Ciência Animal Brasileira
Brazilian Animal Science

DOI: 10.1590/1809-6891v26e-80449E

e-ISSN 1809-6891
Animal science | Research article

Brazilian consumer perception of beef produced in a feedlot system

Percepção do consumidor brasileiro sobre a carne bovina produzida em sistema de confinamento

Dayana Bernardi Sarzi Sartori[1], Pablo Tavares Costa[2], Ana Carolina Fluck[3], Paola Francine Brizola[1], Greicy Sofia Maysonnave[4], Tanice Andreatta[1], Isadora dos Santos[5], João Restle[6], Viviane Garcia Dias da Conceição[1], Ricardo Zambarda Vaz*[1]

1 Universidade Federal de Santa Maria (UFSM), Palmeira das Missões, Rio Grande do Sul, Brazil
2 Universidade Federal de Pelotas (UFPel), Pelotas, Rio Grande do Sul, Brazil
3 Instituto Federal de Educação, Ciência e Tecnologia do Rio Grande do Sul (IFRS), Vacaria, Rio Grande do Sul, Brazil
4 Universidade Federal Rural do Rio de Janeiro (UFRRJ), Seropédica, Rio de Janeiro, Brazil
5 Universidade federal de São Paulo (USP), Pirassununga, São Paulo, Brazil
6 Universidade Federal de Goiás (UFG), Goiânia, Goiás, Brazil

*corresponding author: rzvaz@terra.com.br

Received: September 10, 2024. Accepted: July 14, 2025. Published: August 12, 2025. Editor: Rondineli P. Barbero

Abstract: The aim of this study was to analyse consumer perception, knowledge and acceptance of beef produced in feedlot. The survey method was used, with data collection carried out through digital platforms, accounting for 496 respondents. The questionnaire was prepared containing two sessions: characterising the respondent profiles and the perception and acceptance of the feedlot system of cattle production. The answers were systematised in electronic spreadsheets, performing descriptive analyses and exploratory techniques of multivariate statistics employing principal component analysis (PCA). 'Quality', 'meat' and 'production' were the principal terms associated with the feedlot production system. The two main axes in the PCA, PC1 (axis x) and PC2 (axis y), explained 75.4% of the variation, representing five groups related to consumer understanding of cattle feedlot. 'Animal welfare', 'sustainability' and 'fat content' are purchasing criteria having little relation to price. 'Flavour' was the main difference cited comparing meat produced in feedlot or on pasture. Consumers with a higher level of education and income have better knowledge and acceptance of feedlot beef. The results associate consumers' search for quality and healthiness in meat products.

Key-words: beef production; consumer behavior; food choice; meat quality; sustainability perceptions.

Resumo: O objetivo deste estudo foi analisar a percepção, o conhecimento e a aceitabilidade do consumidor em relação à carne bovina produzida em confinamento. Foi utilizado o método Survey, sendo a coleta de dados realizada através de plataformas digitais, contabilizando 496 respondentes. O questionário foi elaborado contendo duas sessões: caraterização do perfil dos entrevistados e percepção e aceitabilidade do sistema de produção de confinamento de bovinos. As respostas foram sistematizadas em planilhas eletrônicas realizando análises descritivas e técnicas exploratórias de estatística multivariada empregando a análise de componentes principais (ACP). Qualidade, carne e produção foram os principais termos associados ao sistema de produção confinamento. Os dois eixos principais da ACP, PC1 (eixo x) e PC2 (eixo y), explicam 75,4% da variação, representando cinco grupos relacionados ao entendimento do consumidor sobre o sistema de produção de confinamento de bovinos. O bem-estar, a sustentabilidade e o

teor de gordura são critérios de compra com pouca relação com o preço. O sabor foi a principal diferença em relação à comparação entre carne produzida em confinamento e em pasto. Consumidores com maior grau de escolaridade e renda apresentam melhor conhecimento e aceitabilidade para carne bovina confinada. Os resultados associam a busca pelos consumidores por qualidade e saudabilidade no produto carne.

Palavras-chave: comportamento de consumidor; escolha alimentar; qualidade da carne; percepção de sustentabilidade; produção de carne bovina.

1. Introduction

The pandemic caused by COVID-19 increased the time spent using the internet, whether for entertainment, education, and/or professional activities, bringing significant changes in the eating habits of consumers, who seek out healthier foods with guaranteed origin [(1)]. As such, based on market analysis worldwide, trends in consumption and in action taken by the food sector are aimed at increasing the nutritional value of products, to ensure sustainable production, and to maintain the transparency and social responsibility of the information [(2)].

Consumer demand for food has changed in recent years, with an ever-increasing search for safe, nutritious and good quality products [(3)]. This search for quality products has driven the beef production chain for many years, with an improvement in meat quality being one of the alternatives for adapting to new market segments and adding value to the product. Research that includes chemical, physical and sensory analysis has contributed to significant improvements throughout the production process [(4)]. Animal feeding systems, whether on pasture or in feedlot, affect the quality of the meat by changing its organoleptic characteristics [(5)], fatty acid profile [(6)] and extrinsic characteristics related to consumer opinion and acceptance of production systems [(7)].

The food industry, responding to market stimuli, together with the demand for standardised beef to meet more-demanding markets, has contributed to a growth in cattle feedlot in Brazil over the last decade [(8)]. The feedlot system allows for greater production, the slaughter of younger animals with a greater deposition of subcutaneous fat, factors that have a positive effect on the tenderness, juiciness and flavour of the meat [(9)].

Brazil is the second largest producer of beef in the world. Therefore, research related to consumer acceptance and perception of production systems is important in guiding the production chain [(10,11)]. Hypothesizing a favourable scenario of a greater demand for beef and the potential for increased production with the use of feedlot, meat from this type of production system would be well accepted by the consumer. The aim of this study is to analyse consumer perception, knowledge and acceptance of beef produced in a feedlot system.

2. Material and methods

The study deals with the knowledge, perception and acceptance of beef coming from a feedlot system. The survey was conducted with Brazilian consumers covering the five demographic regions (North, Northeast, Southeast, South and Midwest). Data was collected using digital platforms, and was based on available contact networks, in an attempt to cover the diversity of the consumer population. The form remained available for 87 days (July 1st to August 26th, 2021) and resulted in a total of 496 respondents.

The design, construction and application of the questionnaire, including data collection, were carried out using the Google Forms software, and characterised as qualitative and quantitative research employing the survey method [12]. The questionnaire consisted of open and closed questions, the latter being multiple choice with only one of the available options possible. The questionnaire was divided into two sections: a characterization of the profile of the respondent (section 1) and an analysis of the knowledge, perception and acceptance of the feedlot system of cattle production (section 2). The profile of each respondent was characterised in terms of sex, age group, average family income, region of Brazil in which they lived, and level of education.

Feedlot systems are characterized by removing animals from pasture, concentrating on them in smaller areas and providing all the food (bulky and concentrate) necessary for their performance. These production systems are important in Brazil for the intensification of the beef production chain. Knowledge, perception and acceptance of the feedlot system of cattle production was then analysed using questions concerning their decision to purchase the meat, preference and frequency of consumption, and choice of where to purchase, taking into account their preference regarding the origin of the production system. Based on the five-point Likert scale, there were questions concerning the relevance of intrinsic (appearance, softness, juiciness) and extrinsic attributes (price, appearance, origin, animal welfare, sustainability, fat colour) when purchasing meat off the shelf at the supermarket. Using the Likert scale, the following values were assigned: 1 (no relevance), 2 (little relevance), 3 (partial relevance), 4 (great relevance), and 5 (total relevance). A further question related to the ability of the consumer to identify the difference between meat produced in the various systems (pasture vs. feedlot). Respondents who recognise the meat from different production systems were asked what the main difference might be.

Initially, the respondents then highlighted the first four words or terms relating to a set of images representing the production of feedlot beef in Brazil, from the production system to the meat produced by the system, after observing Figure 1.

Figure 1. Representative image of the feedlot system of cattle production in Brazil. Source: Collection of the authors (2021).

The opinion of each respondent was evaluated based on various statements taken from scientific articles, using the following Likert scale: 1 (Completely agree), 2 (Partially agree), 3 (Don't know), 4 (Partially disagree), and 5 (Strongly disagree). The data were systematized on electronic spreadsheets using the Microsoft Office Excel® 2016 software to carry out a descriptive analysis, focusing on relative-frequency distribution. Exploratory factor analysis was applied to check the latent and underlying variables verified in the data using the proc factor procedure. Decomposition of the factorial correlation matrix was applied using the Iterated Principal Factor method. The commonality and loading of each variable were estimated in the composition of the latent variables (factors) using the varimax rotation method.

To analyse the association of words and terms relating to the principal difference between the beef produced under different systems (pasture vs. feedlot), word clouds were prepared using the developer extension of the Microsoft Word® 2016 software. Once ordered by principal component analysis (PCA), where the words were grouped into dimensions using inductive coding by triangulation and then tabulated, the relative frequencies were generated [13]. Ten dimensions, called variables in the present study, were developed and, together with age and level of education, were generated based on the correlation matrix, to obtain a sensory map of respondent perception when viewing the images relating to beef production in feedlot. The dimensions were chosen by three researchers with experience in word association and synonymy. The principal components were extracted in descending order of importance based on their contribution to the total variation of the data, following a representativeness criterion of 70% or more of the total variation [14], using the analysis was carried out Past 3 software.

3. Results and discussion

3.1. Characterisation of the respondent profiles

The largest share of respondents was male (55.3%), aged between 25 and 39 (36.6%), with an average family income of up to three minimum salaries (27.7%), most live in urban areas (78.9%) in the south of Brazil (68.8%) and have a higher level of education (92.9%) (Tab. 1).

Table 1. Socio-demographic characterisation of the respondents.

Question	Choices	Relative Frequency (%)
Sex	Female	44.7
	Male	55.3
Age	18 - 24 years	26.6
	25 - 39 years	36.6
	40 - 59 years	29.0
	60 years or more	7.8
Average Family income*	Up to 3 minimun salaries	27.7
	From 3 to 5 minimum salaries	20.5
	From 5 to 7 minimum salaries	11.5
	From 8 to 10 minimum salaries	12.9
	More than 10 minimum salaries	27.4
Region of Brazil Where You reside	North	5.6
	Northeast	3.4
	Southeast	10.1
	South	68.8
	Midwest	12.1
Environment in which you reside	Rural	21.1
	Urban	78.9
Level of education	No schooling	0.4
	Basic education or equivalent	1.4
	Secondary education or equivalent	5.3
	Higher education or equivalent	46.7
	Post-graduation or equivalent	46.2

*Minimum salary BRL 1,100.00, in effect during 2021.

Meat consumption is directly related to socioeconomic factors, such as the level of education and pricing [16]. Beef is considered a primary product [17], i.e. the increase in the purchasing power of the population is decisive in increasing consumption of the product.

Brazilian Association of Animal Protein [18] reports that increases in production costs in recent years have been passed on to the end consumer, resulting in a fall in the per capita consumption of beef (37.2 kg), and an increase in the consumption of substitute protein such as pork (19.52 kg) and poultry (44.9 kg), and especially the consumption of eggs (266.5 eggs). However, in the south of the country, where most respondents are from, there is a tradition of high meat consumption, with demographic and cultural variables having a direct impact on consumer perception and purchase [19].

3.2 Analysis of the knowledge, perception and acceptance of the feedlot system of cattle production

Almost all respondents (83%) claimed to have some knowledge of purchasing meat when the classifications "expert", "connoisseur" and "some knowledge" were totalled. Beef is the most preferred type of meat among respondents compared to other proteins of animal origin, with a high frequency of consumption of three to five times a week (Tab. 2).

Table 2. Characterisation of the beef-purchasing process.

Question	Choices	Relative Frequency (%)
Knowledge when purchasing meat	Expert	5.4
	Connoisseur	34.4
	Some knowledge	48.5
	Little knowledge	2.4
	No knowledge	9.3
Preference when consuming meat	Beef	72.6
	Chicken	7.6
	Pork	6.8
	Sheep	5.3
	Meat alternatives*	4.2
	Fish	3.0
	I do not consume meat	0.5
Frequency of consuming beef	Daily	30.4
	3 to 5 times a week	52.1
	Weekly#	14.5
	Monthly#	3.0
When purchasing meat, which type of production system do you prefer	Pasture	69.4
	Feedlot	30.6
As a consumer, it important to show the origin of the feeding system on the meat packaging	Yes	94.0
	No	6.0
How much more would you be willing to pay for beef with verified feedlot origin certification	I would not pay more	50.7
	Up to 3%	21.3
	From 3% to 6%	15.3
	From 6% to 10%	8.5
	More than 10%	4.2

*Meat alternatives = Plant-based protein. # Weekly and monthly refer to consumption just once per week or once per month.

The large number of connoisseurs is related to the high level of education and income of the respondents, who have greater access to information (92.9%). As for the production system, most consumers prefer meat from a pasture system (69.4%) and consider it important that this information be included on the packaging (Tab. 2). Therefore, the results show that the majority of consumers still choose grass-fed beef, but accept beef finished in feedlot. At the time of purchase, the production system is important in choosing the meat, with preference given to the pasture system due its association with greater healthiness [7, 11] and the flavour characteristic a polyunsaturated lipid profile [20]. Much of the meat available on the shelves of Brazilian supermarkets comes from animals raised on pasture [8], but consumers often are not given this information. Freitas *et al.* [21] emphasize that, due to the shorter period of confinement than the North American ones, Brazilian feedlot produces meat with a lipid profile that is not harmful to human health, provided that consumption follows the recommended amount.

When questioned about the added value of certified meat from a feedlot system, 49.3% of the respondents would be willing to pay extra for such certification, probably consumers looking for a specific level of quality that can be provided by meat from feedlot. When a product is accepted and consumers are willing to pay more it shows the market segment to be promising [22]. There is also a group of consumers who prefer to consume meat with a greater level of marbling and its characteristic sensory aspects [23], with this market niche having increased considerably in recent years. Almost all of the participants in the present study considered it important that the feeding system be identified, showing that the origin of consumed products is important when evaluating the purchase [24]; however, a large part of Brazilian beef on the market still does not have a certificate of origin [25]. Bruhn *et al.* [26] found similar results to those of the present study, where the greater degree of knowledge together with the higher income of the consumers means they want more information about the product they are purchasing, and are willing to pay for a certificate of origin. Thinking from an economic perspective, it can be deduced that price elasticity is inelastic for beef because the price increase does not reduce the intention to consume.

The respondents look for cuts with a higher fat content and color, which is related to a high and/or low number of carotenoids (Fig. 2). Animal welfare and sustainability were reported as purchase criteria, albeit showing little relation to the price of the product. Daley *et al.* [6] point out that the yellowish colour of the fat of animals raised on pasture is associated with the high level of carotenoids in the forage, which are the precursors of vitamin A. The yellow colour of bovine fat may also be associated with the advanced age of the animals [27]. On the other hand, fat of a lighter colour may occur due to the greater amount of grain in the diet, particularly in young animals [28].

An evaluation of the path diagram shows the factors organised (Fig. 2) into characteristics related to the breeding system (Factor 2) and characteristics related to meat quality (Factor 1). Price plays no part in the composition of the paths, as it contributes little to the factors. Consumers with greater purchasing power and a higher level of education tend not to consider the monetary value of the product as their first concern, but the intrinsic and extrinsic characteristics of the food. An increase in purchasing power is linked to the visibility of sanitary and ethical requirements demanded not only by the domestic Brazilian market, but also by foreign markets [29]. In recent years, beef production in Brazil has adopted more sustainable practices [10, 11]: recovering and fertilising pastures, intensifying finishing on pasture or in feedlot, the early production of calves, as well as integrated systems, among others [30]. However, final fattening under feedlot other major negative environmental impacts such as pollution of local water sources and foul odor derived from disposal of concentrated animal wastes [31].

Animal welfare is an emerging issue worldwide, and is a demand of many beef consumers. Although much sought after and often required, the regulation and a knowledge of animal welfare during production is greater among consumers who are producers and live in rural areas than among urban consumers. Knowledge about production systems increases sensitivity to animal welfare issues [32]. A lack of knowledge is seen as a barrier to putting value on a product [33], and for beef, producers see little or no marketing initiative by the industry [34]. Less marketing by the industry makes it possible to develop actions that not only promote, but also improve the information that reaches consumers about a particular product or production system and its benefits [33].

Most respondents can sensorially differentiate meat from different production systems, reporting flavour as the main difference, followed by meat, fat (Fig. 3). Recent research shows greater relevance by consumers to the flavour of the meat [35, 36, 5] which is influenced mainly by the feeding system [5]. Furthermore, such characteristics as the breed of the animal [4], production system [9], age at slaughter, sex [35], finishing and marbling [5] influence the flavour, fat content, fatty acid profile, tenderness, colour, juiciness and taste of the meat.

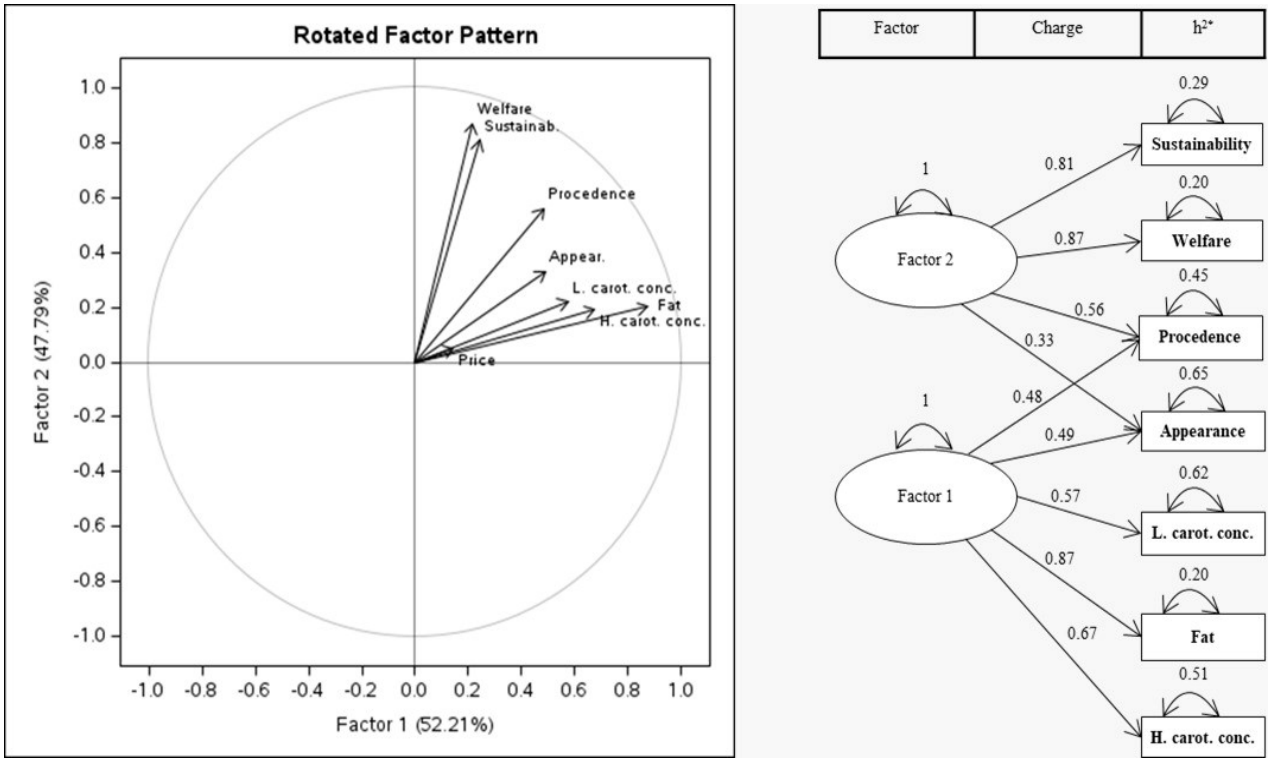

Figure 2. Graph and path diagram: factor loadings and similarities in knowledge and purchase preference concerning feedlot beef. *Communalities (h2) of questionnaire items following the Varimax rotation; *Factor 1 - Characteristics related to meat quality; *Factor 2 - Characteristics related to the breeding system.

Figure 3. Tag Cloud of words related to the main differences found by consumers able to differentiate meat produced on pasture or in feedlot.

A total of 3,049 terms/words were obtained by associating the ideas of consumers viewing images of a feedlot system and the meat it produces (Fig. 1). 'Quality' was the word most highlighted by the respondents, together with the terms 'meat' and 'production' as the principal words/terms relating to the feedlot system (Fig. 4). Gómez *et al.* [9], evaluating meat quality as a function of the feeding system at different growth rates (high or low) in finishing cattle, concluded that the high growth rate afforded by feedlot diets with more added grain (80%) improved the sensory attributes of the meat. Greater fat deposition, both subcutaneous and marbling, together with a lower age at slaughter, optimises the systems and improves the quality of the meat, which depends on grain being added to the diets [9, 37]. The addition of grain has a favourable effect, since, during the finishing phase, animals have greater energy requirements for maintenance, weight gain and adipose tissue deposition [38].

Figure 4. Terms/words used by respondents for images relating to a feedlot production system.

Table 3. Frequência das dimensões, categorias e exemplos de associações individuais relativas a um sistema de confinamento para produção de carne bovina.

Dimension	Category	Relative Frequency (%)
Characteristics of the production system		71.51
	Precocity	6.04
	Efficiency	9.68
	Uniformity	5.63
	Planning	2.42
	Technical assistance	1.21
	Productivity	24.19
	Intensive	14.08
	Organisation	3.83
	Safety	4.23
	Alternative	0.20
Hedonic attitudes and feelings*		60.8
	Positive feelings	17.9
	Negative feelings	42.9
End product		38.7
	Meat	11.3
	Quality	27.4
Feeding system		35.63
	Feeding	13.88
	Feedlot	0.20
	Grain	3.22
	Feed	7.66
	Nutrition	9.26
	Pasture	1.41
Attributes of the end product		32.44
	Finishing	14.3
	Marbling	5.85
	Flavour	3.62
	Softness	8.67
Economical characteristics		25.98
	Profitability	4.23
	Profit	3.02
	Slaughter/industry/ market	3.82
	Economy	8.87
	High cost	6.04
Attributes of animal performance		24.79
	Weight gain	4.44
	Termination	7.65
	Genetics	5.04
	Technology	2.62
	Performance	3.83
	Feed conversion	1.21

Production system/Animal association		15.1
	Feedlot	7.24
	Cattle	4.64
	Angus/Nelore	3.22
Management		13.48
	Handling	2.82
	Animal welfare	9.05
	Stress	1.61
Consumption and form of consumption		6.2
	Consumption	1.4
	Barbecue	4.8

*Hedonic attitudes and feelings - All positive or negative manifestations regarding the beef cattle confinement system.

The interrelationships between many variables were analysed by PCA in an attempt to explain their behaviour. Using PCA, it was possible to condense the information contained in the original variables into a smaller set of statistical variables represented by the principal components (PC) with a minimal loss of information [39]. The two principal axes, PC1 (axis x) and PC2 (axis y), explained 75.4% of the variations in ordination relating to consumer perception of feedlot beef, with PC1 responsible for 60.9% and PC2 for 14.5% of the variability in the correlations between terms (Fig. 5). As such, dispersion was characterised into five groups based on the type of understanding of the consumers. The groups are represented by the distance between the dimensions of the first and second quadrants, i.e. positive and negative correlations, showing that they do not differ in relation to the terms used by the interviewees within the groups.

In the first group, the variables 'feeding system' and 'economic characteristics' showed a positive correlation (Fig. 5). Kallas *et al.* [40] found that Spanish consumers who are better informed are willing to accept meat with a higher amount of visible fat if it is enriched with beneficial fatty acids. Furthermore, the way the consumer searches for a particular meat affords it value: when out of necessity it has a certain value, but when the search is based on acceptance or knowledge of the quality that can be found, this value takes on a greater dimension. Hammer *et al.* [14] report that consumers could find no difference between meat from different feeding systems. Very early calves finished in feedlot produce meat of better quality, tenderness and colour, this meat being preferred by consumers.

Similarly, the second group was formed from the dimensions 'attitudes' and 'hedonic feelings and attributes' of animal performance, in which negative associations (42.9%) stood out in relation to the feedlot production system (Fig. 5). Many people associate the intensive production and rapid termination of animals with the use of hormones [41, 42], however this practice is prohibited in Brazil, and the high growth rate of the animals is due to genetic improvement and nutrition. Another negative point is the association with the "taste of pork", which is due to the change in the fatty acid profile that occurs when animals are fed larger amounts of grain [23]. Furthermore, meat from feedlot animals is associated with higher cholesterol levels compared to meat produced on pasture [20].

The third group is formed by dimensions that include characteristics of the production system and attributes of the and product, which have negative correlations in PC2 (Fig. 5). Flavour can be affected by consumer methods of preparation, and familiarity with the different flavours and animal production systems [37]. Miller [5] reports that taste preferences also vary between countries, and that together with tenderness, they are influenced by production systems of each region, resulting in specific flavours. For example, Hunt *et al.* [43] report that some American consumers rate better flavour and taste in meat with a higher degree of fat, especially marbling, but prefer leaner meats.

Maughan *et al.* [44], carrying out PCA to correlate consumer acceptance with the flavour profile of meat from animals fed on either forage or grain, found that meat from grain showed a strong correlation with positive attributes. On the other hand, meat from animals fed on forage correlated strongly with negative attributes, showing that meat produced on pasture has a lower acceptance than meat produced in a feedlot system. Results generally show a preference for meat from a pasture system, clearly showing market segmentation based on the change in consumer perception of feedlot meat, with the potential to be exploited by the meat production chain.

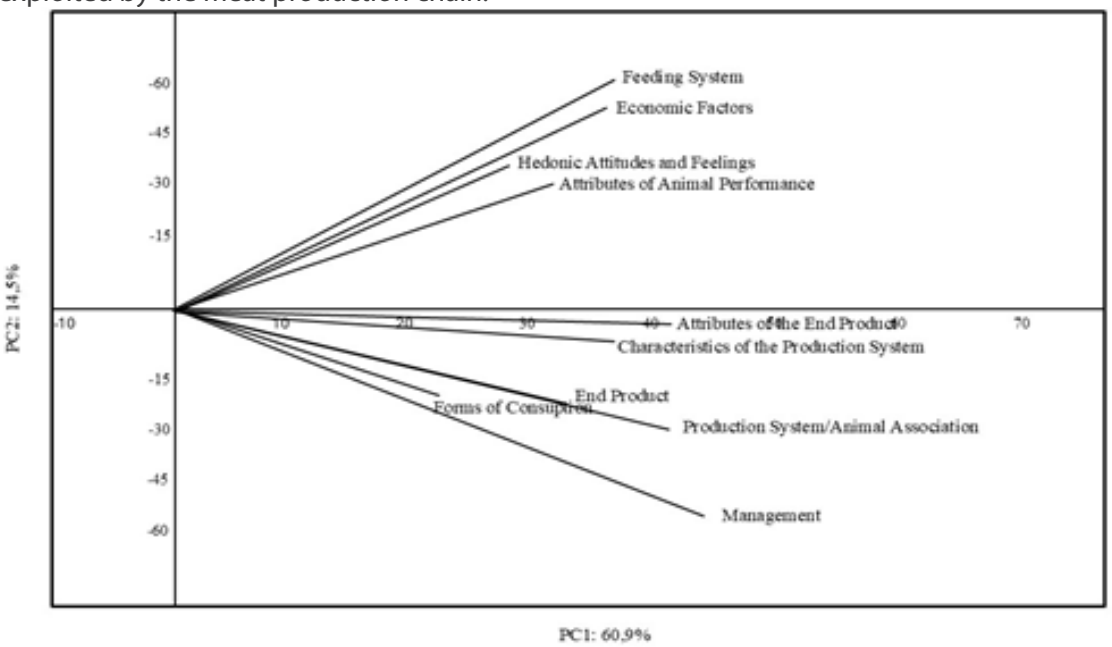

Figure 5. Principal component analysis from the variance-covariance matrix of the scores of dimensions relating to a feedlot system of beef production. *PC1 Principal component 1 (x axis), PC2 Principal component 2 (y axis).

The meat industry has divided its production between a public that craves products with a lower fat content and those willing to pay more for better quality meat from young animals and marbling [2]. Hwang *et al.* [45] state that, in many countries, the value of beef carcasses is determined by the degree of marbling and that increasing this type of fat improves product quality. Barragán-Hernández *et al.* [46] demonstrated that visible fat and overall appearance are decisive when purchasing beef.

The variables "production system/animal association", "consumption/ form of consumption" and "end product" make up a group with negative correlations in PC2 (Fig. 5). Most respondents live in the south of the country, where the barbecue is a part of the culture [47], which would explain its being associated with "form of consumption".

The fifth group, consisting of the variable "management" with a negative correlation (Fig. 5), shows that a smaller number of participants highlight associations with positive or negative management only, such as animal welfare (9.05%) and stress (1.61%). Yunes *et al.* [48], in research with consumers on feedlot production systems, show that the population believes that the animals are not well-treated, as there are, there exist behavioural restrictions. However, a less significant number prefer more-intensive systems, as these are associated with food security, increased productivity and hygiene [49].

Statements based on research and legislation were presented to the respondents to assess their degree of knowledge of the subject. The female public, aged between 40 and 59, were more in agreement with the statements, together with the male sample, aged between 18 and 24. Respondents aged

between 25 and 39, regardless of gender, showed a similar lack of knowledge about the statements (Fig. 6). The quantity and quality of information is closely related to consumer perception, as shown in the present research [48]. According to Sanchez-Sabate *et al.* [50], women are more concerned with ecologically correct eating habits.

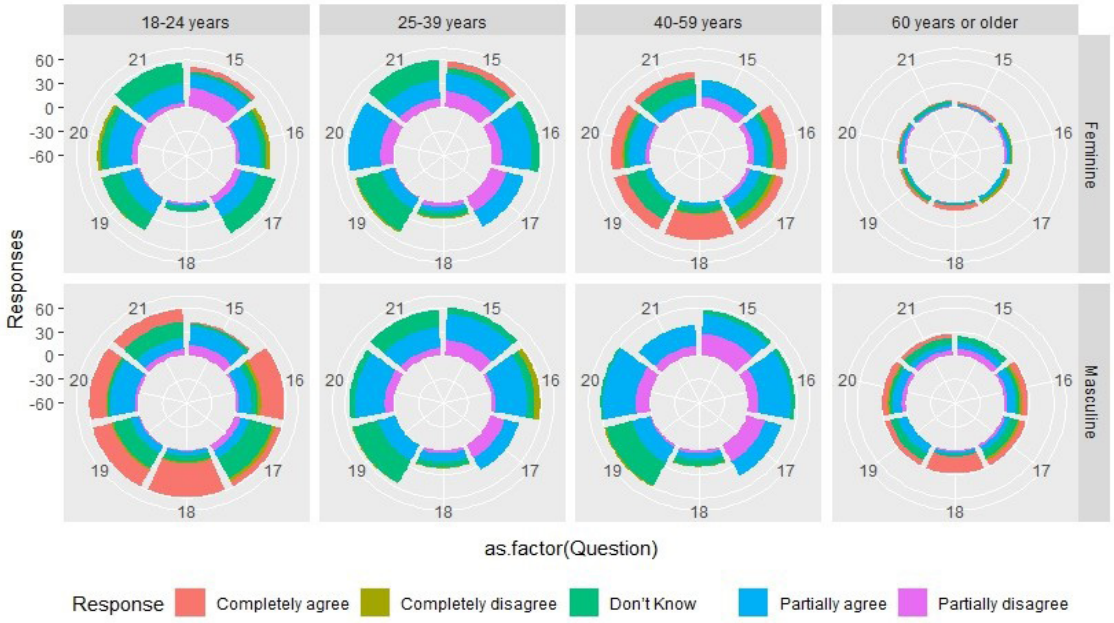

Figure 6. Consumer perception of information inherent to the qualitative aspects of meat from animals in feedlot. *Analysis of the statements relating to scientific research and Brazilian legislation. *15 "The daily consumption of red meat increases the risk of developing heart disease, which may affect heart function, increase cholesterol, atherosclerosis and high blood pressure." *16 " Feedlot meat has a higher concentration of intramuscular fat (marbling) affording greater tenderness, flavour and juiciness to the end product." *17 "Animals finished in feedlot for a short period on a diet containing more added grain, have little effect on the lipid profile of the meat (alterations in fat) when compared to animals fed exclusively on pasture. This means that there is no risk to human health from the consumption of meat from a feedlot production system." *18 "The Ministry of Agriculture, Livestock and Supply (MAPA) prohibits the use of any anabolic hormones in animals for slaughter or even in those dedicated to the production of by-products, such as eggs and milk." *19 "It is possible to manipulate the diet of feedlot cattle so that they deposit a greater amount of omega-3 fatty acids, in order to improve the n-6/n-3 ratio." *20 "The beef of cattle finished in feedlot is more tender with more-attractive colouring." *21 "Feedlot, when analysed in absolute terms, increases Greenhouse Gas (GHG) emissions, as the change in the pattern of rumen fermentation generates a greater volume of methane. However, the shorter production cycle and the consequent increase in meat production generate fewer gas emissions per kilogram of meat produced. Considering the higher productivity, a fall of approximately 17% in GHG emissions per kilogram of meat produced has already been seen."

The pandemic caused by COVID-19 accelerated the process in the digital sphere, making it easier for consumers to access information via technology and the internet, changing the perception of products from specific production systems, with the internet today being one of the principal channels of communication [49]. Individuals begin to consume more content disseminated by the media when they spend more time connected to the internet. There are many myths and prejudices spread by institutions, professionals and influencers with ideologies contrary to those of the food sector and production systems; these use tactics with no basis in fact or scientific principle, harming the sector [1,2].

Research carried out in Brazil showed that half the people are confused in the face of so many conflicting messages concerning what they should or should not eat. There is, therefore, a need for communication aimed at dismantling the myths, a complex task that requires effort from all agents involved in the production chain. Furthermore, companies in the food sector have made public commitments aimed at more transparency in communicating with society in order to minimise the impact of non-scientific information that leads to distorted perceptions [2].

Based on our results, it is worth noting that, although there is a good distribution between age groups, the study is based on a convenience sample via online platforms, which may have excluded non-digital populations and represented a population with technological knowledge. In addition to this fact, the responses were mostly from the South region, which may not be consistent with the characteristics of other regions, and care should be taken when generalizing the results.

4. Conclusion

Consumers with a higher level of education and income have greater knowledge and a greater acceptance of beef from feedlot systems, however, they prefer meat produced on pasture, due to their level of education and marketing strategies. When buying beef, animal welfare and sustainability are purchasing desirable criteria. Also, some consumers look for cuts with a higher fat content, associating this with carotenoids. The main perception of consumers is that the feedlot system is related to quality and production, differentiating the meat by its flavour. The female audience, aged from 40 to 59, together with a male sample aged from 18 to 24, are more knowledgeable about beef research and the legislation pertaining to its production. With this results, industry professionals and policy makers can outline their strategies for better product marketing and acceptance.

Conflict of interest statement

All authors declared that there was no potential conflict of interest regarding this article.

Data availability statement

The data will be provided upon request.

Author contributions

Conceptualization: D.B.S. Sartori, R.Z. Vaz, V.G.D. Conceição and G.S. Maysonnave. Data curation: D.B.S. Sartori, R.Z. Vaz, T. Andreatta and I. Santos. Formal analysis: D.B.S. Sartori, P.T. Costa and V.G.D. Conceição Funding acquisition: R.Z. Vaz, and J. Restle. Project administration: D.B.S. Sartori and R.Z. Vaz. Methodology: D.B.S. Sartori, V.G.D. Conceição and G.S. Maysonnave. Supervision: R.Z. Vaz, and J. Restle. Investigation: D.B.S. Sartori, G.S. Maysonnave, A.C. Fluck and P.F. Brizola. Writing (original draft): D.B.S. Sartori, R.Z. Vaz, T. Andreatta, A.C. Fluck, P.T. Costa and G.S. Maysonnave. Writing (review and editing): D.B.S. Sartori, R.Z. Vaz, A.C. Fluck.

References

1. Pereira DO, Pereira RO. Mudanças nos hábitos alimentares durante a pandemia de covid-19 e sua relação com o uso de meios digitais de comunicação e distribuição de produtos alimentícios. Revista Científica UMC. 2022; 7(3):1-13. Available from: https://revista.umc.br/index.php/revistaumc/article/view/1716

2. Madi L, Rego RA. Publications of ITAL Series Trends 2020: encouraging innovation and entrepreneurship in the food sector. Brazilian Journal Food Technology. 2015; 18(3):258-261. Available from: http://dx.doi.org/10.1590/1981-6723.9115

3. Kantono K, Hamid NMAQ, Chadha D, Oey I. Consumers' perception and purchase behaviour of meat in China. Meat Science. 2021; 1(79):108548. Available from: https://doi.org/10.1016/j.meatsci.2021.108548

4. Bonny FPS, O'reilly RA, Pethick DW, Gardner GE, Hocquette JF, Pannier L. Update of Meat Standards Australia and the cuts-based grading scheme for beef and sheep meat. Journal of Integrative Agriculture. 2018; 17(7):1641-1654. Available from: https://doi.org/10.1016/S2095-3119(18)61924-0

5. Miller R. Drivers of consumer liking for beef, pork, and lamb: A review. Foods. 2020; 9(4):428. Available from: https://doi.org/10.3390/foods9040428

6. Daley CA, Abbott A, Doyle PS, Nader GA, Larson S. A review of fatty acid profiles and antioxidant content in grass-fed and grain-fed beef. Nutrition Journal.2010; 9(1):1-12. Available from: https://doi.org/10.1186/1475-2891-9-10

7. Dehghan M, Mente A, Zhang X, Swaminathan S, Li W, Mohan V, Iqbal R, Kumar R, Wentzel-Viljoen E, Rosengren A. Associations of fats and carbohydrate intake with cardiovascular disease and mortality in 18 countries from five continents (PURE): a prospective cohort study. Lancet. 2017; 390(10107):2050-2062. Available from: https://doi.org/10.1016/S0140-6736(17)32252-3

8. Brazilian Association of Meat Export Industries. ABIEC [Internet]. Brasília: ABIEC 2023 [citado 2025 julho 13]. Available from: http://abiec.com.br/publicacoes/beef-report-2023

9. Gómez JFM, Antonelo DS, Beline M, Pavan B, Bambil DB, Fantinato Neto P, Saran Netto A, Leme PR, Goulart RS, Gerrard DE, Silva SL. Feeding strategies impact animal growth and beef color and tenderness. Meat Science. 2022; 183(1):108599. Available from: https://doi.org/10.1016/j.meatsci.2021.108599

10. Costa PT, Vaz RZ, Mendonça G, Restle J, Kroning AB, Ferreira OGL, Farias PP. Consumer perception of products from the production chain of natural coloured sheep. Small Ruminat Research. 2020; 192(1):106223. Available from: https://doi.org/10.1016/j.smallrumres.2020.106223

11. Farias PP, Ferreira OGL, Kröning, AB, De Azevedo GM, Costa, PT, Fluck, AC, Vaz RZ, Restle, J. Consumers' perception of beef from cattle raised in native grasslands in the Pampa Biome. Observatorio De La Economía Latinoamericana. 2023; 21(1):1848-1867. Available from : https://doi.org/10.55905/oelv21n4-007

12. GERHARDT, T.E.; SILVEIRA, D.T. Métodos de pesquisa. 1. ed. Porto Alegre. 2009. 92 p. https://www.ufrgs.br/cursopgdr/downloadsSerie/derad005.pdf

13. Guerrero L, Claret A, Verbeke W, Enderli G, Zakowska-Biemans S, Vanhonacker F, Issanchou S, Sajdakowska M, Granli BS, Scalvedi L, Contel M, Hersleth M. Perception of traditional food products in six European regions using free word association. Food Quality and Preference. 2010; 21(2):225–233. Available from : https://doi.org/10.1016/j.foodqual.2009.06.003

14. Silva AS, Lima JSS, Xavier AC, Teixeira MM. Variabilidade espacial de atributos químicos de um Latossolo Vermelho-Amarelo húmico cultivado com café. Revista Brasileira de Ciências do Solo. 2010; 34(1):15-22. Available from : https://doi.org/10.1590/S0100-06832010000100002

15. Hammer O, Harper DAT, Ryan PD. Past: palaentological statistics software package for education and data analysis. Palaentologia Electronica. 2001; 4(1):1-9. Available from : https://palaeo-electronica.org/2001_1/past/issue1_01.htm

16. Da Costa Leite BF, Ouriveis NF, Gimenes NK, Gomes MDNB, Faria FJC, De Souza AS, Brumatti RC. Beef consumers: behavior and preferences. Brazilian Journal of Development. 2020; 6(1):1927-1937. Available from : https://doi.org/10.34117/bjdv6n1-136

17. Pascoal LL, Lobato JFP, Restle J, Vaz RZ, Vaz FN. Meat yield of culled cow and steer carcasses. Revista Brasileira de Zootecnia. 2009; 38(11):2230-2237. Disponível em : https://doi.org/10.1590/S1516-35982009001100024

18. Brazilian Association of Animal Protein. ABPA. [Internet]. São Paulo: ABPA 2022. Annual report, Brazilian per capita consumption of different animal proteins. Disponível em :https://abpa-br.org/relatorios/

19. Girardi, MW, Fabri RK, Bianchini VU, Martinelli SS, Cavalli SB. Oferta de preparações culinárias e alimentos regionais e da sociobiodiversidade na alimentação escolar: um estudo na Região Sul do Brasil. Segurança Alimentar e Nutricional. 2018; 25(3):29-44. Disponível em : Available from : https://doi.org/10.20396/san.v25i3.8652261

20. Lobato JFP, Freitas A, Devincenzi T, Cardoso LL, Tarouco JU, Vieira RM, Dillenburg DR, Castro, I. Brazilian beef produced on pastures: Sustainable and healthy. Meat Science. 2014; 98(3):336-345. Available from: https://doi.org/10.1016/j.meatsci.2014.06.022

21. Freitas AK, Lobato JFP, Cardoso LL, Tarouco JU, Vieira RM, Dillenburg DR, Castro I. Nutritional composition of the meat of Hereford and Braford steers finished on pastures or in a feedlot in southern Brazil. Meat Science. 2014; 96(1):353-360. Available from: https://doi.org/10.1016/j.meatsci.2013.07.021

22. Vale P, Gibbs H, Vale R, Christie M, Florence E, Munger J, Sabaini D. The expansion of intensive beef farming to the Brazilian Amazon. Global Environmental Change. 2019; 57(1):101922. Available from: https://doi.org/10.1016/j.gloenvcha.2019.05.006

23. Burnett DD, Legako JF, Phelps KJ, Gonzalez JM. Biology, strategies, and fresh meat consequences of manipulating the fatty acid composition of meat. Journal of Animal Science. 2020; 98(2):skaa033. Disponível em : https://doi.org/10.1093/jas/skaa033

24. Villalobos P, Padilla C, Ponce C, Rojas A. Beef consumer preferences in chile: Importance of quality attribute differentiators on the purchase decision. Chilean Journal of Agricultural Research. 2010; 70(1):85-94. Available from: http://dx.doi.org/10.4067/S0718-58392010000100009

25. Batistelli JCDOR, Batistelli IJC, De Menezes FL, De Araújo CV. Estimates of traceability and certification of beef in Brazil. Research, Society and Development. 2022; 11(4):e4111427079. Available from: https://doi.org/10.33448/rsd-v11i4.27079

26. Bruhn FRP, Lopes MA, Faria PB, Junqueira LV, Da Rocha CMBM. Factors associated with the perception and attitude of beef consumers with certification of origin. Brazilian Journal of Veterinary Medicine. 2015; 37(4):371-378. Available from: https://bjvm.org.br/BJVM/article/view/424

27. Philippe MG, Clementino FMM, Gadotti GA, Puel AC, Martins CEN, Moreira F, Peripolli V. Características da carcaça e da carne de bovinos de corte certificados. Brazilian Journal Development. 2020; 6(7):52942-52951. Available from: https://doi.org/10.34117/bjdv6n7-805

28. Fernandes ARM, Sampaio AAM, Henrique W, Oliveira EA, Tullio RR, Perecin D. Características da carcaça e da carne de bovinos sob diferentes dietas, em confinamento. Arquivos Brasileiro de Medicina Veterinária e Zootecnia. 2008; 60(1):139-147. Available from: https://doi.org/10.1590/S0102-09352008000100020

29. Moreira SM, Mendonça FS, Costa PT, De Conto L, Corrêa GF, Schwengber EB, Vaz RZ Silveira IDB. Carne bovina: Percepções do consumidor frente ao bem-estar animal–Revisão de literatura. Revista Electronica de Veterinária. 2017; 18(5):1-17. Available from: https://wp.ufpel.edu.br/gecapec/files/2017/12/Redvet-Carne-bovina-percepções-do-consumidor.pdf

30. Telhado S, Capdeville G. Earth-saving technologies. Brasilia: Embrapa. 2021. Available from: https://www.infoteca.cnptia.embrapa.br/infoteca/handle/doc/1131517

31. Cardoso AS, Berndt A, Leytem A, Alves BJR, Carvalho INO, Soares LHB, Urquiaga S, Boddey RM, Impact of the intensification of beef production in Brazil on greenhouse gas emissions and land use. Agricultural Systems. 2016; 143(1):86-96. Available from: https://doi.org/10.1016/j.agsy.2015.12.007

32. Raineri C, Morales AMT, Barros CS, Gameiro AH. Contribution to economic evaluation of systems that value animal welfare at farm. Revista Colombiana de Ciências Pecuárias. 2012; 2(1):123-134. Available from: https://doi.org/10.17533/udea.rccp.324740

33. Moraes RE, Silveira IDB, Wiegand MM, Vaz RZ. Profile consumption of sheep meat front to animal welfare in the view of producers and consumers. Research, Society and Development. 9(1):e089108158. Available from: https://doi.org/10.33448/rsd-v9i10.8158

34. Chini J, Spers EE, Silva HMRD, Oliveira MCJD. The influence of signal attributes on the willingness to pay for pasture-raised beef. RAUSP Management Journal. 2021; 55(4):435-456. Available from: https://doi.org/10.1108/RAUSP-02-2019-0020

35. Felderhoff C, Lyford C, Malaga J, Polkinghorne R, Brooks C, Garmyn A, Miller M. Beef quality preferences: Factors driving consumer satisfaction. Foods. 2020; 9(3):289. Available from: https://doi.org/10.3390/foods9030289

36. Liu J, Ellies-Oury MP, Chriki S, Legrand I, Pogorzelski G, Wierzbicki J, Farmer L, Troy D, Polkinghorne R, Hocquette JF. Contributions of tenderness, juiciness and flavor liking to overall liking of beef in Europe. Meat Science. 2020; 168(1):108190. Available from: https://doi.org/10.1016/j.meatsci.2020.108190

37. Mwangi FW, Charmley E, Gardiner CP, Malau-Aduli BS, Kinobe RT, Malau-Aduli AE. Diet and genetics influence beef cattle performance and meat quality characteristics. Foods. 2019; 8(12):648. Available from: https://doi.org/10.3390/foods8120648

38. Owens FN, Dubeski P, Hanson CF. Factors that alter the growth and development of ruminants. Journal of Animal Science. 1993; 71(11):3138-3150. Available from: https://doi.org/10.2527/1993.71113138x

39. Aguiar OBD, Vasconcelos AGG, Barreiro PLD. Identificação de padrões alimentares: comparação das técnicas de análise de componentes principais e de principais eixos fatoriais. Revista Brasileira de Epidemiologia. 2019; 22(1):1-12. Available from: https://doi.org/10.1590/1980-549720190048

40. Kallas Z, Realini CE, Gil JM. Health information impact on the relative importance of beef attributes including its enrichment with polyunsaturated fatty acids (omega-3 and conjugated linoleic acid). Meat Science. 2014; 97(4):497-503. Available from: https://doi.org/10.1016/j.meatsci.2014.03.015

41. De Lima HL, Junior IAS, Zampar A, Soldá NM, Bottin FL, Tomasi T, De Córdova Cucco D. Diferentes sistemas de terminação e seus efeitos na carcaça e carne de novilhos angus superprecoces. Medicina Veterinária – UFRPE. 2021; 15(1):46-57. Available from: https://doi.org/10.26605/medvet-v15n1-2388

42. Yang R, Raper KC, Lusk JL. The impact of hormone use perception on consumer meat preference. Journal of Agricultural and Resource Economics. 2020; 45(1):107-123. Available from: https://doi.org/10.22004/ag.econ.298437

43. Hunt MR, Garmyn AJ, O'quinn TG, Corbin CH, Legako JF, Rathmann RJ, Brooks JC, Miller MF. Consumer assessment of beef palatability from four beef muscles from USDA Choice and Select graded carcasses. Meat Science. 2014; 98(1):1-8. Available from: https://doi.org/10.1016/j.meatsci.2014.04.004

44. Maughan C, Tansawat R, Cornforth D, Ward R, Martini S. Development of a beef flavor lexicon and its application to compare the flavor profile and consumer acceptance of rib steaks from grass-or grain-fed cattle. Meat Science. 2012; 90(1):116-121. Available from: https://doi.org/10.1016/j.meatsci.2011.06.006

45. Hwang YH, Joo ST. Fatty acid profiles of ten muscles from high and low marbled (quality grade 1++ and 2) Hanwoo steers. Korean Journal of Food Science Animal Research. 2016; 36(5):679. Available from: https://doi.org/10.5851/kosfa.2016.36.5.679

46. Barragán-Hernández W, Mahecha-Ledesma L, Olivera-Angel M, Angulo-Arizala J. Beef consumers' perceptions and relationships with acceptation assessed by photography. Italian Journal of Animal Science. 2021; 20(1):505-513. Disponível em : https://doi.org/10.1080/1828051X.2021.1893132

47. Schneider AS, Schemes C, De Araújo DC. O consumidor de moda no Rio Grande do Sul: características e percepções. Modapalavra e-periódico. 2009; 3(1):13-34. https://doi.org/10.5965/1982615x02032009013

48. Yunes MC, Von Keyserlingk MA, Hötzel MJ. Brazilian citizens' opinions and attitudes about farm animal production systems. Animals. 2017; 28(7):75. https://doi.org/10.3390/ani7100075

49. Huang C, Chen Y. Agricultural business and product marketing effected by using big data analysis in smart agriculture. Acta Agriculturae Scandinavica. 2021; 71(9):980-991. https://doi.org/10.1080/09064710.2021.1967439

50. Sanchez-Sabate R, Sabaté, J. Consumer attitudes towards environmental concerns of meat consumption: A systematic review. International Journal of Environmental Research Public Health. 2019; 16(7):1220. https://doi.org/10.3390/ijerph16071220