CONSUMER PERCEPTION OF CHAROLAIS MIXED BREED (LEMBU SADO) MEAT CONSUMPTION IN TERENGGANU, MALAYSIA

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Abstract: Charolais mixed breed, also known as Lembu Sado locally, is a quite new cattle breed in Malaysia. Lembu Sado usually been raised in certain states in Malaysia such as Terengganu, Kelantan, Pahang, and Johor. Consumer perceptions on Lembu Sado meat for consumption are being measures since Lembu sado meat become relevant as one of meat beef. This study aims to identify the level of consumer perception on Lembu Sado meat consumption and to determine the significant factor of consumer perception that influence Lembu Sado meat consumption. A Google form survey was distributed to 50 respondents across Terengganu, to test the hypotheses whether the perception factors such as psychological, sensory, and marketing factors had influenced consumer consumption of Lembu Sado meat. Descriptive analysis and factor analysis were employed in this study. The results indicated that leanness of meat, health, ethnicity and advertisement are the main factors that influence the consumption of Lembu Sado meat. The findings may help consumer to decide which variables they should consider when purchasing Lembu Sado meat and also give them a clear view on what to expect when consuming Lembu Sado meat in the future.

Keywords: consumer perception, lembu sado, factor analysis, Terengganu

Abstrak: Breed campuran Charolais, juga dikenal sebagai Lembu Sado secara lokal, adalah breed sapi yang cukup baru di Malaysia. Lembu Sado biasanya dibesarkan di beberapa negara bagian di Malaysia seperti Terengganu, Kelantan, Pahang, dan Johor. Persepsi konsumen terhadap konsumsi daging Lembu Sado diukur karena daging Lembu sado menjadi relevan sebagai salah satu daging sapi. Penelitian ini bertujuan untuk mengetahui tingkat persepsi konsumen terhadap konsumsi daging Lembu Sado dan untuk mengetahui faktor signifikan persepsi konsumen yang mempengaruhi konsumsi daging Lembu Sado. Survei formulir Google dibagikan kepada 50 responden di seluruh Terengganu, untuk menguji hipotesis apakah faktor persepsi seperti faktor psikologis, sensorik, dan pemasaran telah mempengaruhi konsumsi konsumen daging Lembu Sado. Analisis deskriptif dan analisis faktor digunakan dalam penelitian ini. Hasil penelitian menunjukkan bahwa ketipisan daging, kesehatan, etnis dan iklan merupakan faktor utama yang mempengaruhi konsumsi daging Lembu Sado. Temuan ini dapat membantu konsumen untuk memutuskan variabel mana yang harus mereka pertimbangkan saat membeli daging Lembu Sado dan juga memberi mereka pandangan yang jelas tentang apa yang diharapkan saat mengonsumsi daging Lembu Sado di masa mendatang.

Kata kunci: persepsi konsumen, lembu sado, analisis faktor, Terengganu

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INTRODUCTION

The worldwide demand for meat and other animal product is increasing due to rising incomes, growing populations and other sociocultural factors (Sanchez-Sabate & Sabaté, 2019). According to Livestock Statistics 2019/2020, beef ranks as the third types of meat consumed in Malaysia after poultry and pork (Department of Veterinary Services, 2021). Table 1 shows the Malaysian per capita consumption of livestock commodities from 2016 to 2020. Even though, the consumption of beef decreased in year 2019 and 2020, still the production of beef meat inadequate to feed the local demand. According to the Malaysian National Agro-food Policy (NAP) 2011-2020, demand and production for meat are expected to increase (Md Sin et al. 2021).

Table 2 shows that beef has the second lowest self-sufficiency ratio (SSR) after mutton for livestock commodities throughout the years. The SSR is only 21.7 % in 2020 which mean that the government have to import 78.3% of meat to fulfil the local consumption.

Government has taken an initiative to improve the meat production by importing more than 15 exotic breeds such as Charolais, Brahman, Brangus and Hereford breeds as purebreds and also for crossbreeding. These breeds especially Charolais have become a choice for crossbreeding to local breed which is Kedah-Kelantan (KK) because they have higher growth rate and body weight (Islam et al. 2021). This mixed breed is locally known as Lembu Sado. Charolais breed usually used for crossbreeding because of their muscle capacity, feed efficiency, libido, longevity and health (Priest, 2019).

Meat consumption, as well as consumer behaviour and attitude towards meat have been heavily visited as research subjects for many years (Verbeke & Viaene, 1999). Consumer demand in relation to food is shifting towards products that are safe, nutritious and good quality (Indrawan et al. 2018; Kantono et al. 2021). Psychological factors such as perceptions, belief, motivations, attitudes, lifestyle values, as well as social and cultural factors, shape consumers' personalities and influence their behaviour (Tsitsos et al. 2020; Indrawan et al. 2021). Consumers like meat and their products to be fresh, juicy, flavourful, tender, and nutritious (Dransfield, 2001, 2003; Ngapo & Dransfield, 2007). For visual appearance, the intrinsic quality that related with consumers' perception of meat are colour, fat content, marbling, and drip loss. Colour was regarded by consumers as the most important quality when purchasing because it is the first attribute for consumer in selecting meat while predict the meat's freshness and wholesomeness. While, fat content is an important cue for consumer's choice in beef because meat with slightly visible fat are preferred in some countries, however consumer's preferences must have changed over time because there are an increasing preference for leaner beef nowadays (Font-i-Furnols & Guerrero, 2014). A study by Ardeshiri & Rose (2018) concluded that consumer pays more attention to beef meat with lower fat content.

Table 1. Per capita consumption of livestock commodities in Malaysia for 2016-2020

Commodities	2016	2017	2018	2019	2020
Beef (kg)	6.6	6.5	6.4	6.1	6.1
Mutton (kg)	1.2	1.3	1.3	1.1	1.2
Pork (kg)	6.8	7.4	7.6	7.4	7.4
Poultry Meat (kg)	53.7	50.1	49.1	48.9	46.8

Source: Department of Veterinary Services, 2021

Table 2. Self-sufficiency ratio (%) of livestock products in Malaysia for 2016-2020

Type of Livestock	2016	2017	2018	2019	2020
Beef	23.04	22.17	22.49	22.28	21.72
Mutton	13.00	10.23	10.95	11.84	10.72
Pork	103.24	103.68	104.02	104.10	104.51
Poultry Meat	117.93	114.67	117.03	119.13	116.60

Source: Department of Veterinary Services, 2021

Consumers' responses to red meat were influenced by a complex range of dynamic and interrelated factors, one of them is marketing factor (Hastie et al. 2020). Tsitsos et al. (2020) stated that advertising, product promotions and proper quality labelling were the most influential ways to reach consumers, affecting their desires and perceptions. Moreover, there was enough information that consumers receive regarding meat and meat quality is provided through advertisement, information campaigns, labels or brands. This information is used by consumers, together with other factors, to create their quality expectations, which in turn influence the choice of product, purchasing decisions and willingness to pay Indrawan et al. 2021).

The study's objectives are (1) to identify the level of consumer perception on Lembu Sado meat consumption, and (2) to determine the most influential factors of consumer perception on Lembu Sado meat consumption.

METHODS

The study was carried out in Terengganu, Malaysia. There are approximately 5,000 of Lembu Sado farmers in Terengganu. The state of Terengganu was chosen because agriculture and livestock are one of their main economic activities. There are also a large-scale Lembu Sado breeding hub in Terengganu. Furthermore, Terengganu has a lot of land which could be optimised as a hub for the breeding of the Lembu Sado.

Consumer data was collected using convenience sampling method. The questionnaire was distributed through Google Forms survey since personal interview was impossible due to an outbreak of pandemic diseases known as Corona Virus (COVID-19). Respondents were given a link to the survey, which was designed in Google form. Then the link of the Google form was distributed using WhatsApp, email and other form of social media. A total of fifty consumers participated in this survey. Participants had to be Lembu Sado meat eaters (at least once). The questionnaire developed in the Malay language was divided into two sections. The first section consists of socio-economic questions while the second section was the Likert-scale type (totally disagree = 1, disagree = 2, neither disagree or agree = 3, agree = 4 and to totally agree = 5) of question regarding the factor of consumer perception such as psychological, sensory and marketing factor. Figure 1 shows research framework for this study.

Statistical Package for Social Science (SPSS) Software Version 26 was used to analyse the data. Descriptive analysis was used to describe the socio economics of the respondent and to summarize the level of consumer perception on Lembu Sado meat consumption. While exploratory factor analysis (EFA) was employed to determine the most influential factors of consumer perception on Lembu Sado meat consumption.
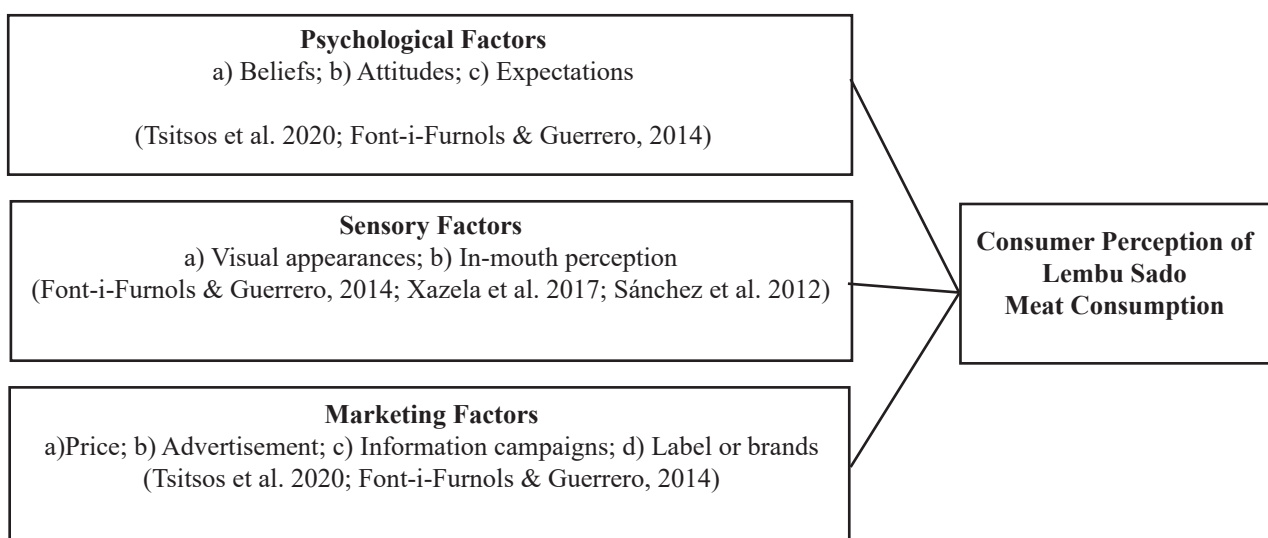
Figure 1. Research framework

RESULTS

Table 3 shows the demographic description of 50 consumers who participated in the study. 58% of respondents are male and 21 % of them are female. Most of the respondent (60%) are from age ranged of 21 to 30 years old, while 22% of the respondents are from age ranged of 31 to 40 years old. This may has contributed to the occupation, where as 46 % of them are students while 28% of them are working in private organization. For ethnicity, majority of the respondents with percentage of 96 are Malay while the rest of 4% are Chinese. The consumers' income level per month shows that 38% of them had income RM1000 or lower. For the consumption frequency, 42% of respondents ate Lembu Sado meat only once, 36% consumed two to three times and 16% of the respondents consumed more than five times. For the influence of consumption, majority of them (60%) agreed that social media influenced their decision to consume Lembu Sado meat. The second factor had influenced their consumption is through friend with 46%.

Table 3. Socio economic description

Demographic background		Frequency	Percentage (%)
Gender	Male	29	58.0
	Female	21	42.0
Age	20 and below	5	10.0
	21 – 30	30	60.0
	31 – 40	11	22.0
	41 – 50	1	2.0
	51 and above	3	6.0
Occupation	Government	5	10.0
	Private	14	28.0
	Student	23	46.0
	Unemployed	2	4.0
	Other	6	12.0
Ethnicity	Malay	48	96.0
	Chinese	2	4.0
Monthly income (RM)	1000 and below	19	38.0
	1001 – 2000	15	30.0
	2001 – 3000	6	12.0
	3001 – 4000	2	4.0
	4001 – 5000	3	6.0
	5001 and above	5	10.0
Frequent consumption	Only once	21	42.0
	2 – 3	18	36.0
	4 – 5	3	6.0
	more than 5	8	16.0
Influence of consumption	Social media	30	60.0
	Advertisement, information campaign	12	24.0
	Family or relative	12	44.0
	Friend	23	46.0

Figure 2 shows the respondent's level of agreement in percentage for subfactor; psychological factor. The finding shows quality of Lembu Sado meat is chosen by majority of the respondents with the highest mean of 4.42 (54%) of respondents are strongly agreed that Lembu Sado meat have better quality than other type of meat. Magrin et al. (2019) found that Charolais breed is well-known for their carcass quality, growth potential and feed efficiency. Birch & Memery (2020) also found that consumers' belief was influenced by information sources and opinions, meaning that most respondents believed that Lembu Sado meat have better quality through their own experiences or information collected by past consumers.

In terms of sensory attributes, tenderness of Lembu Sado meat has the highest mean of 4.42, compared to other subfactor. Figure 3 shows that 52 % of the respondents are strongly agreed that Lembu Sado meat is tenderer than other type of meat. The meat from Charolais breed are reported to be more tender and have a stronger beef flavour compared to other breed like Simmental and Eastern Anatolian Red (Conanec et al. 2021). Tenderness is one of the main criteria for the

consumer to evaluate the quality of the meat (El Hou et al. 2019; Kantono et al. 2021)including genetic and environmental factors. Based on phenotypic data for three traits related to muscular characteristics and /or meat quality in Charolais French beef cattle breed, 108 QTLs (Quantitative Trait Loci. In addition, tenderness and juiciness also has been reported as being correlated with intramuscular fat content (Font-i-Furnols & Guerrero, 2014). According to Ardeshiri & Rose (2018), they conclude that consumer is more interested towards beef meat with lower fat content.

Figure 4 shows that majority of the respondents with the percentage of 38, strongly agreed that they were interested to consume Lembu Sado meat after seeing an advertisement about it. Tsitsos et al. (2020) stated that much of the information that consumers receive regarding meat is provided through advertisement. Subsequently, the information from the advertisement are used by respondents to create their quality expectations, which in turn influenced their consumption decision (Font-i-Furnols & Guerrero, 2014) of Lembu Sado meat.
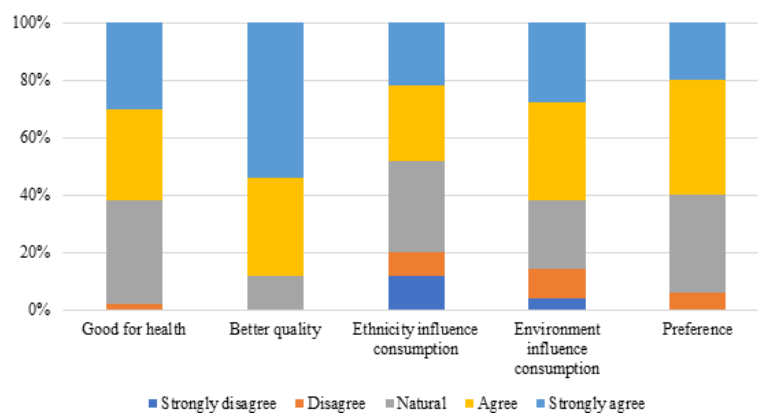

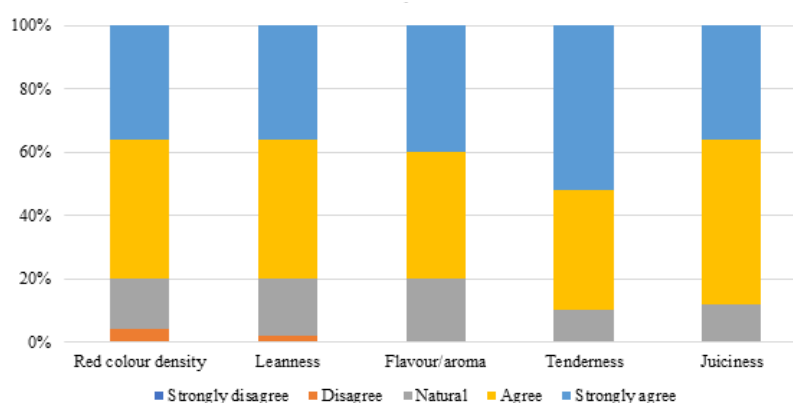Figure 2. The level of agreement of psychological factor

Figure 3. The level of agreement of sensory factor

In order to run factor analysis, Kaiser-Meyer-Olkin (KMO) and Bartlett's Test was applied to test the eligibility of the data if it is adequate to conduct the factor analysis. If the KMO measure is more than 0.5, hence it is possible to extract any reliable factors from the given set of variables. Besides that, the Bartlett test of sphericity will test the hypothesis that the correlation matrix is an identity matrix.

Table 4 shows the KMO of sampling adequacy value is 0.744 which can be considered as good. Since the p-value of the test is 0.000 which is lower than 0.05, the hypothesis is rejected. Therefore, the Bartlett's test of sphericity was significant, and the factorability of the correlation matrix can be deduced which means the dataset of the research is suitable for the factor analysis. Lau et al. (2019) indicated that Bartlett's test of sphericity was used in assessing a correlation matrix for factor analysis, and it was interpreted that if $p < 0.05$ as suitable for structure detection.

Exploratory Factor Analysis

For the factor extraction study, there are a lot of methods that can be used for example Principal Component Analysis, Unweighted Least Square Method, and Generalized – Least Square Method. For this study, Exploratory Factor Analysis (EFA) was applied. According to the Table 5 on the rotation sum of squared loadings, personal factor, psychological factor and cultural factor were extracted or retained when referred on the eigenvalue more than 1.

Rotated Component Matrix was used to determine what the factors represent. The results from Table 6 shows that there are 14 indicators being analysed and have a value more than 0.5. The grouping of the factor was done in accordance with the factor loading value. Hence all the 4 factors were well loaded. These were the 4 newly formed factors:
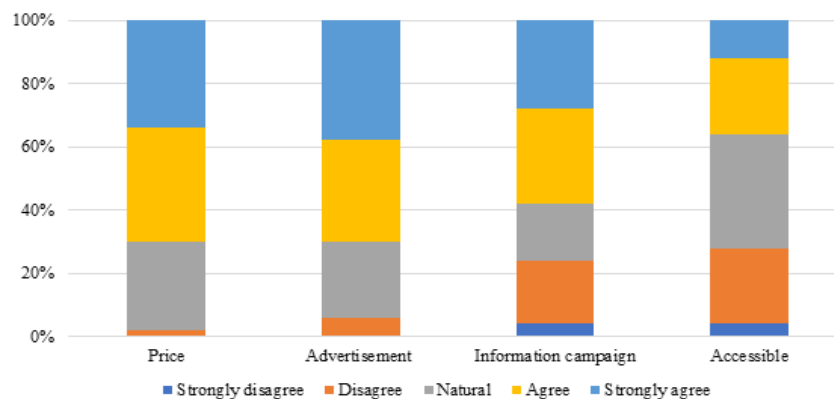

Figure 4. The level of agreement of marketing factor

Table 4. Kaiser-Meyer Olkin (KMO) Measure and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.744
Bartlett's Test of Sphericity	Approx. Chi-Square	302.197
	Degree of freedom	91
	Significance	0.000

Table 5. Total Variance Explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
Sensory factor	5.152	36.800	36.800	3.028	21.626	21.626
Psychological factor	1.912	13.655	50.455	2.610	18.639	40.266
Psychological factor	1.577	11.267	61.722	2.082	14.870	55.136
Marketing factor	1.064	7.600	69.322	1.986	14.186	69.322

Sensory factor: The first factor had the eigenvalue of 3.28 and percentage contribution of 21.63%. This factor represented 5 variables of sensory factor, which are leanness (0.787), juiciness (0.773), red colour density (0.698), tenderness (0.685), and flavour or aroma (0.661) of Lembu Sado meat. According to Conanec et al. (2021), the meat from Charolais breed has been reported to be more tender and have stronger beef flavour, but not high in juiciness.

Psychological factor: The second factor which had the eigenvalue of 2.61 and of contribution 18.64%. Most of the variables were from psychological factor, which the consumers believe that Lembu Sado meat is good for health (0.798) and have a better quality (0.599), and preference (0.659). A study by Kantono et al. (2021) almost half of the Chinese consumers believed that the main factor influencing purchase of meat was its nutritional and health benefits (45.64%), followed by quality (33.56%).

Psychological factor: The third factor had the eigenvalue of 2.08 and percentage contribution of 14.87%. This factor represented 2 variables from psychological factor, which were the influence of ethnicity (0.867) and environment (0.747) on Lembu Sado meat consumption. Beef consumption were not only depending on socio economic factors, but also on ethics and religious belief and traditions (Tsitos et al. 2020). For example, Indian consumers or respondents who embrace Hindu as their religion were forbidden to eat beef meat because of their religious belief.

Marketing factor: The fourth factor had the eigenvalue of 1.98 and percentage of contribution 14.19%. Two variables were derived successfully, which were advertisement (0.856) and information campaign (0.845) from marketing factor. Advertisement and information campaign was a proper way to intrigue consumption among respondents because the information collected through it will help them to create their quality expectations (Font-i-Furnols and Guerrero, 2014).

Reliability Analysis

Information cannot be validated without being reliable. Therefore, reliability analysis was conducted on the three new extracted factors from the factor analysis. In practice, the reliability of a test score must be estimated from the data of a study. The measurement that most frequently used in estimating the reliability in behavioural and social science research is the coefficient alpha (Levinson et al. 2015). According to Shamri et al. (2021), Cronbach's alpha reliability coefficient normally ranges between 0 and 1. However, there is no lower limit to the coefficient. The closer Cronbach's alpha coefficient to 1 the greater the internal consistency of the items in the scale (Table 7).

Table 6. Rotated Component Matrix

Indicators	Component			
	1	2	3	4
Leanness	0.787			
Juiciness	0.773			
Red colour density	0.698			
Tenderness	0.685			
Flavour/aroma	0.661			
Good for health		0.798		
Price		0.765		
Preference		0.659		
Better quality		0.599		
Ethnicity influence			0.867	
Environmental influence			0.747	
Accessible			0.527	
Advertisement				0.856
Information campaign				0.845

Table 7. Reliability analysis of four component

Factors	Cronbach's alpha	Cronbach's alpha based on standardized items	N of items
Component 1	0.835	0.840	5
Component 2	0.768	0.770	4
Component 3	0.714	0.712	3
Component 4	0.788	0.804	2

Managerial Implications

The results of this study have implications for meat consumer, farmer and marketer. From the consumer side, this study can increase consumer's knowledge on Lembu Sado meat. Consumer's knowledge about the benefit and availability of Lembu Sado in the local market is significant role in making a decision on meat consumption. This study also provides a guideline for marketer, using all the information on consumer preferences. While, cattle farmers should consider to rear more mixed breed in order to cater the local market.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The objectives of this study are to identify the level of consumer's perception on Lembu Sado meat consumption and to determine the significant factor of consumer perception that influence Lembu Sado meat consumption. The results show that majority of the respondents strongly agreed that Lembu Sado meat have better quality and more tender, and their consumption were influenced by advertisement. As for factor analysis, the results indicated that the most influential factors on the consumption of Lembu Sado meat are leanness of meat, health, ethnicity and advertisement.

Recommendations

Future research can be conducted on much bigger population not only in Terengganu, to reach more target audience, and for more better and accurate result. Future research can also focus on other types of exotic cattle breed such as Brahman or Limousin. This can be beneficial for consumers as it gives them more knowledge on the meat's attributes of foreign breed, thus influence their willingness to pay and their decision whether to consume the meat or not in the future.

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REFERENCES

Ardeshiri A, Rose JM. 2018. How Australian consumers value intrinsic and extrinsic attributes of beef products. *Food Quality and Preference* 65:146– 163. https://doi.org/10.1016/j.foodqual.2017.10.018

Birch D, Memery J. 2020. Tourists, local food and the intention-behaviour gap. *Journal of Hospitality and Tourism Management* 43:53–61. https://doi.org/10.1016/j.jhtm.2020.02.006

Conanec A, Campo M, Richardson I, Ertbjerg P, Failla S, Panea B, Chavent M, Saracco J, Williams JL, Ellies-Oury MP, Hocquette JF. 2021. Has breed any effect on beef sensory quality?. *Livestock Science* 250:104548. https://doi.org/10.1016/j.livsci.2021.104548

Department of Veterinary Services. 2021. 2019/2020 Livestock statistics: Department of veterinary services (DVS). http://www.dvs.gov.my/index.php/pages/view/3338?mid=42. [2 Sept 2022].

Dransfield E. 2001. Consumer issues and acceptance of meat. In Paper presented at the International Congress of meat science and technology. *Japan Society for Meat Science and Technology* 47:72-79.

Dransfield E. 2003. Consumer acceptance-meat quality aspects. In Paper presented at the Proc 11th International. Pretoria, South Africa: Meat Symposium on Consistency of Quality.

El Hou A, Philippe R, Rocha D, Blanquet V. 2019. Fine QTL mapping for meat quality traits in French Charolaise breed using HD SNP data. In: Proceeding of the New Challenge in Data Sciences: acts of the Second Conference of the Moroccan Classification Society. New York, NY. 1–5. https://doi.org/10.1145/3314074.3314101

Font-i-Furnols M, Guerrero L. 2014. Consumer preference, behavior and perception about meat and meat products: An overview. *Meat Science* 98(3):361–371. https://doi.org/10.1016/j. meatsci.2014.06.025

Hastie M, Ashman H, Torrico D, Ha M, Warner R. 2020. A mixed method approach for the investigation of consumer responses to sheepmeat and beef. *Foods* 9(2):1-17. https://doi.org/10.3390/ foods9020126

Indrawan D, Christy, Hogeveen H. 2021. Improving poultry meat and sales channels to address food safety concerns: consumers' preferences on poultry meat attributes. *British Food Journal* 123(13): 529-546. https://doi.org/10.1108/BFJ-04-2021-0362

Indrawan, D, Tacken G, Hogeveen H. 2018. What drives the choice of poultry market channel and the change of purchase behavior due to highly pathogenic avian influenza outbreaks?. *Poultry Science* 97(10):3652-3660. https://doi. org/10.3382/ps/pey222

Islam MS, Degu NY, Haron AW, Abdullah JFF, Wen Han MH, Fitri WN. 2021. Growth and reproductive performance of the indigenous Kedah-Kelantan (KK) cattle: A review. *Pertanika Journal of Tropical Agricultural Science* 44(1):25–48. https://doi.org/10.47836/pjtas.44.1.02

Kantono K, Hamid N, Ma Q, Chadha D, Oey I. 2021. Consumers' perception and purchase behaviour of meat in China. *Meat Science* 179:108548. https://doi.org/10.1016/j.meatsci.2021.108548

Levinson, CA, Rodebaugh TL, Shumaker EA, Menatti AR, Weeks JW, White EK, Heimberg RG, Warren CS, Blanco C, Schneier F, Liebowitz MR. 2015. Perception matters for clinical perfectionism and social anxiety. *Journal of Anxiety Disorders* 29:61- 71. https://doi. org/10.1016/j.janxdis.2014.11.002

Magrin L, Gottardo F, Brscic M, Contiero B, Cozzi G. 2019. Health, behaviour and growth performance of Charolais and Limousin bulls fattened on different types of flooring. *Animal* 13(11):2603– 2611. https://doi.org/10.1017/ S175173111900106X

Ngapo TM, Martin JF, Dransfield E. 2007. International preferences for pork appearance: I. Consumer choices. *Food Quality and Preference* 18(1):26- 36. https://doi.org/10.1016/j. foodqual.2005.07.001

Lau ST, Lopez V, Liaw SY, Lau Y. 2019. Development and psychometric evaluation of the community care competency scale in multi-ethnic undergraduate nursing students. *Health & Social Care in the Community* 27(5):802-813. https:// doi.org/10.1111/hsc.12809

Priest R. 2019. Flavor profiles and traits of crossbred dairy cattle [dissertation]. Texas: Texas Tech University.

Sanchez-Sabate R, Sabaté, J. 2019. Consumer attitudes towards environmental concerns of meat consumption: A systematic review. *International Journal of Environmental Research and Public Health* 16(7):1-37.

Sánchez M, Beriain MJ, Carr TR. 2012. Socio-economic factors affecting consumer behaviour for United States and Spanish beef under different information scenarios. *Food Quality and Preference* 24(1):30-39. https://doi. org/10.1016/j.foodqual.2011.08.008

Shamri SN, Suhaimi NAM, Alwi A. 2021. The factors affecting the consumer buying behaviour towards local brand of food product in Selangor. *Journal of Agrobiotechnology* 12(1):40-50. https://doi. org/10.37231/jab.2021.12.1S.269

Md Sin MA, Ariffin AS, Ibrahim S, Ahmad MA. 2021. Technology innovation, supply chain risk and digital marketing towards business performance. A conceptual study in livestock industry in Malaysia. *Journal of Information System and Technology Management* 6(24):9-17. https://doi. org/10.35631/JISTM.624002

Tsitsos A, Economou V, Arsenos G, Kalitsis T, Theodoridis A. 2020. A review of consumer preferences for lamb and beef products. In Proceedings of the 9th International Conference on Information and Communication Technologies in Agriculture, Food and Environment (HAICTA 2020), Tessaloniki, Greece. 2761:28–36.

Verbeke W, Viaene J. 1999. Beliefs, attitude and behaviour towards fresh meat consumption in Belgium: empirical evidence from a consumer survey. *Food Quality and Preference* 10(6):437- 445. https://doi.org/10.1016/S0950-3293(99)00031-2

Xazela NM, Hugo A, Marume U, Muchenje V. 2017. Perceptions of rural consumers on the aspects of meat quality and health implications associated with meat consumption. *Sustainability* 9(5):1–11. https://doi.org/10.3390/su9050830