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Consumers across five European countries prioritise animal welfare above environmental sustainability when buying meat and dairy products

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ABSTRACT

Food production systems, especially meat and dairy supply chains, contribute to greenhouse gas emissions. An important question emerges as to whether consumers care about environmental sustainability when buying food products, as this can determine their consumption practices. Further, if sustainability labels are available, identifying information that is relevant to consumers is important. This research therefore aimed to identify the attributes that are most important for consumers when buying meat or dairy products and the perceived helpfulness of sustainability labels for meat and dairy products and important label properties. An online survey was conducted in five European countries (i.e. Czechia, Spain, Sweden, Switzerland, and the UK). Consumers valued similar attributes when buying meat and dairy products across all countries. *Freshness, quality/taste* and *animal welfare* emerged as the most important attributes, while environmental attributes such as *food miles, carbon footprint*, and *organic production* were the least important. Sustainability labels for meat and dairy products were perceived as helpful. Regression analysis identified similar patterns within all five countries regarding the predictors of the perceived helpfulness of sustainability labels. Attitudes towards *sustainable food consumption, environmental attitudes*, and *food production and policies* emerged as significant positive predictors in most models. Most importantly, information regarding *animal welfare, food safety*, and *health and nutrition* was perceived as being more important than *environmental sustainability*. This suggests that food choice decisions are unlikely to be made based on the environmental sustainability of a food product's production alone.

1. Introduction

Our current diets contribute to climate change due to the emission of greenhouse gases at every stage of the food supply chain, from crop and livestock production to food consumption (Rosenzweig et al., 2020). In 2018, around 17 % of global greenhouse gas emissions were caused by agriculture and related land use emissions (Fao, 2020), and around 20 % to 30 % of the total environmental impact caused by humans is estimated to derive from food production (Tukker & Jansen, 2006).

Scientific evidence indicates that current levels of ruminant livestock production (i.e. beef and dairy) significantly contribute to the emission of greenhouse gases and biodiversity losses (FAO, 2006; Mondière et al., 2024; Scarborough et al., 2023). The global trend towards increased consumption of animal products in human diets has negative environmental impacts, and in countries where meat consumption is already high, this can have social and health-related impacts (Bonnet, Bouamra-Mechemache, Réquillart, & Treich, 2020).

Looking at the consumption stage, the current work therefore aimed

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to identify the attributes that are most important for consumers when buying meat or dairy products to better understand the consumer demand side. These insights can help tailor labels in a way that makes them most appealing and useful to consumers and ultimately facilitates transformation towards more sustainable consumption. Further, to increase the relevance of the results, consumer preferences for these attributes were compared across five European countries with different socioeconomic, cultural, and geographic conditions. Finally, to assess consumer perception in terms of concrete practical applications, the perceived helpfulness of sustainability labels for meat and dairy products and important label properties were investigated. With that, the current work provides important novel insights in terms of cross-cultural research and the connection between theoretical insights (understanding of consumer preferences) and practical implications (helpfulness of sustainability labels).

2. Literature review

2.1. External costs of meat and dairy production

Globally, beef consumption is the primary contributor to diet-related greenhouse gas emissions from animal production systems, followed by milk, poultry, pig, and goat production systems (Chaudhary, Gustafson, and Mathys (2018). Imports of food and inputs for agricultural production represent key drivers of biodiversity loss due to land use change (Chaudhary & Kastner, 2016). Our food system is also associated with changes in social pressures and concerns. For example, many consumers are becoming more concerned about animal suffering and animal welfare in the farming industry (Bonnet et al., 2020). Furthermore, in high-income Western countries, ample meat consumption may increase the risk of various human diseases, such as cardiovascular diseases (Godfray et al., 2018; Nelson, Hamm, Hu, Abrams, & Griffin, 2016). In most industrialised countries, a reduction in meat consumption has the potential to deliver benefits to human health, the environment, and animal welfare (Godfray et al., 2018; Willett et al., 2019).

Dairy production represents the second largest agricultural sector in the European Union (EU), accounting for 12 % of the total agricultural economic output (Augère-Granier, 2018). Major sustainability concerns associated with dairy production include, inter alia, the potential for negative impacts on climate and animal welfare (Karlsson et al., 2023). Given this economic importance and sustainability concerns, understanding how consumers perceive the relative importance of different product attributes in relation to meat and dairy products is important if interventions to promote sustainability are to be accepted by the public.

2.2. Food consumption and its drivers

Some consumers have changed their diets due to concerns about the negative impacts of current food production systems as well as their preferences for consuming healthier diets (Ploll, Petritz, & Stern, 2020). Various factors motivate these changes. For instance, consumers may be concerned about the sustainability or the environmental effects of their diets (Fox & Ward, 2008; Hallström, Carlsson-Kanyama, & Börjesson, 2015), animal welfare or respect for animal life (Fox & Ward, 2008), and health considerations (Glick-Bauer & Yeh, 2014).

The perception of healthiness in relation to food choices, together with price, has been reported to be a more important determinant of food choices than environmental sustainability (Rolfe, Rajapaksa, De Valck, & Star, 2023). A study in nine European countries found that price and taste tended to be more important than ethical concerns (Markovina et al., 2015). Reducing meat intake in the diet can have a positive impact on human health when consumption levels are previously high (Gonzalez, Marques, Nadal, & Domingo, 2020). In line with this, Eurobarometer data from 2020 revealed that both nutrition and environment were motivating factors for meat reduction (de Boer & Aiking, 2022).

In terms of animal welfare, Eurobarometer surveys conducted in 2005 and 2015, together with comparative research conducted in Switzerland, suggested that consumers consider animal welfare to be one of the most important goals of agricultural policy (Ammann, Mack, et al., 2023; European Commission, 2006; 2016; Umbricht & Schaub, 2022). A recent scoping review suggests that there has been an increase in public concern regarding animal welfare (Hårstad, 2023), although some consumers might apply cognitive dissonance mechanisms to maintain existing dietary behaviours (Ong, Frewer, & Chan, 2017).

Other important drivers of individual dietary patterns are socio-demographic and lifestyle variables (e.g. gender, age, BMI, and nationality), which have been found to influence individuals' dietary choices (Krieger et al., 2018). For example, in the case of gender, women tend to have a higher diet-related health consciousness than men (Dohle, Hartmann, & Keller, 2014). In terms of the environmental sustainability of diets, women tend to be more concerned (Grunert, Hieke, & Wills, 2014), have more knowledge (Vecchio, Annunziata, Krystallis, & Pomarici, 2015), and regard ecolabels as more important than men (Calderon-Monge, Redondo-Rodriguez, & Ramirez-Hurtado, 2020). Lastly, women value animal welfare more than men (Ammann, Mack, et al., 2023).

2.3. Sustainability labels as possible facilitators of behaviour change

In recent years, many consumers have become more environmentally aware and more conscious of how food is produced and where it comes from (Gadema & Oglethorpe, 2011; Karlsson et al., 2023). Some consumers prioritise the inclusion of high animal welfare and environmentally sustainable products in their diets and are willing to pay more for products with these attributes (Janssen, Rödiger, & Hamm, 2016). One information-based measure for communicating environmental sustainability information or animal welfare standards is product labels, which can be used or ignored by consumers and, as a consequence, are preferred by many consumers (Ammann, Arbenz, et al., 2023). Labels can also help promote more sustainable products by providing sustainability information to consumers (Kühne, Reijnen, Laasner Vogt, & Baumgartner, 2023; Potter et al., 2021; Potter et al., 2022). For example, the majority of Japanese consumers are interested in environmental sustainability and animal welfare labels for beef (Sonoda, Oishi, Chomei, & Hirooka, 2018).

Countries differ in terms of which product attributes they value most. For instance, Polish and Swedish consumers tend to express lower levels of concern about the environmental sustainability of products than consumers in Spain, the UK, and Germany (Grunert et al., 2014). German consumers exhibit a stronger preference for products with a lower environmental footprint than Canadian consumers (Greibitus, Steiner, & Veeman, 2016). Similarly, consumers in different countries differ in the kinds of labels they prefer (Zepeda, Sirieix, Pizarro, Corderre, & Rodier, 2013). For instance, American participants expressed a preference for labels that were related to a "cause" (e.g. promotion of sustainability or fairtrade), whereas participants from Canada, France, and Spain preferred labels indicating that the product originated from their respective countries (Zepeda et al., 2013).

3. Methods

This research represents secondary analysis data originating in a citizen survey conducted in the EU Horizon 2020 programme SUPER-G (Developing Sustainable Permanent Grassland Systems and Policies). The survey was conducted in five major European biogeographic regions that also include important meat and dairy producing regions: the Continental, Mediterranean, Boreal, Atlantic, and Alpine regions. The aim of the survey was to understand the drivers of citizens' attitudes, values, and preferences for policies associated with the preservation and management of permanent grasslands and the products derived from them.

The intention will be to publish on the platform zenodo.org. In the meantime, the data set will be available by contacting the corresponding author.

3.1. Participants

A total of 3,192 participants were recruited from five countries to cover different biogeographic zones within Europe: (1) Czechia – Continental, (2) Spain – Mediterranean, (3) Sweden – Boreal, (4) Switzerland – Alpine, and (5) UK – Atlantic. In terms of political context, Czechia, Sweden, and Spain are member states of the European Union (EU), whereas the UK left the European Union in 2020, and Switzerland has never been an EU member state.

Participants from each country were quota sampled to be nationally representative on the basis of gender, age (categorised as 18–30, 31–40, 41–50, 51–60, 61–70, and 71 and older), and education level (see education levels in [Table 1](#)). The participants (with recruitment aimed at 620 individuals per country) were recruited from an existing panel of a social research agency. Ethical approval was obtained from Newcastle University’s Faculty of Science, Agriculture and Engineering’s ethics committee, UK (20-TIN-29, 21/08/2020).

3.2. Survey

An online survey was used to collect the data. The participants received information about the aims of the research and provided informed consent. Data were collected in November 2021. The full survey can be found in the [supplementary materials](#) and the complete list of items used in this analysis, and the reliability analysis (Cronbach’s alpha) for all scales in the survey are available in the appendix. Socio-demographic information was collected, including participants’ age, their gender, whether they were rural- or urban-dwelling, and their level of education.

The participants were asked to rate the importance of different factors when shopping for meat and dairy products on a scale from 1 (not at all important) to 5 (extremely important). These 18 attributes were selected based on focus group research conducted within the SUPER-G project ([Tindale et al., 2023](#)). These include various hedonic attributes (freshness, quality/taste, healthy eating, nutrition, price, processing, special offers, convenience of use/preparation, and familiarity of brand), animal welfare attributes (animal welfare, outdoor-reared/free range, and pasture-fed), attributes related to environmental sustainability (locally produced, sustainable packaging, food miles, carbon footprint, and organic), and social sustainability (fairtrade or producer/

farmer fairly paid).

The survey assessed general *environmental attitudes* using the brief version of the Environmental Attitudes Inventory (24 questions, EAI) ([Milfont & Duckitt, 2010](#)). All items were rated for agreement on a scale from 1 (strongly disagree) to 5 (strongly agree). Attitudes towards *food production and policies* were measured using five items ([Howley, Donoghue, & Hynes, 2012; Rodríguez-Ortega, Bernués, & Alfnes, 2016](#)). These included attitudes towards food production, self-sufficiency and supporting policies. The participants indicated how much they agreed with each item on a scale from 1 (strongly disagree) to 5 (strongly agree).

Trust in government management of the countryside was assessed with four statements, which were rated by the participants on a scale from 1 (strongly disagree) to 5 (strongly agree). The four statements measured two dimensions of social trust in both local and national governments—perceptions of government competency and intent—specifically associated with their management of the countryside.

Attitudes towards *sustainable consumption of meat and dairy products* were assessed using seven items that were identified in the focus group discussions ([Tindale et al., 2023](#)). The items aimed to explore participants’ opinions about ease of identification and purchase of sustainably produced food, and their intention to buy, increase, or reduce or avoid purchase of sustainably produced food. The participants indicated how much they agreed with each item on a scale from 1 (strongly disagree) to 5 (strongly agree). Next, the perceived helpfulness of a sustainability label was measured using one item. The participants were asked to rate the statement “For me, a label or symbol indicating sustainability of meat and dairy products would be ...”. The participants answered on a scale from 1 (unhelpful) to 5 (helpful). Finally, the participants rated different items regarding label properties. The question was “How far do you agree or disagree that the following are important information for a product label or symbol indicating sustainability of meat and dairy products”. The nine items also included hedonic properties, the extent to which the product addressed animal welfare, and environmental sustainability and were measured using a scale from 1 (strongly disagree) to 5 (strongly agree).

The data used in the analysis included participants’ characteristics regarding socioeconomic information, consumption behaviour, and psychological attributes ([Table 1](#)). The sample sizes varied between 623 and 649 across the five countries. The total sample for all countries consisted of 3,189 participants.

Table 1
Sample description for the five countries and the complete sample, including group differences.

	Czechia (n = 649)		Spain (n = 623)		Sweden (n = 645)		Switzerland (n = 640)		UK (n = 632)		All (N = 3,189)	
	%	Mean (SD)	%	Mean (SD)	%	Mean (SD)	%	Mean (SD)	%	Mean (SD)	%	Mean (SD)
Gender (women)	49.9		43.2		42.5		54.5		52.1		48.4	
Age	46.1	(15.4)	43.1	(13.5)	47.4	(16.5)	44.9	(16.4)	46.4	(16.5)	45.6	(15.8)
Education												
Secondary education or less	9.4		34.8		20.9		6.9		20.1		18.3	
Upper secondary education	69.6		27.1		34.3		50.6		37.5		44.0	
Undergraduate degree or diploma	19.1		28.9		31.6		19.7		33.2		26.5	
Postgraduate degree or qualification	1.8		9.1		13.2		22.8		9.2		11.2	
Place of residence (countryside dwellers)	49.9		45.7		47.9		45.3		48.6		47.5	
Do not buy meat	7.2		6.9		11.9		11.6		11.2		9.8	
Do not buy dairy	13.4		11.7		9.8		15.2		12.3		12.5	
Sustainable consumption	2.96	(0.59)	3.25	(0.70)	2.97	(0.63)	3.29	(0.65)	3.16	(0.70)	3.12	(0.67)
Trust	2.93	(0.80)	2.90	(1.02)	2.95	(0.98)	3.30	(0.81)	3.05	(0.92)	3.02	(0.92)
Environment	3.47	(0.44)	3.53	(0.44)	3.52	(0.49)	3.43	(0.45)	3.53	(0.52)	3.50	(0.47)
Food production and policies	3.72	(0.68)	3.83	(0.74)	3.68	(0.63)	3.71	(0.75)	3.55	(0.63)	3.70	(0.70)

Note. Sustainable consumption: sustainable consumption of meat and dairy products, Trust: trust in government management of the countryside, Environment: general environmental attitudes using the brief version of the Environmental Attitudes Inventory ([Milfont & Duckitt, 2010](#)), Food production and policies ([Howley et al., 2012; Rodríguez-Ortega et al., 2016](#)).

3.3. Data analysis

Descriptive statistics and regression analyses were used to analyse the data. All analyses were carried out separately for each country, and the results were compared across countries. The perceived importance of the 18 different attributes (hedonic, animal welfare, and environmental sustainability) for buying meat and dairy products, and the importance of different information that should be communicated on labels were analysed descriptively. As a direct comparison of hedonic scores across cultures is not recommended (Ares, 2018), we translated the mean values for the perceived importance of the different attributes and information into ranks within countries, indicating which attributes and information received the most or least importance ratings overall. To identify factors that influence the perceived usefulness of a sustainability label for decision-making when buying meat and dairy products, we developed a framework based upon the literature presented above (Fig. 1). Linear ordinary least squares regression analysis was used to investigate the effect of these factors on the perceived helpfulness of sustainability labels for meat and dairy purchase decisions. All predictors were analysed in the same regression model. For both analyses, only participants who indicated that they bought either meat or dairy products were included (n = 3,178). All data were analysed with the Statistical Package for the Social Sciences (SPSS) version 26 (IBM, New York, USA) for Windows.

4. Results

4.1. What attributes do consumers care about when buying meat and dairy products?

Direct comparisons of mean values and hedonic scores across cultures should be made with care, as cultural differences can lead to individual response styles (Ares, 2018). We therefore also report the ranking in this descriptive section to aid interpretation of the results.

For meat, we found that in all countries, the hedonic attribute *freshness* was rated as most important by participants (rank 1, Table 2), followed by *quality/taste*, which was among the top three attributes (ranks 2 and 3) in all countries. For *price*, however, the results were less homogeneous across the five countries. In Czechia and the UK, *price* was among the more important attributes (ranks 3 and 5), whereas it had a less important role in the purchase decision of meat in Sweden, Switzerland, and Spain (rank 7 and below). Another attribute that emerged as being important was *healthy eating*, which was rated as the

third most important attribute in Spain (rank 3) but slightly lower in the other countries (ranks 4 and 6).

In three European countries, *animal welfare* emerged as the third most important attribute for meat products (i.e. in Sweden, Switzerland, and the UK). The other two animal welfare issues, that is, *outdoor-reared/free range* and *pasture-fed*, were rated as less important (overall ranks 6 and 11). In terms of environmental sustainability, consumers rated general measures of sustainability, such as *local production of meat* as the most important attribute (overall rank 8), followed by *sustainable packaging* (overall rank 12). More specific measures of sustainability, such as *food miles* and *carbon footprint*, were rated as less important (overall ranks 13 and 15). Nevertheless, their mean scores were between 3 and 4, indicating that they were perceived as important. Across all countries, organic production received little importance (overall rank 18).

Regarding the purchase of dairy products, we found that *freshness* and *quality/taste* were rated as the three most important attributes (Table 3, overall ranks 1 and 2). Again, *price* was important in Czechia and the UK (ranks 3 and 5) but much less so in Sweden, Switzerland, and Spain (ranks 12 and 13). *Animal welfare* was among the five most important attributes of dairy products across all countries (overall rank 3), and the most important in Sweden (rank 1). *Outdoor-reared/free range* and *pasture-fed* were rated as less important (overall ranks 6 and 11). Further, dairy consumers rated *local production* as the most important attribute in the attribute group of environmental sustainability (overall rank 8), followed by *sustainable packaging* (overall rank 12). Measures of sustainability, such as *food miles* and *carbon footprint*, were rated as less important (overall ranks 13 and 14). *Organic* production was the least important (overall rank 18), although its overall mean was 3.2, indicating that it was nevertheless perceived as important.

Considering the overall mean across all five European countries, the important attributes for buying meat and dairy products were very similar. Hedonic attributes (*freshness*, *quality/taste*, *price* and *healthy eating*) were rated as most important when buying meat and dairy products, followed by *animal welfare*, which was rated as more important than environmental sustainability attributes (*locally produced*, *sustainable packaging*, *food miles*, *carbon footprint*, and *organic*). Lastly, *organic* production was the least important attribute for both meat and dairy products in all countries (overall rank 18).

An observational difference in ranks that emerged between the countries is that price was more highly prioritised in Czechia and the UK compared to the other three countries. Another difference in terms of price emerged from the comparison of meat and dairy products. There was a small tendency for countries to rate price as more important for meat than dairy (e.g. Spain, Sweden, and Switzerland).

4.2. Helpfulness of a sustainability label

Consumers across all five countries perceived a label or symbol indicating the sustainability of the production of meat and dairy products as helpful (Table 4).

A linear regression analysis was conducted to evaluate the predictors driving the perceived helpfulness of sustainability labels in each of the five countries. All models were statistically significant and explained between 18 % and 28 % of the variance (Table 5). *Sustainable consumption of meat and dairy products* emerged as a significant positive predictor in all five models. Similarly, *attitude towards the environment* emerged as a significant positive predictor of perceived helpfulness of a sustainability label for meat and dairy products across all five models (Table 5). *Attitude towards food production and policies* was a significant positive predictor for four countries but not Switzerland. In terms of sociodemographic factors, gender was a significant negative predictor of the perceived helpfulness of sustainability labels in Czechia, Spain, and Sweden, indicating that men found labels more helpful than women.

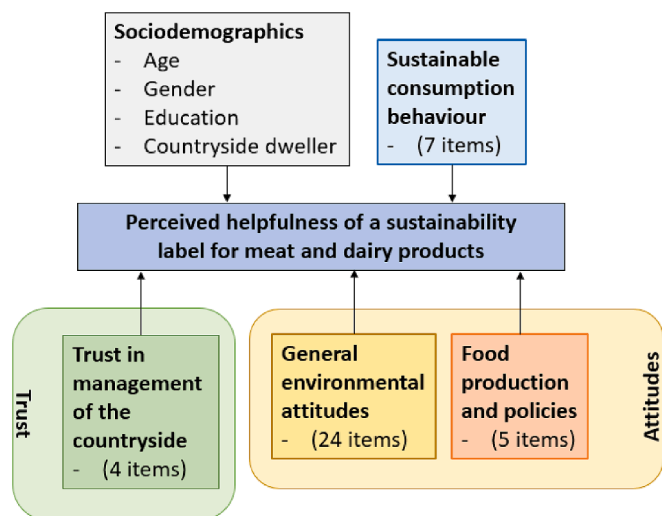


Fig. 1. Framework used to analyse the predictors of perceived helpfulness of a sustainability label for meat and dairy product decision-making.

Table 2
Importance of various product attributes when buying meat for each of the five countries.

	Czechia (n = 602)			Spain (n = 580)			Sweden (n = 568)			Switzerland (n = 566)			UK (n = 561)			All (N = 2,877)		
	M	SD	Rk.	M	SD	Rk.	M	SD	Rk.	M	SD	Rk.	M	SD	Rk.	M	SD	Rk.
Hedonic attributes																		
Freshness	4.34	0.83	1	4.34	0.73	1	4.12	0.83	1	4.13	0.87	1	4.29	0.82	1	4.25	0.82	1
Quality/taste	4.16	0.80	2	4.15	0.78	3	4.11	0.73	2	3.96	0.84	2	4.13	0.86	2	4.10	0.80	2
Healthy eating	3.72	0.99	4	4.19	0.83	2	3.85	0.90	6	3.89	0.89	4	3.88	0.98	6	3.90	0.93	4
Nutrition	3.69	0.92	7	4.09	0.80	4	3.80	0.82	7	3.65	0.90	7	3.99	0.90	4	3.84	0.88	5
Price	3.85	0.92	3	3.87	0.92	8	3.64	0.93	10	3.57	0.97	10	3.91	0.93	5	3.77	0.94	7
Processing	3.70	0.94	5	3.72	1.10	12	3.52	0.99	12	3.55	0.94	12	3.54	1.07	14	3.61	1.01	10
Special offers	3.56	1.01	9	3.64	0.99	15	3.28	1.05	16	3.34	1.09	14	3.49	1.09	15	3.47	1.05	14
Convenience of use/ preparation	3.23	0.99	14	3.54	1.02	17	3.31	0.96	15	3.14	1.09	18	3.46	1.07	16	3.33	1.04	16
Familiarity or brand	3.04	1.04	16	3.47	1.07	18	3.22	1.05	17	3.31	1.11	16	3.31	1.18	17	3.27	1.10	17
Animal welfare																		
Animal welfare	3.69	1.05	6	4.01	0.95	5	4.07	0.92	3	3.89	0.95	3	4.03	0.99	3	3.94	0.98	3
Outdoor-reared/free range	3.52	1.09	10	4	0.90	6	3.93	1.02	4	3.80	0.94	5	3.79	1.11	9	3.80	1.03	6
Pasture-fed	3.37	1.03	12	3.76	0.97	11	3.90	1.03	5	3.47	1.02	13	3.56	1.11	12	3.61	1.05	11
Environ. sustainability																		
Locally produced	3.62	1.01	8	3.82	0.99	9	3.68	1.05	9	3.69	0.99	6	3.77	1.07	10	3.71	1.02	8
Sustainable packaging	3.36	1.05	13	3.80	1.01	10	3.46	1.12	13	3.56	1.06	11	3.81	1.06	8	3.59	1.07	12
Food miles	3.07	1.04	15	3.70	1.05	13	3.72	1.10	8	3.64	1.03	8	3.55	1.17	13	3.53	1.11	13
Carbon footprint	2.98	1.17	17	3.66	1.05	14	3.36	1.16	14	3.34	1.09	15	3.60	1.14	11	3.38	1.15	15
Organic	2.82	1.17	18	3.62	1.05	16	3.21	1.22	18	3.17	1.21	17	3.09	1.28	18	3.18	1.22	18
Social sustainability																		
Fairtrade or producer/farmer fairly paid	3.44	0.98	11	3.98	0.94	7	3.60	1.04	11	3.61	0.98	9	3.81	1.02	7	3.69	1.01	9

Note. Only meat consumers are considered in this analysis. Each attribute was rated on a scale from 1 (not at all important) to 5 (extremely important). Rk. = Rank. The three most highly ranked attributes are printed in bold.

Table 3
Importance of various product attributes when buying dairy products for each of the five countries.

	Czechia (n = 562)			Spain (n = 550)			Sweden (n = 582)			Switzerland (n = 543)			UK (n = 554)			All (N = 2,791)		
	M	SD	Rk.	M	SD	Rk.	M	SD	Rk.	M	SD	Rk.	M	SD	Rk.	M	SD	Rk.
Hedonic attributes																		
Freshness	4.42	0.77	1	4.34	0.80	1	4.09	0.80	3	4.15	0.82	1	4.37	0.78	1	4.27	0.8	1
Quality/taste	4.29	0.77	2	4.25	0.76	2	4.11	0.71	2	4.07	0.80	2	4.27	0.78	2	4.20	0.77	2
Nutrition	3.81	0.90	4	4.21	0.78	3	3.78	0.84	7	3.66	0.89	7	4.07	0.88	3	3.90	0.88	4
Healthy eating	3.73	1.04	7	4.17	0.87	4	3.81	0.92	6	3.90	0.90	3	3.90	1.03	6	3.90	0.97	5
Price	3.88	0.89	3	3.83	0.93	12	3.56	0.92	12	3.46	1.03	13	3.92	0.96	5	3.73	0.96	7
Processing	3.74	0.95	6	3.84	1.03	10	3.56	0.97	11	3.56	0.93	11	3.72	1.06	11	3.68	0.99	10
Convenience of use/ preparation	3.33	1	14	3.64	1.07	16	3.34	0.99	16	3.13	1.14	18	3.59	1.07	15	3.41	1.07	15
Special offers	3.54	1.03	9	3.59	1.02	17	3.17	1.11	18	3.25	1.16	16	3.44	1.15	16	3.40	1.10	16
Familiarity or brand	3.11	1.10	15	3.49	1.09	18	3.21	1.08	17	3.30	1.15	15	3.32	1.24	17	3.29	1.14	17
Animal welfare																		
Animal welfare	3.75	1.04	5	4.11	0.91	5	4.12	0.92	1	3.86	0.97	4	4.06	1.05	4	3.98	0.99	3
Outdoor-reared/free range	3.51	1.14	10	4.03	0.94	6	3.96	0.97	5	3.80	0.99	5	3.89	1.12	7	3.84	1.05	6
Pasture-fed	3.42	1.11	12	3.83	0.98	11	3.97	0.95	4	3.52	1.02	12	3.68	1.14	12	3.69	1.06	11
Environ. sustainability																		
Locally produced	3.58	1.03	8	3.87	0.96	8	3.68	1.03	8	3.72	0.99	6	3.76	1.12	10	3.72	1.03	8
Sustainable packaging	3.35	1.1	13	3.86	1.02	9	3.53	1.09	13	3.62	1.04	9	3.76	1.12	9	3.62	1.09	12
Food miles	3.03	1.04	16	3.77	1.04	13	3.66	1.08	9	3.62	1.05	10	3.62	1.16	14	3.54	1.11	13
Carbon footprint	2.97	1.18	17	3.70	1.11	14	3.44	1.13	14	3.31	1.09	14	3.67	1.18	13	3.42	1.17	14
Organic	2.88	1.24	18	3.69	1.05	15	3.34	1.19	15	3.16	1.19	17	3.23	1.31	18	3.26	1.23	18
Social sustainability																		
Fairtrade or producer/farmer fairly paid	3.45	1.07	11	3.99	0.93	7	3.60	1.05	10	3.64	1.02	8	3.84	1.08	8	3.29	1.14	9

Note. Only dairy consumers are considered in this analysis. Each attribute was rated on a scale from 1 (not at all important) to 5 (extremely important). Rk. = Rank. The three most highly ranked attributes are printed in bold.

Table 4

Perceived helpfulness of a sustainability label or symbol for meat and dairy products across the five countries.

	M	SD	N
Spain	4.08	0.89	623
UK	4.07	0.92	621
Sweden	3.95	0.98	645
Switzerland	3.80	1.02	640
Czechia	3.70	1.09	649

Note. Participants rated the question “For me, a label or symbol indicating sustainability of meat and dairy products would be ...” on a scale from 1 (not helpful) to 5 (helpful).

4.3. Information that should be communicated by labels

Based on the finding that participants believed labels to be helpful, it was important to investigate more closely the specific information that this type of label should communicate. When participants were asked to rate different attributes for perceived importance, we found that *animal welfare*, *food safety*, and *health and nutrition* were among the three most important attributes that participants would like to be communicated on labels for both dairy and meat products (Table 6). Some differences in ranking emerged between countries. In Czechia and Spain, *food safety* and *health and nutrition* were rated as more important than *animal welfare*, whereas the other countries prioritised *animal welfare*. Participants exhibited the lowest interest in a link or QR code to access additional information. However, it is important to note that, with an overall mean of 3.5, this was still considered important.

5. Discussion

This research investigated which product attributes were important for consumers when buying meat and dairy products. Further, the perceived usefulness of a sustainability label for meat and dairy products and the information that consumers perceive to be important on such a label were assessed. Consumer preferences were compared across five European countries with different socioeconomic, cultural, and geographic conditions. These countries were chosen based on their different production systems and cultural preferences (Schils et al., 2022; Tindale et al., 2023). Overall, the results were fairly similar between the countries. The consumers perceived the hedonic attributes of *freshness* and *quality/taste* and *animal welfare* as most important when buying meat and dairy products. This aligns with research that has indicated that taste and price are usually the main drivers of food consumption in general (Ammann, Arbenz, et al., 2023) and meat specifically (Liu et al., 2023). Information on environmental sustainability was perceived as less important than *animal welfare* and *health and safety* information, which was most appreciated on a sustainability label. Personal attitudes were more important than socio-demographic characteristics when people evaluated the perceived usefulness of labels.

5.1. Important attributes when buying meat and dairy products

Our results indicate that *animal welfare* attributes were perceived to be more important than environmental sustainability attributes (*locally produced*, *sustainable packaging*, *food miles*, *carbon footprint*, and *organic*). This preference for animal welfare compared to environmental sustainability is in line with other research, which found that (uniform or differentiated) taxes on meat received higher levels of acceptance if justified on the grounds of animal welfare rather than climate change mitigation (Perino & Schwickert, 2023). Perino and Schwickert (2023) hypothesised that a possible reason for this could be participants expecting additional individual benefits from more animal welfare (e.g. healthier or tastier products due to better animal welfare standards).

Animal welfare is a broad construct, and consensus on its definition is currently lacking (Reimert, Webb, van Marwijk, & Bolhuis, 2023). An

Table 5 Linear regression predicting the helpfulness of a sustainability label for meat and dairy products across the five countries for participants who consume meat and dairy products.

	Czechia (n = 648)		Spain (n = 621)		Sweden (n = 640)		Switzerland (n = 637)		UK (n = 620)	
	B	SD	β	SD	B	SD	β	SD	B	SD
Constant	-1.81***	0.45		0.38	-1.23**	0.37		0.39	-0.59	0.36
Age	<0.01	<0.01	-0.01	<0.01	0.01*	<0.01	<0.01	<0.01	<0.01	<0.01
Gender	-0.16*	0.08	-0.07	0.07	-0.16*	0.07	-0.08	0.07	0.15	0.07
Countryside dwellers		0.08	-0.05	0.08	0.10	0.07	0.05	0.08	0.01	0.07
Education		0.07	-0.06	0.04	0.01	0.04	<0.01	0.04	-0.01	0.04
Sustainable consumption	0.50***	0.07	0.27	0.05	0.34***	0.06	0.22	0.07	0.26***	0.05
Trust	0.09	0.05	0.07	0.03	0.15***	0.04	0.15	0.05	0.18	0.04
Environment	0.98***	0.09	0.39	0.08	0.77***	0.07	0.39	0.67***	0.79***	0.07
Food production and policies	0.21**	0.06	0.13	0.05	0.21***	0.06	0.13	0.09	0.26***	0.05
	F(8,640) = 28.62***		F(8, 613) = 17.26***		F(8, 632) = 30.82***		F(8, 629) = 27.68***		F(8, 612) = 25.86***	
	R ² = 0.26		R ² = 0.18		R ² = 0.28		R ² = 0.26		R ² = 0.25	

Note. All attributes were rated for perceived importance on a scale from 1 to 5, with increasing values indicating higher perceived importance. Gender: men (0) and women (1); Sustainable consumption: sustainable consumption of meat and dairy products; Trust: trust in government management of the countryside; Environment: general environmental attitudes using the brief version of the Environmental Attitudes Inventory (Milfont & Duckitt, 2010); Food production and policies (Howley et al., 2012; Rodriguez-Ortega et al., 2016). Significant predictors are printed in bold. *p < 0.05, ** p < 0.01, *** p < 0.001.

Table 6
Perceived importance of label attributes across five European countries.

	Czechia (n = 649)			Spain (n = 623)			Sweden (n = 645)			Switzerland (n = 641)			UK (n = 632)			All (N = 3,189)		
	M	SD	Rk.	M	SD	Rk.	M	SD	Rk.	M	SD	Rk.	M	SD	Rk.	M	SD	Rk.
Animal welfare																		
Animal welfare	3.82	1.01	3	4.29	0.92	3	4.24	0.95	1	4.07	0.97	1	4.20.	0.97	1	4.12	0.98	1
Health and safety																		
Food safety	3.94	0.94	1	4.43	0.82	1	4.01	0.91	4	4.00	0.90	2	4.19	0.89	2	4.11	0.91	2
Health and nutrition	3.85	0.94	2	4.38	0.82	2	4.10	0.95	2	3.95	0.92	3	4.12	0.89	3	4.08	0.92	3
Environ. sustainability																		
Local product	3.71	0.97	4	4.18	0.91	5	4.08	0.94	3	3.87	0.98	6	3.97	0.95	6	3.96	0.96	4
Sustainable methods of production	3.52	1.03	5	4.18	0.89	4	3.99	0.97	5	3.86	0.97	4	4.01	0.95	4	3.91	0.99	5
Carbon footprint from supply and distribution	3.19	1.12	8	3.95	1.01	8	3.64	1.13	7	3.54	1.09	7	3.89	1.01	7	3.64	1.11	7
Social sustainability																		
Ethical methods of production	3.51	1.03	6	4.15	0.89	6	3.86	0.99	6	3.74	1.02	5	3.98	0.97	5	3.85	1.00	6
Benefits for producers	3.18	1.02	9	4.11	0.95	7	3.53	1.02	8	3.48	1.07	8	3.81	0.93	8	3.62	1.05	8
Information provision																		
Link or QR code to a website for more information	3.41	1.06	7	3.88	1.08	9	3.16	1.16	9	3.69	0.96	9	3.46	1.12	9	3.52	1.10	9

Note. All attributes were rated for perceived importance on a scale from 1 to 5, with increasing values indicating higher importance. Rk. = Rank. The three most highly ranked attributes are printed in bold.

*p < 0.05, **p < 0.01, ***p < 0.001.

early attempt at a definition was made by the Brambell Commission of the UK government in 1965 (Brambell, 1965), defining animal welfare as “a wide term that embraces both the physical and mental well-being of the animal”. In our data, the general *animal welfare* attribute was valued more than more specific information regarding the production systems, such as *outdoor-reared/free range* or *pasture-fed*, possibly because they are too specific, more difficult to conceptualise, and do not encompass all elements of animal welfare. The level of animal welfare between different farms and production systems is very variable, for example in relation to stocking rates and other measures of animal welfare. These differences in production practices must be clearly defined, and addressed in claims producers and retailers are allowed to make regarding animal welfare associated with animal production systems. Hence, accurate information on animal welfare is needed. In this sense, some attempts have been made (Browning, 2022). If specific information regarding the production system is provided, the connection to animal welfare should be clearly highlighted.

In the EU, animal welfare has become a major policy issue in recent years (Simonin & Gavinelli, 2019). Passing the Farm to Fork Strategy in 2020, the EU aims to transform the European food system and evaluate and revise animal welfare laws and regulations (Chang & Chen, 2022; European Commission, 2020). The main aims of the strategy regarding animal welfare include reviewing EU legislation to align it with general sustainability goals and considering options for animal welfare labelling (Molitorisová & Burke, 2022). This aligns with evidence regarding public prioritisation of animal production system requirements; for example, the public perceives animal welfare to be one of the major agricultural policy goals in Switzerland (Ammann, Mack, et al., 2023), and Umbricht and Schaub (2022) reported that animal welfare is an important consumer priority in Switzerland. Similar results were found in the UK, where animal welfare was identified as a key concern related to current livestock systems (Blair, Moran, & Alexander, 2023).

In terms of environmental sustainability, attributes such as *local production*, and *sustainable packaging* were perceived to be more important than indicators such as *food miles* or *carbon footprint*. One explanation for this result could be that consumers tend to refer to country of

origin as a proxy for a product’s sustainability assessment (Lazzarini, Visschers, & Siegrist, 2017). Consumers’ preference for local food products has been found to be associated not only with product perceptions regarding higher environmental sustainability (i.e. short transport distance), but also social sustainability (i.e. support of local farmers), freshness, and home (Meyerding, Trajer, & Lehberger, 2019). Some scientific assessments, however, found that for animal products such as beef, emissions from transport are minor (Gaillac & Marbach, 2021; Poore & Nemecek, 2018). Other factors, such as production methods, significantly impact the environmental footprint of a product. Consumers may overestimate the effect of packaging in terms of the environmental impact of food (Lazzarini, Zimmermann, Visschers, & Siegrist, 2016), when in fact its impact in comparison to the total impact of the product is small (Jungbluth, Tietje, & Scholz, 2000; Nemecek, Jungbluth, & i Canals, L. M., & Schenck, R., 2016).

It is interesting to note that organic production, although considered important, was perceived to be of less importance than other attributes across all five countries. One possible reason for this is that organic production is associated with a number of different product attributes, such as ‘environmentally friendly’, healthy, expensive, or supportive of farmers (Zagata, 2014). Evidence of the complex nature of consumers’ perceptions of organic production was provided by Neuhofer, Lusk, and Villas-Boas (2023), who asked US milk consumers to choose between milk with a sustainability facts label and milk with a nutrition facts label. The authors showed that the sustainability facts label increased the likelihood of organic purchases. This is unexpected, as the label provided realistic information indicating that the organic product performed better in some environmental metrics but not in others. This finding could indicate that consumers use the labels as heuristics without actually understanding the labels.

5.2. Perceived helpfulness of a sustainability label

Across all five countries, the participants perceived labels to be helpful. Another result is that across all countries, personal attitudes were more important than the socio-demographic characteristics of

individuals in the evaluation of the helpfulness of sustainability labels. In Czechia and Sweden only, we found a significant and negative relationship with gender, indicating that women found a label less helpful than men. Previous research found that women tend to be more likely than men to buy sustainable products (Pomarici & Vecchio, 2014). From this, we hypothesise that women seem more interested in these products than men and therefore find sustainability labels useful, as they make it easier for them to identify sustainable products. At the same time, men may find the labels useful due to being less acquainted with sustainability issues which might therefore help them to increase the purchases of sustainable foods. This could be a useful topic for future research. However, a recent review reported that the effects of sociodemographic variables on consumers' perceptions of labels and sustainable products are mixed in many cases (Ammann, 2023). Overall, it seems that labels appeal differently to different consumer segments (Majer, Henschler, Reuber, Fischer-Kreer, & Fischer, 2022). Whereas environmentally conscious consumers might look for information regarding sustainability, other consumer segments may prefer hedonic attributes. Not surprisingly, *sustainable consumption* and *environmental attitude* emerged as significant positive predictors of the perceived helpfulness of a sustainability label across all five countries. This means that both general attitudes towards the environment and specific attitudes towards sustainable food consumption play a role in the perception of the usefulness of a label.

Regarding the attitude towards agricultural policy, attitude towards *food production and policies* was a significant positive predictor of perceived helpfulness of a sustainability label in all countries except Switzerland. A possible interpretation of this finding could be that environmental sustainability is a major topic in the food-related discourse in Switzerland (Runte, Nuessli Guth, & Ammann, 2023), which means that this has become a consumer priority.

Further, it is interesting to note that *trust in the government management of the countryside* was a significant positive predictor of the perceived helpfulness of a food sustainability label in all countries except for Czechia and the UK. Greater trust in government management in the countryside may correlate with consumers' more positive perceptions of food produced in the countryside, particularly concerning sustainable production practices (Wang, Lin, & Tsai, 2021). Consequently, consumers are more inclined to develop positive attitudes towards sustainability labels, especially when they possess a low level of behavioural control in identifying sustainably produced foods, as labelling plays a role in enhancing consumers' perceived ability to identify such foods (Aitken, Watkins, Williams, & Kean, 2020). In the present research, Czech and UK participants perceived weaker capabilities in identifying sustainably produced foods, which could explain why significant correlations between trust in government countryside management and the perceived helpfulness of a sustainability label were observed only in the two countries.

5.3. Properties of sustainability labels

In terms of product labels, participants perceived information regarding *animal welfare*, *food safety*, and *health and nutrition* as more important than *environmental sustainability*. This implies that currently, food choice decisions are unlikely to be made on the basis of the environmental sustainability of a food product's production alone. However, sustainability linked to other preferred attributes (e.g. improved animal welfare) might encourage consumers to make more sustainable food choices because of the association between the two issues. Linking sustainability attributes with other labels might be a focus for further research. Further, there is a general tendency for similarities in preferences among the five countries. Nevertheless, there are a few differences. For instance, in Sweden, local production was in the top three label properties, whereas in the other countries food safety was prioritised in addition to animal welfare, and health and nutrition. Again, we found a preference for general attributes (e.g. local production or animal

welfare) over specific attributes (e.g. reduced carbon footprint). Local production and animal welfare can be associated with specific attributes, for example, higher income for local farmers, shorter transport distances (local production) or more space for the animals, different husbandry systems or use of technology (animal welfare). Reduced carbon footprint, however, is a specific attribute.

Overall, labels should be simple (to avoid information overload) and convenient, allowing consumers to quickly access the information and make their decision (Ammann, 2023; Weber, 2021). A lack of simplicity and convenience might be the reason why a link or QR code was perceived as important but least helpful, given that consumers would have to invest additional time to check information on a website instead of simply scanning a product (label) and finding all the information necessary to make a purchase decision.

5.4. Limitations

One potential limitation was that recruitment was performed via a social science panel using quota sampling on age, gender and education. Although the sample was representative in terms of the demographic characteristics used in the quota sample, they had also agreed to participate in a social science research panel, which might bias the results. It is therefore difficult to make population level inferences about how acceptable people find sustainability labelling based on average scores.

Another limitation of this research is that consumers were asked to rate the importance of different attributes in a theoretical setting, which might differ from their actual food choice behaviour. Although future research could complement our findings with experimental data, it may also be relevant to assess food choices in relation to real-world settings (e.g. in a living laboratory¹). Although the participants indicated an interest in animal welfare when buying meat, addressing consumers' concerns for animal welfare alone would not sufficiently change consumer behaviour, as positive attitudes alone may not be sufficient to change behaviour (Grankvist & Biel, 2007; Xu, Hartmann, & Siegrist, 2023). For example, it appears that sales of welfare-friendly products tend to be lower than the reported levels of concern (Clark, Stewart, Panzone, Kyriazakis, & Frewer, 2016; European Commission, 2006). Further, there is some evidence that consumers have a small willingness to pay for improved farm animal welfare (Clark, Stewart, Panzone, Kyriazakis, & Frewer, 2017). Future research could investigate how consumer behaviour change can be supported, that is, how the perceived importance of animal welfare as product attribute can be used to support sustainable consumption behaviours. Also, more direct cross-cultural comparisons regarding the roles of different factors in affecting consumers' attitudes towards sustainability labelling should be made in future studies. This, however, demands addressing the measurement invariance of the relevant factors, thereby more precisely informing policy and marketing strategy-making across cultural contexts.

6. Conclusions

In terms of product attributes, participants valued *freshness*, *quality/taste*, and *animal welfare* as the most important when buying meat and dairy products. Producers should ensure that sustainable products score high on these attributes to make them attractive. Overall, participants across the five European countries perceived sustainability labels for meat and dairy products as helpful. However, labels alone are not enough to change behaviour, especially for consumers who have low or no behavioural intention to buy sustainable meat or dairy products. Therefore, these results should be translated into additional policy measures, such as nudges or behavioural interventions, helping individuals translate their attitudes into behaviour and facilitating the

¹ <https://enoll.org/about-us/what-are-living-labs/>.

choice of sustainable products. On product labels, consumers valued information regarding *animal welfare*, *food safety*, and *health and nutrition*. Producers can use these findings to market particularly sustainable products in a more targeted way and make them more attractive to consumers. From our country comparisons, we can conclude that the same information regarding, for instance, animal welfare and the government management of the countryside can be used by actors in meat and dairy value chains in a number of different countries. Future research should also extend to countries outside Europe.

CRediT authorship contribution statement

Jeanine Ammann: Writing – original draft, Formal analysis. **Gabriele Mack:** Writing – review & editing. **Nadja El Benni:** Writing – review & editing. **Shan Jin:** Writing – review & editing. **Paul Newell-Price:** Writing – review & editing. **Sophie Tindale:** Methodology, Conceptualization. **Erik Hunter:** Writing – review & editing. **Victoria Vicario-Modroño:** Writing – review & editing. **Rosa Gallardo-Cobos:** Writing – review & editing. **Pedro Sánchez-Zamora:** Writing – review & editing. **Simona Miškolci:** Writing – review & editing. **Lynn J. Frewer:** Writing – review & editing, Project administration, Funding acquisition.

Appendix

Table A1

Scales and corresponding items used in the survey.

Environmental attitude ($\alpha = 0.79$) (Milfont & Duckitt, 2010)

1	I really like going on trips into the countryside, for example to forests or fields.
2	Protecting peoples' jobs is more important than protecting the environment. (R)
3	I'd much prefer a garden that is well groomed and ordered to a wild and natural one. (R)
4	I would NOT get involved in an environmentalist organization. (R)
5	We need to keep rivers and lakes clean in order to protect the environment, and NOT as places for people to enjoy water sports.
6	A married couple should have as many children as they wish, as long as they can adequately provide for them. (R)
7	I do not believe that the environment has been severely abused by humans. (R)
8	It makes me sad to see forests cleared for agriculture.
9	Modern science will NOT be able to solve our environmental problems.
10	Grass and weeds growing between pavement stones really looks untidy. (R)
11	I DO NOT believe humans were created or evolved to dominate the rest of nature.
12	Governments should control the rate at which raw materials are used to ensure that they last as long as possible.
13	One of the most important reasons to keep lakes and rivers clean is so that people have a place to enjoy water sports. (R)
14	Modern science will solve our environmental problems. (R)
15	I think spending time in nature is boring. (R)
16	I would like to join and actively participate in an environmentalist group.
17	Whenever possible, I try to save natural resources.
18	It does NOT make me sad to see natural environments destroyed. (R)
19	Human beings were created or evolved to dominate the rest of nature. (R)
20	Protecting the environment is more important than protecting peoples' jobs.
21	Humans are severely abusing the environment.
22	I am opposed to governments controlling and regulating the way raw materials are used in order to try and make them last longer. (R)
23	Families should be encouraged to limit themselves to two children or less.
24	I am NOT the kind of person who makes efforts to conserve natural resources. (R)

Food production and policies ($\alpha = 0.74$)

1	I believe producing high quality food is the most important function of agriculture in my country (Howley et al., 2012)
2	Agricultural policies and premiums to farmers need to be maintained because agriculture is a strategic sector (Rodríguez-Ortega et al., 2016)
3	Agricultural premiums must be given to farmers according to their production level (Rodríguez-Ortega et al., 2016)
4	I believe that more of our land should be used for producing food (Howley et al., 2012)
5	I believe that it is important that my country is self-sufficient when it comes to producing food (Howley et al., 2012)

Sustainable consumption of meat and dairy products ($\alpha = 0.66$)

1	It is easy for me to identify sustainably produced food
2	It is easy for me to buy sustainably produced food
3	Sustainable production of food is not a priority for me. (R)
4	I intend to buy foods that are sustainably produced (intention)
5	I plan to reduce my consumption of foods that are sustainably produced (R)
6	I intend to increase my consumption of foods that are sustainably produced
7	I avoid purchasing foods that are sustainably produced (R)

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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(continued on next page)

Table A1 (continued)

Environmental attitude ($\alpha = 0.79$) (Milfont & Duckitt, 2010)	
Trust in government management of the countryside ($\alpha = 0.83$)	
1	The national government is able to manage the countryside effectively
2	The local administration/local government is able to manage the countryside effectively
3	I trust that the national government is motivated to manage the countryside effectively
4	I trust that the local administration/local government is motivated to manage the countryside effectively

Note. (R) = item has been recoded; all items were answered on a 5-point scale.

Table A2

Cronbach's alphas for all scales and countries.

	# items	Czechia (n = 649)	Spain (n = 598)	Sweden (n = 645)	Switzerland (n = 640)	UK (n = 621)
Sustainable consumption	7	0.69	0.72	0.62	0.70	0.73
Trust	4	0.80	0.84	0.85	0.81	0.86
Environment	24	0.79	0.74	0.82	0.75	0.85
Food production and policies	5	0.72	0.75	0.70	0.80	0.71

Note. Sustainable consumption: Sustainable consumption of meat and dairy products, Trust: trust in management of the countryside, Environment: general environmental attitudes using the brief version of the Environmental Attitudes Inventory (Milfont & Duckitt, 2010), Food production and policies (Howley et al., 2012; Rodríguez-Ortega et al., 2016).

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.foodqual.2024.105179>.

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