suggestions. According with referee suggestion we decide re-focusing the manuscript to animal welfare influence on markets and consumers attitudes and change the title from:

Consumer attitudes and perceptions towards livestock welfare in Mexico, Chile and Brazil: A perspective

To:

Farm animal welfare influences on markets and consumer attitudes in Latin America: The cases of Mexico, Chile and Brazil

2. *I would like to see a clear definition of animal/livestock welfare in this study. The standards of animal welfare vary cross animals and countries, so it's important to specify the standards before discussing livestock welfare. If there are different standards in Latin America, it might help to provide a table of summarized standards in interested countries. It seems confined intensive systems and pasture systems are used in the article as an example of livestock welfare, then I would like to see some clear definitions and sources.*

Response: We add more information and definitions of animal welfare and develop a new Table (see table 2) about law enforcements of the three countries (**See lines 35-41, 60-62, 68-75, 155-156, 162-167**).

3. *The authors provided many information on livestock production, economic and political aspects in Latin America. While they are good information, I think the authors might spend too much time on this. Do the authors believe these are major drivers for consumer's preferences and attitudes towards animal welfare? If so, please provide a more comprehensive review or more evidences. For example, the authors argued that "Mexican empathy towards animal welfare could be a strategy for redirecting the frustration for solving inequity justice and social exclusion." Is there a reference for this?*

Response: We add more evidences about the animal welfare phenomenon in Latin America (See line 176-178, 220-225, 234-239). Additionally, we add the reference solicited by the reviewer (See line 168-170).

4. *I believe the section "consumer's attitudes towards farm animal welfare" is the key part of this article. If so, I expect the authors to discuss more in detail about relevant studies, because as mentioned in the article, not many animal welfare studies focused on Latin America. For major studies, I would like to see some discussion like the samples if they use survey instrument, methods, and key findings (e.g., major drivers they found). Again, a summary table might help.*

Response: We improve these aspects (see lines 237, 241-266), and develop a new Table (see table 3).

5. *It's not surprising to see countries different in economy and politics. The major goal of this article should be about how consumer's attitudes and perceptions about livestock welfare are different across countries or regions, and further to identify or summarize the key drivers behind those differences. In this sense, I hope to see more discussions and reviews on these aspects.*

Response: We add more information about differences across countries or regions of Mexico, Chile and Brazil (See lines 6-7, 14-17, 322-325).