



Antecedents of the intention to buy animal welfare certified products: A study with brazilian consumers

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Abstract

Animal welfare, often regarded as a singular and generic factor, necessitates explanatory models that reflect its multidimensional nature. This study addresses this complexity by investigating the purchasing behavior of consumers in developing countries, focusing on animal welfare-certified foods. To achieve this goal, a conceptual analytical model was developed, grounded in an extensive literature review and expert consultations. The model positions beliefs about animal welfare as the central component, with empathy for animals and knowledge of the production sector as antecedents. It also identifies beliefs about certified products, engagement, and perceived quality attributes as consequences. The methodology involved an online survey of 707 Brazilian consumers to test eight hypotheses derived from the model using structural equation modeling. The findings confirmed all hypotheses at a significance level of $p \leq 0.05$, underscoring the cognitive, affective, and educational bases of consumer beliefs about animal welfare. These beliefs were shown to positively influence engagement with, and perceived quality attributes of, certified products, ultimately shaping purchase intentions. However, a negative relationship between beliefs about animal welfare and beliefs about certified products suggests skepticism among Brazilian consumers regarding certification systems. This study contributes to the literature by presenting a multidimensional model that offers both theoretical insights and practical implications for marketing strategies and certification systems, particularly in developing country contexts. This novel approach lays a foundation for future cross-cultural validations and product-specific investigations.

Keywords Consumer behavior · Food-purchasing behavior · Animal welfare products · Marketing · Structural equation models

1 Introduction

In a scenario marked by significant changes in general consumption behaviors, particularly regarding animal products, the investigative interest in beliefs and concerns about production animal welfare has gained prominence. Consequently, the public's perception of animal welfare spans various contexts, including tourism, research, and pet care, demonstrating that this topic encompasses multiple layers and interpretative angles (Von Essen et al., 2020; Schweiggart, 2024). It is evident that this theme attracts diverse researchers, who have explored the relationship between purchase intentions and animal welfare, along with their specificities across different groups and cultures (Bonifacio et al., 2024; Grunert et al., 2018; Vargas-Bello-Pérez et al., 2017; Wolf et al., 2016). Building on these studies, this article addresses three key gaps of scientific interest: the relationship between beliefs about animal welfare and certified products, the need for multidimensional investigative models, and the perception of Brazilian consumers regarding animal welfare.

To enhance the value of animal products and bolster consumer confidence in production quality—thereby bridging the gap between consumers and the production process—welfare certifications or quality seals have been introduced. These certifications aim to promote welfare policies within the production chain and add value to food products (Heerwagen et al., 2015; Ingenbleek et al., 2013; Veissier et al., 2008). However, Yang (2023) and Heerwagen et al. (2015) highlight that the variety and inconsistency of welfare certifications available in the market may confuse consumers, hindering the dissemination of information and discouraging the purchase of such products. Thus, as the first gap, this study identifies the need to investigate how beliefs and perceptions about animal welfare relate to those regarding certified products.

Consumer perceptions of welfare encompass a variety of factors, including ethical, economic, social, cultural, spiritual, educational, and commercial dimensions (Liang et al., 2023). Despite this complexity, many studies reduce welfare to a singular, generic scale, offering limited causal relationships for the multifaceted aspects of this concept. The second gap, therefore, underscores the necessity of a multidimensional approach that explores animal welfare as a nuanced and holistic concept.

Lastly, Miranda-de la Lama et al. (2017) observe that most research on perceptions of animal welfare targets consumers in the European Union, the United States, and Canada, where animal protection policies are more advanced. The third gap arises from the lack of investigation into the consumption habits of developing countries—in this case, Brazilian consumers. Notably, in 2019, Brazil emerged as the world's second-largest meat producer (ABIEC, 2018; Pereira et al., 2024), assuming significant international responsibility as a major exporter. Brazilians also rank highly in the global consumption of beef (third place), pork (fifth place), and chicken and milk (both fourth place) (USDA, 2020a; USDA, 2020b). Specific evaluations of Brazilian consumer perceptions about animal welfare, based on regions or products, are provided in studies by Bonamigo et al. (2012), Queiroz et al. (2014), Cardoso et al. (2017), Yunes et al. (2017), and Franco et al., (2018a, 2018b).

In response to these identified gaps, this study focuses on developing a theoretical model addressing animal welfare through a multidimensional approach. It also aims to adapt and validate measurement scales for these factors. The primary objective of this work is to examine how beliefs about animal welfare—and their antecedents and consequences—influence Brazilian consumers' intention to purchase welfare-certified products.

This article is structured as follows. First, a literature review on consumer perceptions of production animal welfare is presented, emphasizing the antecedents and consequences of welfare beliefs. Next, the development of a theoretical model and the corresponding hypotheses are outlined. This is followed by an empirical validation of the model, assessing Brazilian consumers' beliefs about animal welfare and introducing a data collection instrument adapted from existing literature. The article concludes with a discussion of the academic and managerial implications derived from the research.

2 Model design and hypothesis formulation

Modern society has specific requirements regarding the quality of animal-based products. Font-i-Furnols and Guerrero (2014), for instance, identify three factors that influence consumer behavior in deciding to purchase such foods: psychological, sensory, and commercial. The influence of these factors on consumption across different cultures has been the focus of numerous studies (Verbeke & Viaene, 1999; Resurreccion, 2004; Fortomaris et al., 2006; Wideman et al., 2016; Harwood & Drake, 2018; Heng & Peterson, 2018; Wang et al., 2018; Devatkal et al., 2019; Mahrous & Bahgaat, 2019; Yang, 2023).

In addition to product-related attributes, consumers have increasingly expressed concerns about the methods used in food production, thereby introducing a new dimension of quality (Brunsø et al., 2002). The literature highlights various aspects of the animal production process that capture consumers' attention, including traceability (Buaprommee & Polyorat, 2016; Gellynck & Verbeke, 2001; Jin et al., 2017; Oliveira & Spers, 2018; Spence et al., 2018; Van Rijswijk et al., 2008; Verbeke & Ward, 2006), organic production (Castellini et al., 2008; Harper & Makatouni, 2002; McEachern & Willock, 2004; Wong & Aini, 2017), greenhouse gas emissions (Michaud et al., 2013; Echeverna et al., 2014; Magistris & Gracia, 2016; Caputo et al., 2018), sustainable management (Burnier et al., 2019; Freitas et al., 2017; Siegrist & Hartmann, 2019), and animal welfare.

As a growing consumer demand, the development and consolidation of the animal welfare concept require collaboration with the scientific community, revisions of governmental policies, and proactive engagement by rural producers to align with agribusiness strategies—all driven by consumer expectations (Hagen et al., 2011; Bock & Buller, 2013; Degeling & Johnson, 2015). This literature review, therefore, operates on the premise that the concept of animal welfare must be understood from a complex and multidimensional perspective.

2.1 Animal welfare

One of the most widely accepted definitions of animal welfare is that "the well-being of an individual is their state in relation to the attempt to adapt to their environment" (Broom, 1986). Consumer concern regarding how production animals are reared, transported, and slaughtered is not a recent phenomenon, dating back to the publication of *Animal Machines* by Ruth Harrison in 1964 (Broom, 2011). The public response to Harrison's book led to the Brambell Report in England (Brambell, 1965), which marked the beginning of animal welfare as an element of governmental policy (Croney & Millman, 2007).

Since then, standards for consuming animal-based products and consumer perceptions of the animal production process have undergone constant change. On one hand, there has been an increase in the number of consumers who restrict or eliminate animal protein from their diets, such as ovo-lacto vegetarians, ovo vegetarians, lacto vegetarians, vegans, flexitarians, and others (Janssen et al., 2016; Marangon et al., 2016; Besson et al., 2020). On the other hand, concern for animal welfare among those who consume products like meat, milk, eggs, and their derivatives has also grown. For example, Hughes (1995), in analyzing changes in the profile of British consumers—such as increases in income, rural-to-urban migration, higher education levels, and pet ownership—highlighted that consumer concerns about animal welfare are increasing, if not already well established.

It is undeniable that the consumption of animal-based products involves moral principles, whether shaped by individual characteristics or cultural norms (Backer & Hudders, 2015; Broom, 2011). Furthermore, animal welfare has become an increasingly significant factor in the decision-making process. Recognizing the complexity of the concept of animal welfare and its relationship to purchase intentions, this study argues that consumer beliefs about well-being, as a central element, have specific antecedents (such as empathy for animals and knowledge of the production system) and consequences (including a sense of engagement with well-being, beliefs about welfare certification, and perceptions of the quality of welfare-certified products).

2.2 Empathy for animals

Empathy is an involuntary and indirect response to affective signals from another individual (Eisenberg & Lennon, 1983; Eisenberg et al., 1994), encompassing social, psychological, and cognitive principles. Rothgerber and Mican (2014) define empathy for animals as comprising cognitive and affective components, which relate, respectively, to the recognition and understanding of an animal's emotions (sentience) and the emotional sharing and response aligned with those emotions. Consequently, empathy can be understood as an antecedent to the formation of beliefs about animal well-being.

To understand attitudes toward animals, Hills (1993, 1995) identifies empathy as one of three motivational foundations, alongside self-interest and beliefs and values about the nature of animals. Hills further suggests that empathy is closely associated

with attitudes of care and concern for animals' well-being. Supporting this notion, Hoffman (1987), Naess (1985), and Hills (1993) consider empathy a fundamental element of genuine morality. Subsequent studies have expanded the understanding of the relationship between empathy and the well-being of companion animals (Daly & Morton, 2003; Taylor et al., 2004), animals used in experimentation (Furnham et al., 2003), and livestock (Coleman et al., 1998; Cornish et al., 2020; Northrope et al., 2024; Verhoef, 2005).

Rothgerber and Mican (2014) explore empathy as a moderating factor in the relationship between childhood pet ownership and meat consumption. They observed that individuals who had pets during childhood were more likely to report aversion to meat consumption as adults. Similarly, Verhoef (2005) identifies empathy as an emotional factor—along with fear and guilt—that positively influences the frequency of organic product purchases. Northrope et al. (2024) highlight that empathy toward farm animals is a significant negative predictor of meat consumption in both Germany and Australia. Their study found that individuals with higher levels of empathy were less likely to consume red meat and poultry, suggesting that empathy-focused interventions could effectively reduce meat consumption.

Cornish et al. (2020) evaluated Australian consumers' perceptions and purchase intentions regarding various welfare certifications on food labels, using empathy as one of the assessment criteria. Their findings revealed that empathy for production animals is more pronounced among younger individuals, women, and those with lower incomes. The greater empathy observed among women has also been emphasized in other studies (Fidler et al., 2000; Taylor et al., 2004), which suggest that women exhibit stronger emotional responses to animal suffering. Cornish et al. (2020) further argue that empathy plays a significant role in shaping purchase intentions for products with animal welfare certifications.

Building on these insights and considering empathy for animals as an antecedent of individual beliefs about animal well-being, this study proposes the following hypothesis:

H1: Empathy for animals is positively related to beliefs about production animal welfare.

2.3 Knowledge of animal production systems

Many authors identify a recurring limitation in studies on consumer perceptions of production animals: the need for consumers to possess knowledge about rearing and slaughter systems (Lagerkvist & Hess, 2011; Queiroz et al., 2014; Cornish et al., 2020). Knowledge plays a critical role in shaping consumer beliefs about animal welfare, which is considered the second antecedent in the present study.

Historically, the rural exodus has distanced much of the consuming public, now predominantly urban, from the systems and processes of animal production (Hughes, 1995). This divide has resulted in a tendency among consumers to lose awareness and understanding of how animals are raised. Lusk and Norwood (2011) observe that many consumers hold an overly optimistic view of

production systems, assuming that most farms provide ideal conditions for animal well-being, thereby revealing a profound lack of knowledge on the subject. Furthermore, many consumers are unaware of the fundamental concepts underlying animal welfare.

Animal production systems consist of a series of processes and management stages that accompany animals from birth to slaughter. These processes—whether on farms, during transport, or in slaughter facilities—carry varying degrees of weight in shaping consumer perceptions and beliefs about animal welfare. On farms, certain management practices are particularly scrutinized by consumers as critical points for animals' quality of life.

For example, Lagerkvist et al. (2006) evaluated consumer perceptions of pig castration methods, comparing immunocastration, surgical castration, and no castration. Their findings indicate that immunocastration is viewed as a socially acceptable alternative. Similarly, Carlsson, Frykblom, and Lagerkvist (2005) and De Barcellos et al. (2011) examined consumer opinions on production practices that pose risks to animal welfare, including feeding genetically modified foodstuffs, confining egg-laying hens in cages, early weaning of cows and calves, rapid growth of broilers, and high stocking densities. In a survey of 479 Brazilian consumers from Florianópolis (Santa Catarina), Yunes et al. (2017) used a questionnaire with images comparing conventional production systems to those emphasizing higher welfare standards. The results showed that 79% of participants believed Brazilian production animals are not well-treated, particularly criticizing systems that restrict animal movement.

Transport and slaughter practices also significantly influence consumer perceptions, often drawing intense media attention (Hughes, 1995; Miranda-De La Lama et al., 2011). Liljenstolpe (2008), in a study of Swedish pork consumers, found greater acceptance of mobile slaughter as an alternative to transporting animals, as it reduces stress and suffering. Similarly, Carlsson, Frykblom, and Lagerkvist (2005) and You et al. (2014) investigated perceptions of animal transport and slaughter practices. A study by WAP (2016) revealed that 55% of 2,200 Brazilian consumers were concerned about slaughter methods.

Despite the physical and experiential distance between urban populations and production centers, social networks and new information sources have amplified discussions on urban consumers' perceptions of animal welfare. Studies such as those by Puckett and Frederico (1992), McEachern and Seaman (2005), Kupsala et al. (2013), Queiroz (2014), Kupsala et al. (2015), and Franco et al., (2018a, 2018b) have compared rural and urban consumer attitudes toward meat consumption and welfare certification, identifying differences and conflicting results between these groups.

Larger investigations could further explore the relationships between consumer knowledge and experiences with animal production systems and their beliefs about welfare. According to WAP (2016), 66% of respondents had no knowledge of how animals are reared, 13% had no opinion, and only 21% were informed about production systems. In a study of chicken meat consumption, Bonamigo (2012) found that 68.5% of Brazilian residents in Curitiba (Paraná) were unaware of the bird production system. A lack of information can mask or distort consumer perceptions. For instance, many consumers expressed a strong willingness to pay more for

animal-based products once they gained awareness of production practices (Harper & Henson, 2001; Lusk & Norwood, 2011).

Given the importance of consumer knowledge about production processes as an antecedent to beliefs about animal welfare, this study proposes the following hypothesis:

H2: Knowledge of the animal production system has a positive relationship with belief regarding the well-being of production animals.

2.4 Beliefs about animal well-being

This study focuses on the beliefs and concerns of consumers of animal-based products regarding animal welfare. Although animal welfare is a science supported by increasingly clear and objective definitions, techniques, and methods, its ethical dimension remains undeniable (Sandøe et al., 2003).

Bastian et al. (2012) argue that animal welfare is a moral issue influenced by perceptions of the relationship between humans and animals, as well as cultural and individual differences. The authors further suggest that many people—particularly those who consume meat while caring for their pets—experience cognitive dissonance, enabling them to avoid considering that meat originates from animals that were once alive.

The identification of perceptions, beliefs, concerns, and values related to animal welfare is a central objective of numerous studies conducted across the globe (María, 2006; Nocella et al., 2010; Vecchio & Annunziata, 2012; Queiroz et al., 2014; You et al., 2014; Wolf et al., 2016; Miranda-de La Lama et al., 2017; Vargas-Bello-Pérez et al., 2017; Franco et al., 2018a, 2018b). In general, public perceptions of animal welfare tend to be negative. Data from the European Commission (2005), based on 44,514 respondents from 31 European countries, reveal that 85% of the population rate the well-being of farm animals as moderate to very poor. Furthermore, 78.3% of respondents believe that improvements could be achieved through enhanced European Union policies aimed at protecting animals and ensuring their welfare.

Fraser et al. (1997) propose that consumers typically express three types of beliefs and concerns regarding animals raised for production: (1) concerns about the “natural life” of animals (e.g., access to pasture); (2) concerns about animals’ affective experiences (e.g., stress-free handling); and (3) concerns about their physical and nutritional health (e.g., access to adequate feed and water). These values align closely with the principles of the Five Freedoms or Five Domains of animal welfare (Broom, 2011; Keeling et al., 2011; Mellor, 2016; Webster, 2016) and are also reflected in studies by Lassen et al. (2006), Marie (2006), and Te Velde et al. (2002).

In the European Union, concern for animal welfare is more prevalent among middle-aged women with higher purchasing power, above-average education levels, and well-regarded occupations (Gracia et al., 2009; Toma et al., 2012; Akaichi & Revoredo-Giha, 2016; Clark et al., 2016; Clark et al., 2017; Cornish et al., 2020). Similarly, in Brazil, research conducted by Franco et al., (2018a, 2018b) in the

State of Paraná found that middle-class women express greater concern for animal well-being.

This study argues that beliefs and concerns about animal welfare have a direct influence on beliefs about welfare-certified products and on individual engagement with animal welfare as outcomes. Therefore, the following is proposed:

H3a: Belief regarding animal welfare has a positive relationship with belief regarding food products with animal welfare certification.

H3b: Belief regarding animal welfare has a positive relationship with engagement regarding animal well-being.

2.5 Engagement with animal well-being

Engagement, from a social conceptual perspective, involves initiative, involvement, and appropriate responses to social stimuli, as well as participation in and interaction with social activities (Achterberg et al., 2003). As a direct primary consequence of beliefs related to animal welfare, this study examines the engagement generated around animal well-being, reflecting consumers' active interest in the subject.

Vanhonacker and Verbeke (2014) and Denver et al. (2017), when analyzing attitudes toward animal welfare, suggest that consumers can be categorized into three groups: those who are very interested, those who are not interested, and those who are moderately concerned but prioritize other attributes (such as quality and price) over welfare considerations. These ethical positions encompass a spectrum of consumer profiles, from individuals unaware of or unconcerned about animal welfare policies to staunch defenders of animal rights (Rodrigues, 2010; Rowlands, 2017).

Attitudes toward animal welfare also vary depending on whether individuals view themselves primarily as citizens or consumers (Degeling & Johnson, 2015; Norwood & Lusk, 2011). Degeling and Johnson (2015), in their study of citizen and consumer profiles regarding animal welfare, emphasize that citizen behavior is more heavily influenced by values shared within society. In contrast, consumer behavior tends to reflect more personal and individualistic attitudes.

While much of the literature has focused on consumer perceptions of animal welfare, the perspective of individuals as citizens is equally significant. This perspective is essential for fostering political debate and advocating for legislation to ensure animal welfare as a matter of public interest, benefiting society as a whole rather than being treated merely as a consumption attribute. Norwood and Lusk (2011) highlight this dichotomy by noting that, in 2008, 63% of Californian citizens voted to eliminate cages from egg-laying bird production systems, yet only 10% of Californian consumers purchased eggs from free-range systems.

Engagement, as a consequence of individual beliefs about animal welfare, aligns more closely with the role of citizens. This stance fosters greater interest in the topic by connecting with the general public and promoting collective and educational discussions (Aguirre & Orihuela, 2010; Algers & Silva-Fletcher, 2015; María, 2016; Hawkins et al., 2017).

In the present study, it is argued that engagement has a direct relationship with the intention to purchase welfare-certified products and with the perception of the quality of such products:

H4a: Engagement with animal welfare has a positive relationship with the intention to buy welfare-certified products.

H4b: Engagement with animal welfare has a positive relationship with the perception of the quality of welfare-certified products.

2.6 Intention to buy animal welfare certified products

A direct consequence of beliefs and concerns about animal welfare is their relationship to beliefs about welfare-certified products. This consequence addresses the beliefs and concerns consumers hold regarding the final product at the point of purchase. The present study highlights that these beliefs may be influenced by the purchase environment or by the product itself, particularly its labeling.

Supermarkets provide abundant information but often tread a fine line between helping and confusing consumers. Regarding information on animal welfare, several studies indicate that supermarkets fail to offer sufficient quantity and quality of information (Harper & Henson, 2001; Vanhonacker & Verbeke, 2014; Vanhonacker et al., 2010). Consumers generally perceive the level of welfare-related information available at points of sale as inadequate.

In a study of 402 Brazilian consumers, Franco et al., (2018a, 2018b) found that 87.3% of respondents reported difficulty finding information in supermarkets about the origin of animals and the systems under which they were raised. Moreover, the majority expressed dissatisfaction with the variety of products offering higher welfare standards. These findings are consistent with prior studies (Franco, Souza and Molento, 2017; Vanhonacker et al., 2010; De Graaf et al., 2016) and suggest that the limited availability of these products directly impacts their price, potentially influencing consumer purchase intentions.

While the perception of the purchase environment is important, product labeling and welfare quality seals have received more scientific attention (Cornish et al., 2020; Gracia et al., 2011; Heerwagen et al., 2015; Hoogland et al., 2007; Rodriguez, 2011). At the point of sale, consumers are increasingly exposed to unfamiliar quality seals and certifications guaranteeing some level of animal welfare (e.g., free-range eggs and chickens, cage-free eggs and chickens, or chicken meat from birds raised without antibiotics) (Ingenbleek & Immink, 2011).

Although packaging often features certification labels, many consumers lack awareness of their meaning and the attributes they represent (Cornish et al., 2020). However, Ingenbleek and Immink (2011) argue that quality seals play an important educational role, guiding conscious consumers in their decision-making by offering information unavailable in most other products. The question remains whether this information is sufficient to meet consumer needs.

Beliefs and perceptions regarding welfare-certified food products play a crucial role in influencing consumer purchase intentions. For instance, Napolitano et al.

(2010) suggest that quality seals, as strategic product differentiators, positively influence Brazilian consumers' purchase intentions and their willingness to pay for such products. Consequently, animal welfare is enhanced as certified products dominate supermarket shelves. Based on this, the following hypothesis is proposed:

H5: The belief about products with animal welfare guarantees has a positive relationship with the intention to purchase the same.

The present study also considers the perceived quality of welfare-certified products as an indirect consequence of beliefs about animal welfare. This perspective draws on emerging evidence of the relationship between animal welfare and food product quality. Merlino et al. (2018) explore this relationship, suggesting that the link between welfare and quality can be interpreted through two lenses: (1) ethical considerations, reflecting welfare principles, and (2) anthropocentric concerns, where animal suffering is associated with health risks, such as those posed by excessive pharmaceutical treatments (e.g., antibiotics). Conversely, animals raised under stringent welfare standards are perceived as healthier, leading to an association with premium product quality (Merlino et al., 2018; Napolitano et al., 2010; Toma et al., 2012).

Vanhonacker et al. (2010) investigated Flemish consumers' decisions to buy welfare-certified products, finding positive associations with improved flavor, health, safety, sustainability, and overall quality. Similarly, Anderson and Barrett (2016) conducted a study in the United States where participants were presented with two identical steaks, each accompanied by information about production systems with differing welfare standards. Participants attributed better appearance, smell, and taste to the steak associated with higher welfare standards. According to WAP (2016), 91% of Brazilian consumers believe that animals raised under welfare-compliant conditions yield better-quality products.

Thus, welfare-certified products are associated with attributes such as quality, flavor, safety, and health (Vanhonacker & Verbeke, 2014). It is important to recognize, however, that while consumers may associate these attributes with animal welfare certifications, the relationships are not always direct or accurate. Investigating why and how consumers form these associations is essential for understanding different markets and consumer audiences. This understanding can, in turn, inform strategies to influence purchase intentions for welfare-certified products. Therefore, the following hypothesis is proposed:

H6: The perceived quality of products that guarantee greater animal welfare has a positive relationship to the intent to purchase.

2.7 Intention to buy certified animal welfare products model

Based on the literature review outlined above, which describes various factors related to animal welfare, and the hypotheses proposed in this study, the structural model depicted in Fig. 1 is introduced.

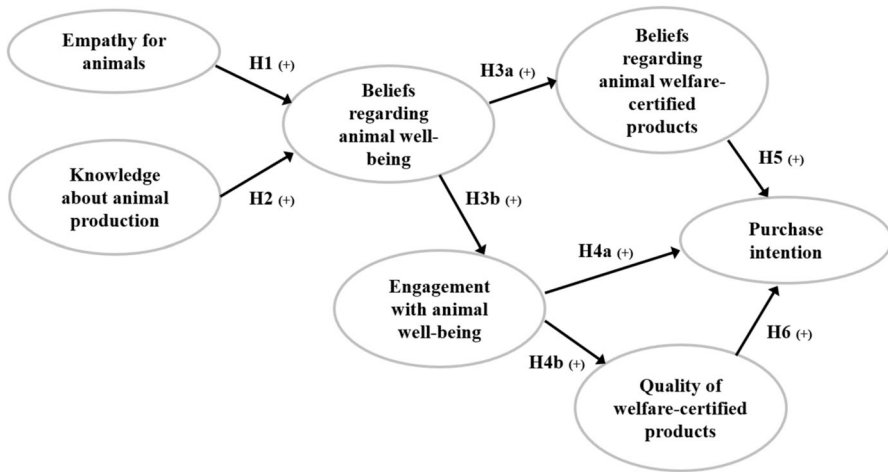


Fig. 1 Conceptual model

A central element of the conceptual model is the beliefs and perceptions individuals hold about animal well-being. It is argued that consumer beliefs are shaped by their empathy toward animals and their knowledge or familiarity with systems of animal rearing, transport, and slaughter. Furthermore, these beliefs about animal welfare have significant consequences. The direct consequences include engagement with animal welfare and beliefs about products that guarantee a higher standard of animal well-being. The indirect consequence is the perceived quality attributed to animal welfare-certified products. Together, these three consequences influence the intention to purchase welfare-certified products.

3 Methodology

In conjunction with the literature review presented in this study, the development of the proposed conceptual model also benefited from the collaboration and expertise of specialists in the field. The model was discussed with three researchers specializing in animal welfare, two researchers in marketing and consumer behavior, a professional from an animal welfare certification company, and a professional working for a non-governmental organization advocating against the mistreatment of production animals. Contributions from these professionals were instrumental in refining the final conceptual model tested in this research.

To validate the model, a quantitative survey was conducted using a structured questionnaire distributed online via the Google Forms platform. The questionnaire targeted consumers of animal-based products (meat, milk, and eggs) residing in Brazil. Distribution was carried out randomly via email and social networks. The sole inclusion criterion was that participants be consumers of animal-based products.

First, the questionnaire was translated from English to Portuguese, with the final version approved by three researchers specializing in marketing and livestock

production. This process of translation and linguistic validation aimed to ensure that the meaning of the statements remained consistent with the English references and that the questions were unambiguous, thereby preserving the integrity of the results. This approach aligns with the recommendations of Brislin (1980). Additionally, a pre-test was conducted with 40 participants to identify and resolve potential issues with ambiguity, misunderstandings, or challenges in completing the questionnaire. The finalized questionnaire was made available online for one week in May 2020, resulting in 707 successfully completed responses.

The questionnaire consisted of 37 structured questions, detailed in Table 3 of the Appendix. A seven-point Likert scale was employed, ranging from 1 (strongly disagree) to 7 (strongly agree). Since many constructs were non-validated, the dimensions under investigation were informed by the literature review and adjusted as necessary.

An animal empathy scale (EFA) was developed based on the studies of Furnham et al. (2003) and Austin et al. (2005). The variables focused on respondents' perceptions of animals' emotions and experiences during rearing, transport, and slaughter. The production systems knowledge scale (PSK) was adapted from WAP (2016) and Queiroz et al. (2014), capturing respondents' knowledge of the production processes for meat, milk, and eggs.

The belief scale regarding animal welfare (BAW) was informed by the works of Austin et al. (2005), María (2006), Wolf et al. (2016), and Franco et al., (2018a, 2018b). This scale included variables related to consumer concern for production animal welfare, their interpretation of the concept, and their perception of responsibility for ensuring welfare. It was noted that the scales for empathy, knowledge, and beliefs about welfare required reflection on animals and the production sector.

The consumer engagement scale (EAW) drew on studies by Austin et al. (2005), María (2006), and Vargas-Bello-Pérez et al. (2017). This scale measured citizen attitudes toward welfare policies, including interest in the subject and the social and educational profiles of respondents. The belief regarding welfare-certified products scale (BCP) was adapted from Franco et al., (2018a, 2018b) and Vecchio and Annunziata (2012), encompassing variables related to consumer perceptions of the availability and information associated with these products. The product quality attribution scale (PQA) was based on the works of Chen (2007), Gracia (2013), and WAP (2016), focusing on food product attributes linked to animal welfare in the literature. Scales for engagement, beliefs about welfare-certified products, and product quality attribution were considered in the context of product certification.

The intention to purchase (INP) scale was adapted from the validated scale of Baker et al. (1977) to align with the study's objectives. Variables addressed consumer purchasing behavior and willingness to pay for certified products.

To evaluate the data, a confirmatory factor analysis (CFA) was performed using variance-based structural equation modeling. This approach assessed the measurement quality of the proposed theoretical model, drawing on insights from the literature (Hair et al., 2009). The analysis combined dependency techniques (factor analysis) with interdependency techniques (multiple regression analysis), as described by Hair et al. (2016). Data analysis was conducted using SmartPLS software version 3.0.

Initially, the reliability of the proposed scales (detailed in Table 3 of the Appendix), as well as their convergent and discriminant validity, was tested. According to Souza et al. (2017), construct validity requires confirmation that variables appropriately measure the intended constructs—an increasingly complex task for abstract constructs. Following this, the hypotheses proposed in this study (represented in the model shown in Fig. 1) were tested using the same software and a set of multiple regression equations.

4 Results and discussion

The results of this study are presented and discussed across four subsections. The first subsection examines the profiles of the research participants. The second subsection details the results of the confirmatory analysis of the constructs, focusing on their reliability. The third subsection presents the outcomes of the hypothesis tests and the validation of the proposed conceptual model. The fourth subsection explores the theoretical and managerial implications derived from the study, along with its limitations and suggestions for future research.

4.1 Sample profile

The average age of the research participants was approximately 37 years, with a standard deviation of ± 14.08 years. The age range of respondents varied from 18 to 77 years. Regarding gender, 60% of the participants were women. This disparity in responses between women and men can be attributed to findings by Kellert and Berry (1987) and Hills (1993), which suggest that women are more influenced by the animal welfare agenda and are therefore more likely to accept invitations to participate in related research. Additionally, in Brazil, women are culturally more likely to be responsible for purchasing food products (Andreuccetti et al., 2005).

The majority of respondents, approximately 75.82%, had pursued higher education, including undergraduate and postgraduate degrees. The research encompassed all Brazilian regions, though representation varied. Only 5 of the 27 states (including the Federal District) that comprise Brazil were not represented in the data. A significant portion of respondents (62.22%) were from the Southeast region, which is home to the majority of Brazil's population (IBGE, 2010). This region was also the primary focus of the initial questionnaire distribution. The states with the highest participation were São Paulo (50.49% of the total), Minas Gerais (9.62%), both in the Southeast, and Rio Grande do Sul (8.06%) in the South.

Regarding income, responses were concentrated at the two extremes: below two Brazilian minimum salaries per month (approximately \$398 USD), which accounted for 31.11% of participants, and above 10 minimum salaries (approximately \$1,990 USD), representing 22.49% of respondents. Table 4 in the appendix summarizes the sample profiles.

4.2 Confirmatory analysis of the constructs

The purpose of this analysis was to evaluate the appropriateness of the scales. Although the variables were derived from the literature, their adaptation for the current study necessitated validation. The validation process was conducted using the total sample of 707 participants. The results of this confirmatory analysis are summarized in Table 1.

The analysis confirmed that the premises of reliability, as well as convergent and discriminant validity, were met for all scales. Using the Average Variance Extracted (AVE) metric, all constructs returned values exceeding the acceptable threshold of 0.500, with the exception of the product quality attribution scale (PQA), which recorded a value of 0.401. While this result did not meet the stipulated threshold, the theoretical complexity addressed in this study provides reasonable justification for considering this value acceptable under these circumstances (Hair et al., 2016).

The composite reliability (CR) for all constructs was found to be above 0.700, which is an acceptable threshold for this variable (Fornell & Larcker, 1981; Hair et al., 2009). Even with an AVE of less than 0.500, the PQA construct also presented a CR above 0.700, a characteristic observed in valid constructs in other studies (Lam, 2012).

Finally, the effectiveness of the discriminant validity tests was analyzed according to the precepts of Fornell and Larcker (1981). This analysis evaluated potential relationships between constructs and other variables and successfully confirmed discriminant validity in every case. The square-root values of the AVE, displayed on the diagonal of Table 1 (highlighted in bold), confirm that the constructs are, indeed, valid. Therefore, the results of the confirmatory analysis indicate that the adaptations made to categorize and measure the dimensions of interest in this study were effective.

Table 1 Discriminant validity calculations for the constructs

Latent variable	PSK	BCP	BAW	EFA	EAW	INP	PQA
Production system knowledge (PSK)	0.851						
Belief about certified products (BCP)	−0.035	0.801					
Belief about animal welfare (BAW)	0.498	−0.145	0.858				
Empathy for animals (EFA)	0.442	−0.184	0.754	0.738			
Engagement with animal welfare (EAW)	0.178	−0.098	0.326	0.375	0.758		
Intention to purchase (INP)	−0.069	0.039	0.107	0.165	0.507	0.795	
Product quality attribution (PQA)	0.044	−0.097	0.382	0.438	0.535	0.575	0.633
CR	0.911	0.841	0.965	0.804	0.843	0.895	0.769
AVE	0.725	0.641	0.737	0.544	0.575	0.632	0.401

Notes: CR = Composite reliability; AVE = Average variance extracted

4.3 Evaluation of the structural model

The results of the structural model analysis demonstrate that all hypotheses were supported at a significance level of $p \leq 0.05$, as shown in Table 2. Notably, all relationships between the constructs proposed in the hypotheses were positive, except for H3a (BAW $\rightarrow$ BCP). Additionally, except for H3a (BAW $\rightarrow$ BCP), H3b (BAW $\rightarrow$ EAW), and H4b (EAW $\rightarrow$ PQA), the variance inflation factor (VIF) values were above 1.000, indicating the presence of multicollinearity (Bowerman & O'Connell, 1990). However, all VIF values remained within acceptable limits, as they were below 3.000 (Ringle et al., 2015).

Although hypothesis H3a (BAW $\rightarrow$ BCP) was statistically supported, the relationship between the constructs was negative, contrary to the originally proposed hypothesis. The results suggest that, for Brazilian consumers, beliefs about animal welfare are inversely related to beliefs about products with animal welfare certification. Specifically, the greater the concern for the quality of life of animals, the lower the satisfaction with the availability of certified products and the quality of information associated with them.

The findings of H3a point to a potential skepticism among consumers who are most concerned about animal welfare. Skepticism, understood as a state of disbelief or doubt, is a significant concept in various marketing studies (Cho & Taylor, 2019; Obermiller & Spangenberg, 1998). In the context of discussions about animal welfare, skepticism regarding the perception of certified food products is highlighted in studies by Hoek et al. (2013) and Weinrich and Spiller (2016).

On the other hand, consistent with the conceptual model proposed, the hypothesis test results reveal that beliefs and perceptions about well-being are positively related to empathy toward production animals (H1) and knowledge about rearing, transport, and slaughter processes (H2), positioning them as antecedent factors, as shown in Fig. 1. Additionally, beliefs about well-being have a direct and positive relationship with engagement in animal welfare guidelines (H3b).

Table 2 Evaluation of the structural model

Hypotheses	Path coefficients	VIF	f ²	Standard deviation	T statistics	p Values
H1: EFA $\rightarrow$ BAW	0.663	1.243	0.887	0.023	29.324	0.000**
H2: PSK $\rightarrow$ BAW	0.204	1.243	0.084	0.025	8.204	0.000**
H3a: BAW $\rightarrow$ BCP	-0.145	1.000	0.022	0.064	2.290	0.022*
H3b: BAW $\rightarrow$ EAW	0.326	1.000	0.119	0.034	9.611	0.000**
H4a: EAW $\rightarrow$ INP	0.286	1.406	0.097	0.042	6.829	0.000**
H4b: EAW $\rightarrow$ PQA	0.535	1.000	0.402	0.027	20.150	0.000**
H5: BCP $\rightarrow$ INP	0.109	1.013	0.019	0.034	3.168	0.002**
H6: PQA $\rightarrow$ INP	0.432	1.406	0.220	0.038	11.428	0.000**

Notes: n = 707

* significance level of $p \leq 0.05$

** significance level of $p \leq 0.01$

The results also revealed a positive relationship between engagement with animal welfare and the perceived quality of certified products (H4b), thereby positioning engagement as a moderating factor between beliefs about well-being and the quality attributes of animal-based foods. Finally, the findings demonstrated that engagement (H4a), beliefs about certified products (H5), and quality attributes (H6) positively influence the intention to purchase.

4.4 Implications and contributions of the conceptual model

Based on the results of this study, several considerations require discussion. First, the theoretical implications arising from the findings are presented, followed by a discussion of the managerial implications derived from the research. This study addresses three critical scientific gaps: (1) the need for complex conceptual models that incorporate various factors related to animal welfare; (2) the relationship between beliefs about animal rearing processes and beliefs about certified products; and (3) consumer behavior in developing countries, such as Brazil. The proposed conceptual model includes the antecedents and consequences of beliefs about well-being and their causal relationships with purchase intentions. All hypotheses supporting the model were validated, with the exception of H3a, which—despite statistical support—indicated a negative relationship.

The findings suggest that the decision to purchase animal welfare-certified products follows an extended explanatory pathway, beginning with consumer knowledge about the management of animal rearing, transport, and slaughter (educational and experiential characteristics) and empathy (affective and cognitive characteristics). Purchase intentions for certified products, therefore, involve educational, cultural, and cognitive dimensions, consistent with the observations of Yang (2023) and Zhang et al. (2023). This underscores the importance of a multidimensional approach to the concept of animal well-being.

This study contributes to research on consumer perceptions of animal welfare-certified products by proposing individual scales for each construct in the model. In contrast to prior studies (e.g., Austin et al., 2005; Franco et al., 2018a, 2018b; María, 2006), where variables are often grouped into a single global scale for animal well-being, this work divides and adjusts these variables into distinct factors for a more nuanced analysis.

This study also advances the scientific understanding of consumer behavior concerning animal well-being by examining Brazilian consumers—a significant producer of meat, milk, and eggs in a developing country where consumption is projected to grow (USDA, 2015). By focusing on Latin American markets, this research aligns with calls for greater regional specificity highlighted by Miranda-De La Lama et al. (2017) and Vargas-Bello-Pérez et al. (2017).

The multidimensional model presented allows for a more comprehensive understanding of well-being, identifying key elements of consumer behavior, purchase intentions, and willingness to pay for certified products. Beyond its theoretical contributions, this approach offers various practical applications.

Considering managerial implications, animal welfare is often associated with the demands of specific consumer segments. In this context, the food industry continually seeks to identify and satisfy this growing market niche. The consumer's role as a catalyst for change in the food production chain is critical (Degeling & Johnson, 2015; Liang et al., 2023). Consumers have the power to reward companies with clear ethical commitments to animal welfare and to reject those that fail to meet such standards (CWS, 1995).

Although many countries lack robust animal welfare policies—Brazil being one, despite its status as a signatory of OIE—the food industry recognizes the importance of its actions, particularly in serving international markets. As a result, companies involved in handling and trading animal-based products, such as supermarket chains and restaurants, are implementing medium- and long-term welfare directives. These efforts include internal initiatives and demands for compliance from their suppliers.

Hoag and Lemme (2018) note that animal welfare represents both risks and opportunities for companies, contributing to tangible benefits (e.g., increased profits) and intangible value (e.g., enhanced brand reputation). Animal welfare practices can affect operating licenses, complicate national and international operations, enhance or damage brand reputation, and provide opportunities for market leadership.

Among economic considerations, the willingness of consumers to pay for products that guarantee better animal welfare is particularly notable. Lagerkvist and Hess (2001) conducted a meta-analysis of 24 international studies, concluding that purchasing behavior shifts when consumers are informed about animal rearing methods. Consumer income and age influence this willingness to pay, whereas regional preferences have less impact. WAP (2016) data indicate that 73% of Brazilians believe welfare-certified products are more expensive. When price parity is achieved, 70% of consumers would choose certified products, while 17% remain indifferent to certification.

While many consumers express willingness to pay more for higher-welfare products, attributes such as taste and price remain dominant at the point of sale (Tiboldo et al., 2024). In Brazil, consumer preferences for welfare-aligned production also include product quality, appearance, texture, price, shelf life, and brand reputation (WAP, 2016). Bonamigo et al. (2012) similarly found that price and type of meat outweigh animal welfare considerations for chicken meat consumers.

Thus, the model developed in this study enables targeted exploration of well-being dimensions, establishing managerial priorities to encourage welfare-certified product consumption. Commercial strategies could focus on bridging the gap between consumers and producers by optimizing access to information about certified products through packaging and in-store displays.

Studies applied from this model are relevant for: certifying companies, which should pay attention to how their guarantee seals are viewed, understood and read by consumers; the animal production chain as a whole, which should invest in better strategies for communication with clients; governments, who should be aware of the demands of citizens and their perceptions and concerns about animal well-being; supermarkets (retail chains), which could optimize their marketing tools to encourage the sale of certified products; and other parties involved in the production and trading of animal-based products.

In summary, this study underscores the importance of a multidimensional approach to understanding animal welfare, consumer beliefs, and purchasing behaviors in developing countries. By addressing critical scientific gaps, such as the interplay between beliefs about production practices and certified products, and by proposing a novel conceptual model, this research provides a framework for analyzing the antecedents and consequences of animal welfare beliefs. The work serves as a benchmark for exploring complex consumer behavior constructs, particularly in emerging markets with unique socio-economic dynamics.

5 Limitations and future studies

Some limitations of the present study and potential avenues for future research are outlined here. A key area for further investigation is the negative relationship between beliefs regarding animal well-being and beliefs about product certification. Skepticism may be a critical element to incorporate into the model to deepen the understanding of this relationship. Given the established link between animal production processes and certified products, the nature of this connection deserves further exploration.

While the conceptual model addresses several factors, questions surrounding consumption and animal welfare also involve additional dimensions. Lagerkvist and Hess (2011) and Clark et al. (2016) note the relationship between animal welfare and food safety, highlighting public concerns about the use of antibiotics and hormones in production animals and their implications for human health. In this regard, factors such as environmental sustainability in production systems and human health are particularly relevant, especially given the growing prominence of the "One Health" concept (Broom & Johnson, 2019; Rushton & Bruce, 2017). For instance, a survey by WAP (2016) found that 74% of Brazilians believe animal welfare-oriented production systems are more sustainable.

Future studies could also explore the influence of psychological profiling on consumer behavior, particularly eating habits. Machado-Oliveira (2020) applied the Five Factor Model (FFM) to evaluate food choices, including preferences for healthy, unfamiliar, and spicy foods. The five factors—extraversion, openness, neuroticism, agreeableness, and conscientiousness—could provide new insights into consumer perceptions of animal welfare.

Additionally, consumer profiles vary globally based on factors such as age, gender, purchasing power, and consumption habits (Clark et al., 2016, 2017; Cornish et al., 2020; Liang et al., 2023). This study did not include an analysis of demographic divisions among Brazilian consumers, presenting an opportunity for future research to evaluate potential differences between demographic groups.

For example, younger consumers may exhibit less concern for animal welfare due to limited financial resources, even though they generally have greater access to information (Lagerkvist & Hess, 2011; María et al., 2017). Similarly, there are conflicting findings in the literature regarding family size and animal welfare perceptions. While products from well-treated animals are often perceived as safer and healthier, appealing to parent consumers (Harper & Henson, 2001), some studies suggest that larger families are less inclined to purchase certified products due to budget constraints (Gracia et al., 2009; Toma et al., 2012).

Income levels are another important variable. In Brazil, higher income is generally associated with greater concern for animal welfare (Molento, 2005). However, this is not a universal rule. Queiroz (2014) observed that higher-income consumers (class A) are often resistant to paying for welfare-certified products, as they tend to view animal welfare as a governmental responsibility.

The conceptual model presented in this study could also be extended to explore consumer perceptions of animal welfare-certified products in other countries or used for cross-cultural evaluations. Additionally, future research could focus on specific product categories, such as meat (beef, pork, chicken), milk, eggs, and derivatives, to better understand purchase intentions for these items.

However, it is essential to recognize that significant societal-level changes in the purchase and consumption of animal welfare-certified products require more than individual changes in belief, knowledge, and behavior, which were the focus of this study. Achieving such transformations demands a paradigm shift at the macro societal level, involving complex, multifaceted dynamics. This broader challenge underscores the importance of systemic efforts to promote animal welfare through policy, education, and industry practices.

Appendix

Table 3 Collection Instrument

Construct	Code	Item	M	SD
Empathy for animals (EFA)	EFA1	I believe that production animals have feelings	6.178	1.453
	EFA2	I believe that production animals feel negative emotions (fear, frustration, anguish and sadness) during rearing	4.949	2.021
	EFA3	I believe that production animals feel negative emotions (fear, frustration, anguish and sadness) during transportation and slaughtering	5.184	1.941
Production system knowledge (PSK)	EFA4	To see a production animal suffering or being neglected would negatively affect me	6.622	0.984
	PSK1	I have contact with the animal production chain (farms, dairies and meat processors) in the rural environment	3.926	2.441
	PSK2	I know how animals destined for meat production (cattle, hens, pigs and fish) are reared	4.126	2.244
	PSK3	I know how animals destined for meat production in general are transported and slaughtered	3.960	2.218
Belief about animal welfare (BAW)	PSK4	I know how animals destined for the production of milk (cows) and eggs (hens) are reared	5.163	2.050
	BAW1	I am concerned about how animals destined for the production of meat in general are reared	5.007	2.026
	BAW2	I am concerned about how animals destined for the production of meat in general are transported and slaughtered	5.010	2.039
	BAW3	I am concerned about how animals destined for the production of milk (cows) and eggs (hens) are reared	6.064	1.421
	BAW4	I believe that an animal in a good state of well-being is a physically healthy animal	5.492	1.870
	BAW5	I believe that an animal in a good state of well-being is a well-fed animal	5.506	1.856
	BAW6	I believe that an animal in a good state of well-being is an animal reared in environments closest to their natural environment	5.229	1.924
	BAW7	I believe that the responsibility for animal well-being lies with consumers	4.231	2.167
	BAW8	I believe that the responsibility for animal well-being lies with rural producers	5.474	1.941
	BAW9	I believe that the responsibility for animal well-being lies with food-processing industries	5.365	2.022
	BAW10	I believe that the responsibility for animal well-being lies with supermarkets and restaurants	4.559	2.135
Engagement about animal welfare (EAW)	BAW11	I believe that the responsibility for animal well-being lies with governments	5.030	2.133
	EAW1	I believe that animal well-being brings benefits for human beings	6.349	1.181
	EAW2	I would like to know more about animal well-being	6.310	1.214
	EAW 3	I believe that schools should include animal well-being on their curriculums	6.023	1.566

Table 3 (continued)

Construct	Code	Item	M	SD
Belief about certified products with animal welfare (BCP)	BCP1	There are sufficient choice possibilities in supermarkets of foods produced from animals who are reared with welfare in mind	2.402	1.446
	BCP2	I am satisfied with the amount of information about animal well-being on food wrappings	2.682	1.577
	BCP3	I believe that supermarket consumers are able to easily find information about the origin of animals and the type of system under which they were reared	2.106	1.390
Quality attribution to products with animal welfare (PQA)	PQA1	I believe that foods produced from animals that were reared considering welfare are healthier	3.943	1.968
	PQA2	I believe that foods produced from animals that were reared considering welfare are always more expensive	3.580	1.797
	PQA3	I believe that foods produced from animals that were reared considering welfare are always safer	3.694	1.927
	PQA4	I believe that foods produced from animals that were reared considering with welfare are in fashion	3.314	1.976
	PQA5	I believe that foods produced from animals that were reared considering welfare are always tastier	3.515	1.881
	PQA6	I would be willing to change the place where I normally buy food for a place that offers a greater variety of foods produced from animals reared considering well-being	5.300	1.686
Intention to purchase (INP)	INP1	I would certainly buy a food item produced from animals reared considering well-being, if I saw it in the supermarket	6.164	1.378
	INP2	I intentionally look for foods that were produced from animals reared considering welfare when I go to the supermarket	4.256	2.055
	INP3	I would certainly pay more for foods produced from animals reared considering welfare	5.281	1.705
	INP4	I would certainly buy a food item produced from animals reared considering welfare, even if it was much more expensive	4.055	1.988
	INP5	I would pay up to 20% more for foods produced from animals reared considering welfare	5.003	1.849

Notes. M = mean; SD = standard deviation

Table 4 Sample profiles

Profile	<i>n</i> = 707 <i>n</i>	% = 100 %
Age		
Less than 29	300	42.43
30–39	115	16.27
40–49	112	15.84
50–59	123	17.40
Over 60	57	8.06
Gender		
Male	279	39.46
Female	425	60.11
Prefer not to say	3	0.42
Level of schooling		
Elementary school	12	1.70
High school	159	22.49
College (graduation)	338	47.81
Masters	96	13.58
Doctorate	67	9.48
Post-doctorate	35	4.95
Region		
Southeast	447	63.22
South	126	17.82
Other	134	18.95
Income (Minimum Brazilian salaries)		
Up to 1	114	16.12
1 to 2	106	14.99
2 to 3	72	10.18
3 to 4	43	6.08
4 to 5	56	7.92
5 to 6	41	5.80
6 to 7	32	4.53
7 to 8	22	3.11
8 to 9	26	3.68
9 to 10	36	5.09
Over 10	159	22.49

Note: the minimum Brazilian salary in 2020 was R\$ 1,045.00, equivalent to US\$ 198.92 based on the exchange rate of July 23, 2020

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Data Availability The data that support the findings of this study are available from the corresponding author, Sérgio Luís de Castro Júnior, upon reasonable request.

Declarations All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

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