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Consumer evaluation of food quality and the role of environmental cues. A comprehensive cross-country study

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ABSTRACT

Widely explored in literature, yet it is unclear which food quality cues consumers find most relevant. The increasing consumers' concern for sustainability aspects in their food buying decisions warrants special attention to environmental-social aspects as food quality indicators. Consequently, this study explores consumer evaluation of food quality and highlights the role of environmental-social cues in food quality evaluation. A cross-national perspective was adopted, using a sample of 761 consumers from Belgium and Romania. Exploratory factor analysis reveals six factors that contained food quality cues perceived as similar by consumers. The first factor, named "Environmental-Social", comprises cues related to environmental protection and social equity. Regression analyses indicate a set of variables that can predict the perceived relevance of environmental-social cues in food quality evaluation. The present study contributes to understanding of consumer food quality evaluation by extending the analysis to a large number (59) of food quality cues. From a practical stance, the study can guide managers' efforts to enhance environmentally sustainable behavior based on the relevance of environmental-social cues in consumers' food quality evaluation.

1. Introduction

1.1. The context of debate

Quality is a matter of degree, an elusive concept (Grunert, 2007; Zeithaml, 1988), and the understanding of how consumers perceive food quality has been a central issue. According to Zeithaml (1988), the perceived quality is seen as "the consumer's judgment about a product's overall excellence or superiority" and the basic understanding of what "food quality" means is not at all universal. Acknowledging that consumers hold perceptions of food quality (Baiardi et al., 2016), the present study assumes that a critical key to understand how quality is evaluated is to look at the relevance that specific food quality cues have in consumers' minds when they evaluate quality.

Widely explored in literature, yet it is unclear which food quality cues consumers find most relevant. This is not surprising since consumers' value systems, beliefs and related food behavior are essentially culturally determined (Schröder, 2003) and, therefore, hard to generalize. Differences in food quality evaluation reflect upon consumers' beliefs and attitudes, their search for information when choosing a product, future purchase decisions, and dietary patterns (Grunert, 2005; Karoui & Khemakhem, 2019; Mascarello et al., 2015).

In light of the high impact food consumption has on environmental sustainability (Eldesouky et al., 2020; Tukker et al., 2006) and consumer's increasing preoccupancy with the effects of agricultural food production practices on environmental well-being, it seems particularly relevant to take a closer look at quality cues related to the environment. This is all the more important as higher-quality diets are often associated with lower greenhouse gas emissions, water use, cropland use, or eutrophication (Behrens et al., 2017; Conrad et al., 2018). Since the environmental impact of food can be associated with social problems such as unfair work conditions, the social aspects were also considered in this study.

Consumers' evaluation of food quality is worthy of investigation because it can help marketers adjust their strategies to consumers' characteristics. Perceived quality can be an essential marketing tool, used as a segmentation variable (Calvo-Porral & Lévy-Mangin, 2017). The study of the relevance of the environmental-social cues in

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consumers' minds can support food industry managers' efforts to adopt environmental strategies in line with consumers' perceptions (Do et al., 2019).

1.2. Aim and objectives

In light of the above-presented frame of discussion, the present study aims to gain insights into consumer evaluation of general food quality, with a particular focus on environmental cues. More to the point, the first objective was to discover which cues signal quality perception in a general food context and which cues consumers can use to define quality are related to each other. In other words, which cues are most relevant for quality perception and which quality cues are categorized together or apart, suggesting perceived similarity or difference between them. The second objective was to discover from all possible quality cues consumers can use, to which ones consumers attach an environmental-social meaning. The third objective was to reveal how well a set of variables (about the importance of food quality and environmental concern) can predict the perceived relevance of environmental-social cues in food quality evaluation. Finally, the fourth objective was to make a comparative assessment between Belgium and Romania regarding the first three objectives.

The focus on environmental-social cues is driven by the observation that today's sociality is transitioning to a more sustainable society with an increasing number of environmentally friendly consumers. Moreover, since the impact of food production and consumption on environmental degradation is steadily increasing (Aschemann-Witzel & Peschel, 2019), insights into factors adding to the use of environmental-social quality cues are warranted.

The reason for adopting the cross-national perspective is that food quality evaluation is influenced by many factors, among which cultural food customs, product availability, and familiarity with the product, which can differ from one country to another (Sulistyawati et al., 2019). Previous research has already highlighted differences in food quality perception between countries (Rahman & Luomala, 2020; Roman et al., 2017). We assumed that quality evaluation is a heterogeneous act, and this requires a context-specific assessment.

The current study builds upon existing literature, and it also brings a contribution in several directions. Firstly, the study adds to the existing knowledge by testing within one questionnaire a large number of cues that can indicate food quality, including cues related to environmental aspects. This questionnaire can serve as the base for future research on food quality evaluation and the role of environmental-social cues, bringing together both extracted food quality cues from extant studies and new ones. Consumer evaluation of general food quality was investigated, unlike most studies, which focused on a specific product. Moreover, to the authors' best knowledge, this is the first study that casts light on perceived similarities among quality cues from the consumer perspective. Secondly, it goes in-depth to analyze environmental-social cues, while other studies took into account a small number of such cues. Thirdly, it reveals what variables can predict the relevance of environmental-social cues as quality indicators. Fourth, this is among the first studies that compare two EU countries, in this case, Belgium and Romania. This study discusses food quality in terms of perceived quality.

The paper is structured as follows. The Theoretical framework highlights the consumer behavior-oriented literature on food quality evaluation and environmental-social cues that served as a basis for conceptualization. The Methodology explains the implementation of the survey and the data analysis methods. Next, the Results section presents the results obtained through the selected investigation methods. The theoretical contributions and managerial implications of the results, the limitations, and the future research directions are included in the Discussion chapter, followed by the last section that briefly explains the main Conclusions of the current study.

2. Theoretical framework

Cue utilization theory affirms that consumers use cues (where "cue" has various meanings – attributes, perceptions, information stimuli) to infer the quality of a specific food product (Olson & Jacoby, 1972). The intrinsic (e.g., shape, color, freshness) and extrinsic (e.g., packaging, price, country of origin) quality cues help consumers to make purchase decisions. Depending on the consumer's profile and type of the product, some cues have a more significant impact than others on purchase decision-making (Lago et al., 2020). Another theory, the Stimulus, Organism, Response (S-O-R) theory, considers that stimulus affects individuals' actions (Jacoby, 2002). Thus, taste, appearance, or shape of food, acting as a stimulus, can influence consumers' evaluation of the product (Konuk, 2019). The "perceived quality'" approach (Northen, 2000), adopted in this study, refers to the product quality from the consumer's perspective, making quality a subjective assessment that depends on his/her perceptions and needs. Oude and Van Trijp consider perceptions (Oude Ophuis & Van Trijp, 1995) as "judgments of the product characteristics which the consumer can associate with or has experienced when evaluating the product."

While a rich vein of research is dedicated to identifying quality cues concerning specific food products, the authors of the present study identified research gaps in the cross-national and national assessment of food quality cues in general. More precisely, there is little theory testing or theory development on general food quality cues, and limited research is based on inputs from cross-national assessments. A significant number of sources focused on quality cues for specific food products (e.g., meat, cheese, chocolate) or specific cues that can be used as a proxy for quality perception. For example, Choi and Lee (2019) investigated the influence of extrinsic cues on USA consumer acceptance and flavor perception for milk tea products. Jantzi et al. (2020) revealed the influence of price and label information on consumers' sensory perception of six red wine blends. Aboah and Lees (2020) focused on meat quality cues that consumers used in their purchasing decisions. de Andrade Silva et al. (2017) demonstrated the influence of "quality" and "sustainability labeling" on the sensory acceptance of dark chocolate.

Moreover, a second gap results from the fact that previous research does not clearly identify which cues that signal the environmental-social food aspects also inform people about food quality.

The environmental-social-related cues are present in the literature, especially when the connection between consumer food choices and sustainable behavior is studied. Consequently, the following paragraphs highlight various environmental-social cues used by consumers when they make purchase decisions. Thus, "health" and "natural content" were reported among the most important food choice cues by Milošević et al. (2012) and Petrescu et al. (2015). While conventional agriculture is one of the main drivers of biodiversity loss, contributors to climate change, and rural livelihoods' vulnerability, organic agriculture is based on sustainable farming practices. A complex image of "organic products" in consumers' minds was grasped by Howard and Allen (2010) and Zander and Hamm (2010). Literature testifies the connection between animal welfare and environmental sustainability in the context of sustainable intensification (Place, 2018). As concerns about health and environmental risks caused by meat production are growing because of food scandals, the "animal welfare" cue is used by consumers as an indicator of product attributes, including quality (Banterle et al., 2013; Gaskell et al., 2017; Grunert et al., 2018). Consumers' preferences for "free-range" products were evidenced by García-Torres et al., and Michaelidou and Hassan (2010). A paper by Van Loo et al. (2014) compared Belgian consumers' preferences for four types of sustainability claims related to "organic meat", "carbon footprint", "animal welfare", and "free-range". In Spain, although consumers appreciate

sustainability attributes in food products, this attitude is not easily translated into purchasing behavior (Eldesouky et al., 2020).

A substantial body of environmental footprint studies focused on "local food", which significantly contributed to lower GHG emissions and landscape conservation (Arsil et al., 2014; Bojnec et al., 2019; Hiroki et al., 2016; Santosa et al., 2010; Sidali et al., 2015). Country of origin may be linked to the miles from the production site to the consumer and, thus, to a specific carbon footprint or a particular resource use pattern (e.g., water, land). However, the link between the country of origin and ecological consideration is less investigated, as studies usually focused on the environmental footprint generated by product transportation (Dekhili & Achabou, 2015). The food production method can play a significant role in the environmental impact through resource use, animal treatment, emissions, etc. The importance of cues "country of origin" and "production method" were investigated in Spanish consumer purchase decision making (Claret et al., 2012). They were also studied by Pouta et al. (2010), who revealed, based on a choice experiment, the importance that consumers paid to "country of origin" and "production method" (organic production, methods that considered animal welfare and consumer health) for the selection of broiler meat in a Finnish sample.

The "environmentally-friendly production" method was often associated with "Protected designation of origin", "Protected geographical indication", and "Traditional food" (Aprile et al., 2012; Cerjak et al., 2014), which are usually signaled to consumers through labels. Hansstein et al. (2017) found that traditional food was associated with quality by Chinese consumers. Following the same direction, it was shown that various sustainability certifications and claims for food products that focus on ethical ("fairtrade") and environmental benefits (e.g., "Rainforest Alliance" and "Carbon Footprint") are increasingly sought after by consumers all over the world (Aprile et al., 2012; Banterle et al., 2013; de Andrade Silva et al., 2017; Gaskell et al., 2017; Sirieix et al., 2013; Zander & Hamm, 2010). As explained by Magnier et al. (2016), intrinsic environmental-social (sustainability) cues can only be communicated via labels and logos. Consequently, labels such as "Fairtrade label", "Effect on rainforest, "CO2 footprint", and "Social equity" were included in the analysis as many times these labels are the only way consumers can recognize the environmental-social cues of a food product.

Not least, the environmental impact of the food is high relative to "packaging" that significantly contributes to or counteracts environmentally sustainable development, both in terms of packaging materials production and end-of-life. Therefore, many papers heeded calls on food "packaging" (Ares et al., 2010; Milošević et al., 2012; Venter et al., 2011).

Taking the previously mentioned gaps as a challenge and following Zeithaml's (1988) model (which uses the cue utilization theory), authors conducted an extensive literature review. The starting point was the most cited quality (Olson & Jacoby, 1972; Steenkamp, 1990) and food quality evaluation models (Bredahl, 2004; Chamhuri & Batt, 2015; Grunert et al., 1996; Molnar, 1995; Oude Ophuis & Van Trijp, 1995; Peri, 2006; Steptoe et al., 1995). Based on these, a set of food quality cues was selected and combined with the cues obtained from two focus groups on Belgian and Romanian consumers. This process generated 59 items (cues) for quality evaluation, of which 22 were related to sustainability, which were included in a questionnaire. The inclusion of a large number of quality cues in the questionnaire aimed to capture as much as possible of consumers' patterns of food quality evaluation. Finally, the research hypotheses included in Table 1 were established in connection to the study objectives.

Table 1
Research hypotheses.

H number	Content
H1a, b	(a) Food quality cues differ in their relevance for indicating food quality (b) There are groups of food quality cues that are considered similar by consumers. [This is linked to the first objective]
H2	The following cues are perceived as similar by consumers when they evaluate food quality, and the common feature is an environmental-social significance: "GMOs", "Cloned animals", "Country of origin", "It is a natural product", "It is a traditional product", "It is a local product", "It is a free-range product", "It is a product obtained from wild animals/ plants", "It is an organic product", "Quality labels: PDO, PGO, TSG", "Fairtrade label", "Label about: Effect on rainforest, CO2 footprint", "Social equity", "Deforestation, reforestation", "Use of fertilizers, pesticides", "Other pollution generated along the food chain", "Animal welfare", "Resources consumed along the food chain", "Packaging: being recyclable and the amount", "Loss of biodiversity", "Waste generated along the food chain", and "Packaging material". [This is linked to the second objective]
H3	The following independent variables "Attention paid to food quality", "Frequency of food quality evaluation during buying process", "Frequency of food quality evaluation after purchasing", "Importance of stopping environmental degradation", "Consequences of human activity on the environment state at country level", "Consequences of human activity on the environment state at global level", "Selective collection of waste", "Financial donations to environmental actions/ causes", "Financial donations to social actions/ causes", "Voluntary involvement in actions for environmental goals", "Voluntary involvement in actions for social goals", "Purchase of organic food", "Purchase of other organic products" contribute to the prediction of the relevance of environmental-social cues in food quality evaluation. [This is linked to the third objective]
H4a,b	There are differences between Belgian and Romanian consumers regarding (a) the relevance assigned to food quality cues and (b) the predictive power of variables that reflect the importance of food quality for consumers and variables that characterize their environmental concern on the perceived relevance of environmental-social cues in food quality evaluation. [This is linked to the fourth objective]

3. Method

3.1. Participants and study design

This study relies on two surveys developed in Belgium and Romania. The two countries were selected with the aim to remain within the EU context and to have, at the same time, different country characteristics that may lead to different food quality evaluations. Such characteristics may be differences in diets and level of economic development. Both are acknowledged between Western and Central-Eastern countries (Petrovici & Ritson, 2006). Following these reasons, Belgium and Romania were chosen for analysis. They are both EU members but are different in terms of surface, population, economic development, history of free-market experience. One is a Western country and the other a Central-Eastern country. In addition, the selection of Belgium and Romania was motivated by the fact that it was more convenient to investigate consumers from these two countries because the researchers knew the language and the market context.

The surveys collected 761 valid questionnaires: 434 from Belgium and 327 from Romania. It was suggested that 5–10 responses per each estimated parameter would result in an appropriate sample size (Hair et al., 2014) and that a sample size over 500 is considered very good (Comrey & Lee, 1992; Tabachnick & Fidell, 2001). The questionnaire was posted online on the iSondadaje.ro website and distributed in Belgium and Romania. Also, a printed version was completed through face-to-face interviews by Romanian consumers. In Belgium, the invitation to answer the questionnaire was sent to email lists obtained from a university and organizations focused on food and the environment. In Romania, 40 interviews were done face-to-face with randomly selected people from one city, as follows: ten shopping points were chosen at random and an interview was requested to every fourth person who came out of the shop. For the questionnaire's online distribution, a list with random numbers was generated in Excel, then emails with those numbers were selected from a list with emails (numbered from 1 to 10, 000), and an invitation was

sent. Participants were informed about the nature of the research and participation was voluntary. Data were collected in 2018. The sample structure is presented in Table 2.

A questionnaire was created (Food Quality Evaluation Questionnaire), pre-tested twice on groups of 30 consumers, and adjusted before data collection in terms of survey design and content for comprehensibility and functionality. The questionnaire had four sections (Table A.1 in the Annex). One section of the questionnaire asked about the importance of quality for consumers. Firstly, they were asked how much attention they paid to food quality on a 7-point scale ranging from not at all to a lot of attention. Then, to mitigate the risk of the attitude-behavior gap (Vermeir & Verbeke, 2006), they were requested to indicate how often they assessed food quality, on a 7-point scale ranging from "never" to "always", at two moments – during buying decision process and after purchase (Grunert, 2005).

Another section asked about quality cues. Consumers received a list with 59 quality cues, including 22 on environmental-social aspects, and they were requested to indicate how relevant each of them was for indicating food quality on a 7-point scale ranging from "it cannot tell anything about food quality" to "it tells a lot about food quality".

The third group of questions tested their environmental concern by asking how much they engaged in activities like selective waste collection or purchase of ecological food on a 3-point scale (often, from time to time, rarely/never). The European Values Study (EVS) (GESIS, 2018) was used as a starting point, and a set of ten variables was created to characterize consumer environmental concern (Table 3). Finally, we collected demographic data (gender, age, education level, average income, children, living environment, and country).

3.2. Data analyses

Several different statistical methods were used to understand how consumers evaluate food quality. These include descriptive statistics, Mann Whitney U test, Wilcoxon Signed Rank Test, Exploratory Factor Analysis (EFA), reliability analysis, and standard linear regression. The use of the exploratory approach is justified by the need for additional research regarding consumers' food quality evaluation process in two different social-economic contexts (Belgian and Romanian). The choice of the EFA was made following a careful assessment of the available options. We chose EFA instead of confirmatory factor analysis (CFA) because of the uncertainty regarding the specific factorial structure of the food quality evaluation questionnaire, how many factors should be modeled, and which cues should load on which factor. Confirmatory factor analysis (CFA) and exploratory factor analysis (EFA) share common features, but there are also conceptual and statistical differences between them. They both show the shared variance of measured variables that is believed to be attributable to a factor or latent construct. Regarding differences, EFA is used when the number of factors within a measure is unknown and when the allocation of items to factors must be determined (Mussel et al., 2011; Ziegler, 2014). EFA is not based on theory; it explores the data and provides information about the number of factors required to represent the data. CFA is used when a theory exists that provides a clear idea about the number of factors and the relationships between factors and items (Ziegler, 2014). In CFA, researchers specify the number of factors in the model and the relationships between variables. In brief, EFA explores the relationship between variables, while CFA confirms or rejects the measurement theory. The present study is exploratory in nature, which made the use of EFA a reasonable choice, similarly to other studies ((Akkaya, 2021) Laurett et al., 2021; Lusk, 2019; Neupane et al., 2021; Nezlek & Forestell, 2019; Schunko & Vogl, 2020). We are aware that, to validate the results of the EFA, CFA must be run. One option would be to use both EFA and CFA on the same sample. This was not preferred in the present analysis considering that the use of the same dataset brought the risk of overfitting, as Fokkema and Greiff (2017) warned, and that running both EFA and CFA on the same dataset is just confirming that the two modeling approaches on the same data converge (Green et al., 2016) apud (Memon et al., 2017). Another option would be to randomly assign, for example, 40% of the sample to EFA and 60% to CFA. The present analysis adopted a comparative approach between Belgium and Romania, so each national sample should be split in 40–60%. This would result in four samples too small to run the factor analysis (131 and 196 people, respectively, for the Romanian sample to run the EFA and CFA; 174 and 260 people for the Belgian sample). Hair et al. (2014) recommend to have a "respondents: item" ratio between 5 and 10, which means that at least 295 respondents per sample are needed for the present analysis on the 59 quality cues.

Regression was used to test the relationship between variables that reflect the importance of food quality for consumers and variables that characterize their environmental concern (independent variables), on the one hand, and the perceived relevance of environmental-social cues in food quality evaluation (dependent variables), on the other hand. Analyses were performed with the software Excel and SPSS.

Table 2
Summary statistics (N = 761).

Variable	Description	Frequency (%)	Mean
Gender	Men	35.9	
	Women	64.1	
Age	Years		25.8
Nationality	Belgian	57	
	Romanian	43	
Living environment	Urban	51.6	
	Rural	48.4	

4. Results

The level of reported attention consumers pay to food quality and the reported frequency of evaluating food quality were above the average score (Table 4).

Mann Whitney U test revealed a statistically significant difference between the attention paid to food quality at purchasing time by Romanian and Belgian consumers ($p < 0.05$), with Romanians showing higher mean ranks (the histograms with the distribution of the attention scores for the two countries are presented in Fig. A.1, Annex). Wilcoxon Signed Rank Test showed a statistically significant difference between the frequency of the quality evaluation on the two tested occasions, before and after purchasing for the entire sample (Z = -7.976, p = 0.001), Belgians (Z = -6.788, p = 0.001), and Romanians (Z = -4.236, p = 0.001). In all cases, consumers evaluated food quality more frequently at purchasing time.

The average scores in the total sample assigned to the relevance of cues to indicate food quality ranged from 31.7% (2.9 points) and 80% (5.8 points) of the maximum level (Fig. 1). A statistically significant difference between countries was observed for 74.6% of quality cues. A higher mean rank of scores was found among the Romanian sample in approximately two-thirds of the cases with a difference (Fig. 1). The relevance of the environmental-social cues ranged from 73% to 58% of the maximum level in the Belgian sample and from 63% to 55% in the Romanian one. The relevance was statistically significantly higher for Belgians in almost all cases, signaling a more important role of environmental-social cues in food quality evaluation in Belgium.

The 59 items of the Food Quality Evaluation Questionnaire, which investigated the relevance of food quality cues for consumers, were

Table 3
Variables that characterize consumer environmental-sustainability concern.

EVS variable	Variable(s) derived from the EVS variable and used in the current study	
	The formulation in the questionnaire used in the present study	Explanations (the scale used in the questionnaire)
"I would give part of my income if I were certain that the money would be used to prevent environmental pollution."	"Financial donations to environmental actions/ causes"	Estimated frequency is measured (often; from time to time; rarely/never*)
	"Financial donations to social actions/ causes"	Estimated frequency is measured (often; from time to time; rarely/never) It was included in order to capture also the social dimension of sustainability
"It is just too difficult for someone like me to do much about the environment."	"Selective collection of waste"	Estimated frequency is measured (often; from time to time; rarely/never)
	"Purchase of organic food" "Purchase of other organic products"	New variables represent actions with positive potential environmental impact
"There are more important things to do in life than protect the environment."	"Importance of stopping environmental degradation"	7-point scale: 1 = Not at all important, . . ., 4 = Average importance, . . ., 7 = Extremely important
"There is no point in doing what I can for the environment unless others do the same."	"Voluntary involvement in actions for environmental goals"	Estimated frequency is measured (often; from time to time; rarely/never)
	"Voluntary involvement in actions for social goals"	Estimated frequency is measured (often; from time to time; rarely/never) It was included in order to capture also the social dimension of sustainability
"Many of the claims about environmental threats are exaggerated."	"Consequences of human activity on the environment state at country level" "Consequences of human activity on the environment state at global level"	Perceived gravity was measured (not at all grave; low gravity; average gravity; high gravity; extremely high gravity)

* Following the example of other studies (Markle, 2013; Takahashi & Selfa, 2015) where the frequency of pro-environmental behavior was measured on a 3-point scale and with the purpose to reduce answer time and, thus, increase the response rate, some items were measured on a 3-point scale.

Table 4
Attention paid to food quality and frequency of evaluating food quality by investigated consumers (average scores on a scale from 1=the lowest level to 7=the highest level).

	Attention paid to food quality	Frequency of food quality evaluation during the buying process	Frequency of food quality evaluation after purchasing
Total	5.7	5.5	4.9
Belgian	5.5	5.6	4.9
Romanian	5.9	5.5	4.9

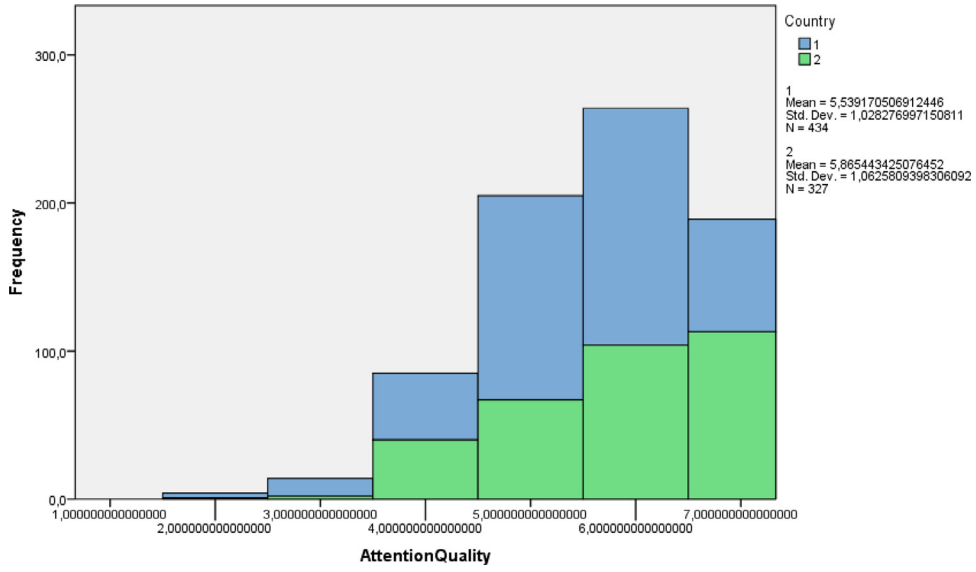

Fig. 1. Perceived relevance of cues for indicating food quality, included in the Food Quality Evaluation Questionnaire (average scores; cues are ranked from the most relevant to the least relevant based on the results for the total sample)

(When a statistically significant difference was found, the abbreviation of the country name with higher relevance scores was mentioned at the end of the cue name; average scores are calculated on a scale from 1 to 7: 1=it cannot tell anything about food quality, . . ., 4=it has an average capacity to indicate food quality, 7=it tells very much about food quality).

processed separately for Belgian and Romanian consumers, using EFA in SPSS, in response to the first and fourth objectives. EFA was used because it is often run in the early stages of research to explore the interrelationships among a set of variables (Pallant, 2005). Principal Components Analysis (PCA) was used as an extraction method for EFA because it is the default method in SPSS, and it is the most straightforward and most intuitive model. Before performing PCA on the 59 items, the assumptions regarding the suitability of Factor Analysis were checked, and the results showed they were fulfilled. Thus, there were correlation coefficients of 0.3 and above in the correlation matrix; the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) value was 0.912 for the Belgian sample and 0.939 for the Romanian sample, therefore, above the required level of 0.6 (Kaiser, 1970, 1974); and the Barlett's Test of Sphericity value was significant, $p = 0.001$, in both cases (Bartlett, 1954).

To determine how many factors should be retained, parallel analysis was run and indicated to retain six factors for the Belgian sample and five for the Romanian one. Considering that this is an exploratory technique, that there is no hard and fast statistical rule that imposes a specific decision (Pallant, 2005) and aiming to have a better context for comparison, it was decided to retain six factors for each sample – Belgian and Romanian.

A rotation was performed to clarify and simplify the results of factor analysis. The rotation does not change the basic aspects of the analysis, such as the amount of variance extracted from the items; what it does is to rotate the axes so that the clusters of items fall as close as possible to them and, thus, are easier to interpret. According to Osborne (2015), there are two main rotation methods groups: orthogonal and oblique (depending on the angle maintained between the *X* and *Y* axes). Orthogonal rotations produce factors that are uncorrelated (i.e., maintain a 90° angle between axes); oblique methods allow the factors to correlate (i.e., allow the *X* and *Y* axes to assume a different angle than 90°) (Osborne, 2015). In the present case, an oblique rotation, the Oblimin rotation, was used, and it revealed higher correlations than 0.3 between factors for both samples. Therefore, the Oblimin rotational technique was proved to be more appropriate. The final Pattern matrix is presented in Table A.2. The items which loaded on more than one factor were eliminated if the difference between loadings was smaller than 0.3. If the difference was 0.3 or above, the items were kept within the factor where the loading was higher. An inspection of the communalities (which show how much of the variance in each item is explained) indicated that all their values were above the recommended level of 0.3 for both samples.

Factors group together items that are similar to each other but distinct from the items nested within the other components. Item selection is a major challenge in studies focusing on new measures and the existence of different views in literature on how to select the items makes this task even more difficult. Thus, statisticians recommend retaining an item in a factor based on the item's factor loading value. A frequently cited example is that of Osborne et al. (2008), who recommend to consider a value above 0.4 as acceptable. Child (2006) considers that a value at least 0.2 can be kept. Additionally it is recommended that all factors resulted from the EFA should have at least three items with loadings above 0.4 in the rotated factor matrix (Yong & Pearce, 2013). This condition was fulfilled in the results generated by the EFA, therefore the items with factor loadings of at least 0.3 were retained in the components. There are also scientists, such as Ziegler (2014), who recommend that decision rules like item discrimination rules should consider not only a statistical cutoff value, but also the aim of the measurement. Ziegler's argument is that authors who rely only on statistical cutoffs may risk eliminating exactly those items needed to fulfill the measurement aim. In the present case, the study aim was to observe what specific food quality cues group in consumers' minds to form a component with a unitary meaning. To this end, the components need to cover a wide range of quality cues. As a consequence, item distributions will vary and the differences in item distributions might potentially lead to low loadings or low item total discriminations for those items with extreme and/or deviating item distributions (Ziegler, 2014). The present research focuses on subjective food quality, a concept that may have very different meanings from one consumer to another. Furthermore, as stated in the Introduction section, there are many cues that contribute to the definition of perceived food quality. Given the elusive nature of subjective food quality and the lack of previous studies for grouping various food quality cues, we opted to follow Ziegler's (2014) view on the decision to keep or eliminate items. Practically, authors' approach for the item selection strategy in the present study was set to find the balance between fulfilling the research aim and ensuring a good psychometric measurement.

The reliability of each factor was checked with Cronbach's Alpha coefficients and the values were above the recommended threshold of 0.7 for all six factors and both samples. The first factor grouped cues that were related to the environment. EFA revealed that the Belgian sample considered that 12 were related to the environment-social aspects (consequently, these variables form the first factor for the Belgians), and the Romanian one perceived 10 of them as having environmental-social significance (Table A.2, Annex).

After running the EFA, the objective was to observe whether the relevance of the 12 environmental-social cues (which form the first factor according to EFA) to indicate food quality depends on 13 independent variables related to the attention paid to food quality and consumer environmental concern (Table A.3, Annex). Regression tests were used for this purpose. More precisely, the independent variables were: "Attention paid to food quality", "Frequency of food quality evaluation during buying process", "Frequency of food quality evaluation after purchase", "Frequency of financial donations to environmental actions/ causes", "Frequency of financial donations to social actions/ causes", "Frequency of selective collection of waste"; "Frequency of purchase of organic food", "Frequency of purchase of other organic products"; "Frequency of voluntary involvement in actions for environmental goals", "Frequency of voluntary involvement in actions for social goals", "Importance of stopping the environmental degradation", "Seriousness of the consequences of human activity on the environment state at country level", and "Seriousness of the consequences of human activity on the environment state at global level" (column (1) and the first note in Table A.3, Annex). The dependent variables were (one at a time): "Fairtrade label", "Effect on rainforest, CO2 footprint", "Social equity", "Deforestation, reforestation", "Use of fertilizers, pesticides", "Other pollution generated along the food chain", "Animal welfare", "Resources consumed along the food chain", "Packaging: being recyclable and the amount", "Loss of biodiversity", "Waste generated along the food chain", and "Packaging material" (column (2) in Table A.3, Annex). Consequently, regression tests were run on each of these 12 environment cues. A synthesis of the regression test results is included in Table A.3, Annex. The Standardized coefficients (beta) (column (3) in Table A.3, Annex) allow us to compare the contribution of each independent variable to the prediction of the dependent variable, when the variance explained by all other variables in the model is controlled for. To see if this contribution is statistically significant, its associated p-value must be 0.05 or less (column (6) in Table A.3, Annex). To simplify the interpretation of the results, only variables with prediction power were included in this table, and, thus, all p values in this column are less than 0.05. The unstandardized coefficients (column (4) in Table A.3, Annex) are used to construct regression equations. The standard error (column (5) in Table A.3, Annex) is a measure of the accuracy of predictions, a measure of uncertainty associated with the regression coefficient. The R^2 value

shows how much of the total variation in the dependent variable is explained by the independent variables. In this case, its value ranges from 25.7% (for the first regression, Belgian sample) to 44.7% (for the tenth regression, Romanian sample). This is an acceptable result as studies indicate R^2 values should be at least 0.10 for the variance explained of a particular endogenous construct to be accepted [(Falk & Miller, 1992) cited by Nasip et al., (2017)]. The p-value for the model (column (8) in Table A.3, Annex) indicates the statistical significance of the regression model that was run. In this study, all values are less than 0.05, which indicates that, overall, each regression model statistically significantly predicts the outcome variable. Nine out of the 13 independent variables were found to have predictive power on the relevance of the selected environmental cues for indicating food quality.

5. Discussion

5.1. Theoretical implications

Zooming in on food consumer behavior literature, the present study assumed that consumers have different levels of quality consciousness or personal relevance attached to food quality, affecting their quality evaluation and decision-making process (Jeong & Jang, 2019; Verbeke et al., 2007). In this way, investigating the importance attached to food quality cues contributes to the understanding of the "universe of food quality" (Peri, 2006). It can be inferred that the present study extends the existing knowledge on food quality cues by adding the Belgium and Romanian consumers' perceptions of a large number (59) of cues, with a special focus on the environmental-social ones.

This contribution indicated that freshness stood out as the most relevant food quality indicator, and it was closely accompanied by taste and hygiene (Fig. 1), similarly to the results of other studies (Chamhuri & Batt, 2015). Often, intrinsic quality cues (e.g., taste, color, freshness) were found to be much more relevant than the external ones (price, brand, packaging) in determining consumers' overall quality perceptions of food products (Chung et al., 2006). However, other cues were also reported to be important for consumers in determining food quality, like color, fat, and origin when purchasing pork (Grunert et al., 2018).

Both Belgian and Romanian consumers evaluate food quality more often at purchasing time compared to after purchase (e.g., the moment when they usually prepare or eat food), thus confirming the importance of the availability of food quality cues during the buying process (Table 4). The fact that investigated consumers pay high attention to food quality during purchasing time is in line with the commonly accepted fact that consumers, in general, prefer high-quality products (Van Rijswijk & Frewer, 2008).

EFA revealed six factors that had a common underlying feature in both samples and also included several differences between samples (Table A.2, Annex). One of the most important tasks that researchers have in running a EFA is to name the factors so that the names reflect their content. Following this aim, we named the factors "Environmental-Social", "Nutrition", "Convenience and suitability", "Artificial", "Sensory and first-sight", and "Trustworthiness and origin (Quality labels)". The first two factors are the most similar ones, with only one different item in each sample. Regression tests revealed differences between Belgian and Romanian samples regarding the predictive power of independent variables for each dependent variable (Table A.3, Annex).

The first factor, named "Environmental-Social", comprises cues related to environmental protection and social equity. These can be obtained from labels or other sources than a label, such as the Internet, friends, and mass media (Bosona & Gebresenbet, 2018) (e.g., information about deforestation linked to beef meat production from the Internet). The relevance of their investigation stands in the fact that the use of this information relies on consumer awareness, activism, and pressure on the market, which altogether can improve the business environment and ethics, thus promoting sustainability in the global supply chain (Lim et al., 2017). Tucker and Farrelly (2016) showed in an investigation dedicated to food waste that concern for chemicals, climate change, and biodiversity preservation was linked to food practices from purchase to disposal. A study on developing countries highlighted that social responsibility influences consumers' food preferences and purchasing decisions and that informed consumers preferred to buy products obtained sustainably and responsibly (Toussaint et al., 2021). In the present study, what turns out to play a relevant role for investigated people is the presence of "Fertilizer, pesticides" cue in this group, signaling that consumers associate the use of these chemicals with environmental aspects more than with health-related ones. Both packaging cues are present in this factor. Although the impact of chemicals from packaging materials on food is well recognized (Ernstoff et al., 2019; Muncke, 2011), tested consumers associate the packaging material more with environmental concerns than its possible impact on health.

It was evidenced that "Fairtrade" belongs to the "Environmental-social" factor for Belgians, while Romanians include it in the "Trustworthiness and origin (Quality labels)" factor. Thus, we can understand that the "Fairtrade" label conveys trust to Romanians, while it is a carrier of environmental-social characteristics for Belgians.

Although the research hypothesis assumed that 22 variables convey environmental information, surveyed results indicated that consumers perceived only 12 of these as sustainability cues, while the others were associated with different characteristics. Thus, Belgians included "GMOs" and "Cloned animals" in the "Artificial" factor (the fourth one), together with "Coloring", "Preservatives", "Taste enhancers", and "Other artificial additives", suggesting they are perceived as "artificial" features of food rather than environment-related ones. The fact that these two cues are not present in any factor generated by factor analysis in the Romanian sample implies that they have a lower capacity than the rest of the cues to convey a specific type of information related to food quality. The rest of the cues which were initially considered to be environment-related, but, according to EFA, were not perceived as such by consumers ("Country of origin", "It is a natural product", "It is a traditional product", "It is a local product", "It is a free-range product", "It is a product obtained from wild animals/ plants", "It is an organic product", and "Quality labels: PDO, PGO, TSG") were all included in the "Trustworthiness and origin (Quality labels)" factor (the sixth one) by Belgian consumers.

For Romanian consumers, the "Trustworthiness and origin" factor (the fifth one here), gathers cues representing the origin of the products and the quality labels for consumers. This factor shows the most numerous differences between the two national samples. The "Local" aspect is seen as a quality label for both samples. This food attribute was often mentioned as an essential motive in food choice, even if the underlying reasons for supporting "Local" may vary among consumers. Some may buy it to save money, others for health benefits (Arsil et al., 2014), and others are motivated by social embeddedness (e.g., belonging to the community, connection with traditions, trust, support of local economy) (Memery et al., 2015; Skallerud & Wien, 2019).

Largely criticized for the negative impact on the environment and health, conventional food is increasingly bypassed by consumers prone to healthy food products, like organic, free-range, or mountain products. The shift in consumers' preferences for minimally-processed, less-pesticides use, fresh products, or additive-free foods (Scholliers, 2015; Stranieri et al., 2017) and for traditional, PDO, PGI, TSG, or local products (Caputo et al., 2018) determined conventional food producers become more oriented to consumers' health, pro-environmental and pro-social concerns. In the current study, all these

cues are perceived as similar, and they gather in the same factor. Naturalness, too, is a type of quality label for Belgian consumers. Previous studies also found that the perceived naturalness of a product positively influences the perceived quality of a product (Tobler et al., 2011). Prior research reported that, usually, consumers defined natural mainly by the absence of "undesirable" inputs such as additives and human intervention, and perceived it as environmentally friendly and healthier (Liu et al., 2017; Rozin et al., 2012). However, here, "It is a natural product" was associated with various quality labels more than with the cues related to the artificial character of the product (factor four for Belgians and six for Romanians). "It is an organic product" is also a quality label for Romanians who also often associate it with healthier and more environmentally-friendly foods (Petrescu & Petrescu-Mag, 2015; Petrescu et al., 2017). The presence of the "Country of origin" cue in this factor suggests that its meaning in consumers' minds is more similar to a quality guarantee of the product than directly pointing to environmental impacts, such as the one derived from traveled distance.

The inclusion of the "Processing type" (e.g., fried, boiled) in the second factor ("Nutrition") suggests its association in consumers' minds with intrinsic nutrition characteristics of food. "Hygiene" is also connected by Belgians with nutrition aspects, which is unexpected and shows that "Hygiene" is judged as an intrinsic quality rather than being related to the process of producing or selling food. However, this is not present in the factor structure for the Romanian sample.

The third factor, "Convenience and suitability" contains cues that indicate how convenient is to prepare or to buy the food item (e.g. "Cooking", "Storing instructions") and how suitable it is with consumer's interests (e.g., "New on the market"). Belgian respondents (unlike Romanians) associate "Familiarity" and "Availability" with convenience. The presence of "Expiration date" and "Allergens" within this factor in the Belgian questionnaire signals the fact that for surveyed Belgian consumers, "Expiration date" and "Allergens" carry a significance that is closer to the use, manipulation, and convenience of the product than to intrinsic nutritional cues.

The fifth factor (the fourth one for Romanians) contains cues that consumers inspect with their senses and at the first-sight. "Taste", "Smell", "Appearance", "Quantity", "Freshness", "Price" and "Expiration date" cues are usually the ones observed at the first contact with the product, mostly through visual inspection, and taste through degustation in some cases (e.g., fruits or other products in markets or in degustation stands in supermarkets). The influence of visual cues (from the food itself, such as its color or shape, to cues belonging to the physical environment attached to the food, like product display area) on food choice was already highlighted by various studies (Coucke et al., 2019; van der Laan et al., 2011). Vermeir and Gudrun (2020) present a comprehensive review on visual aspects, they describe the visual cues people look at, at first sight, and include color, shape, esthetic cues (e.g., symmetrical design), materiality (e.g., food texture), text and picture combinations, logo, location, movement, spatial relation between object and the self (i.e., third versus first-person perspective). It is unexpected that "Quantity", "Freshness", and "Price" are not present in the factor structure for Romanian consumers, implying that these cues are not indicating to Romanians similar food quality characteristics as "Taste", "Smell" and "Appearance" do. In exchange, "Expiration date" is perceived as similar to these by Romanians, but not by Belgians who associate "Expiration date" with "Convenience"-type characteristics from factor three.

Several insights resulted from the regression analyses with 12 sustainability quality cues as a dependent variable and 13 variables as independent variables. Even though "Attention paid to food quality" is relatively high (5.7 points out of max. 7; Table 4), regression analysis indicated that "Attention paid to food quality" can predict the relevance of only three sustainability cues, only for Belgian consumers, and in a negative way. Thus, results show that when Belgian consumers pay more attention to food quality, they perceive less relevance of cues "Fairtrade label", "Effect on rainforest, CO2 footprint", and "Social equity" in indicating food quality. Possibly, they are consumers who perceive the mentioned sustainability aspects as more detached from the material world of food quality and more related to ethical motivations, such as rainforest preservation for future generations. The same negative relationship is observed in the Belgian sample between the frequency of "Selective collection of waste" and the relevance of cues "Effect on rainforest and CO2 footprint" and "Loss of biodiversity".

Regarding the predictive power of the variables "Frequency of food quality assessment before purchase", a difference between countries is present concerning it. The variable is statistically significant only in the Romanian sample and only for the cues "Use of fertilizers, pesticides", "Packaging: being recyclable and the amount", and "Packaging material".

"Importance of stopping environmental degradation" is the variable that influenced the relevance of each environmental cue. This perception and the one about the gravity of the "Consequences of human activity on the environment state at country level" directly express concern for the environment. Previous research (Melbye et al., 2017; Nguyen et al., 2016; Schanes et al., 2018) demonstrated that people that voice a high environmental concern are more likely to adopt a sustainable consumption behavior.

The other independent variables ("Consequences of human activity on the environment state at global level", "Financial donations to environmental actions/ causes", "Financial donations to social actions/ causes", and "Voluntary involvement in actions for environmental goals") included in the H3 research hypothesis did not have any contribution to the prediction of the relevance of environmental cues in food quality evaluation.

5.2. Managerial implications

The study suggests that food-marketing managers should consider consumers' understanding of food quality cues to enhance their purchase satisfaction and drive them into more sustainable choices. Marketers should acknowledge that even if not all the 59 cues are used simultaneously when the quality of one food item is evaluated, it is important to know their relevance for consumers within the quality evaluation process for at least two reasons. Firstly, it serves to discover if there is a need for marketing interventions to change consumers' perceptions regarding the relevance of a specific cue. Secondly, when a cue is relevant for consumers, it is important that consumers have the opportunity to use it. For example, even when information about cloned animals is relevant for some consumers in the Romanian market context, they cannot use it because it is rarely present on the market. Another interesting aspect is that, in many cases, the relevance of the quality cues nonrelated to the environment was higher in the Romanian group compared to the Belgian one. This difference could stem from an overall higher appreciation of the cues involved in food quality evaluation and of higher attention given to the food quality assessment process by Romanians. The latter assumption seems to be supported by consumers' answers to the question about the attention assigned to food quality (Table 4).

Another difference between the two samples refers to the attention paid to food quality at purchasing time, with Romanians paying statistically significantly higher attention. One possible explanation can stem from the dual standard, a much exposed concet in media. The dual standard means the existence of products presented under the same brand and packaging but with different ingredients on different markets (European Commission, 2019). The European Commission acknowledges that multinational companies sell food products with lower quality ingredients in Eastern EU member states (former communist countries), thus eroding consumers' trust in the

brands which adopt such practices (Euractiv, 2018). From a practical perspective, this finding shows to managers who operate on the Romanian market that if their messages focus on quality cues, they will gain consumers' attention, which is an important step toward final purchase.

In a global context where 30% of current biodiversity loss is due to animal husbandry (Stoll-Kleemann & Schmidt, 2017), many strategies from technological to natural sciences have been proposed to boost food production while protecting biodiversity, but it is appreciated that none of these are likely to stop biodiversity loss (Crist et al., 2017). To compensate for this drawback, consumer behavior investigation may offer insights to be incorporated in strategies with positive environmental impact. The consideration for investigation of food quality cues like "Loss of biodiversity", "Waste generated along the food chain", or "Pollution generated along the food chain" can have a relevant role for up-scaling improvements in the understanding of the environmental impact of food production. The promotion of sustainability-related characteristics of the food is valued as one of the main channels to encourage a pro-environmental food consumption pattern (Grunert et al., 2014). In some countries, sustainability labels were found to be attractive for business consumers, such as retailers and processors (Ricci et al., 2018). As long as these characteristics are credence attributes, food labeling schemes (e.g., Rainforest Alliance, Recyclable/ Plastic-free packaging) communicate these invisible characteristics, and they have the ability to facilitate better-informed consumer choices, as was reported by Apostolidis and McLeay (2019). For the Belgian sample, one more item is present within this factor compared to the Romanian sample – "Animal welfare", suggesting that it should be taken into account by managers when the environmental-social side of quality evaluation is assessed.

The "Expiration date" is associated with "Convenience and suitability" by Belgians and with "Sensory and first-sight" characteristics by Romanians. This difference suggests that the ways of promoting "Expiration date" as a carrier of food quality information should differ between countries to be more easily accepted by consumers. Thus, it should be put forward as a convenience cue for Belgians and as an easily and rapidly accessible cue for Romanians. Another option would be to link the "Expiration date" to other cues associated with convenience in Belgium and with first-sight aspects in Romania to converge with consumers' views on it.

Marketing managers could use the results from the regression analyses to take better advantage of consumers' food quality evaluation process. Thus, the regressions for the prediction of "Use of fertilizers, pesticides", "Packaging: being recyclable and the amount", and "Packaging material" show that Romanian consumers who have the habit to frequently assess food quality during the buying process will perceive the three mentioned environmental cues as having higher relevance in expressing quality. As such, the availability of these cues during the purchasing decision process will influence quality perception.

The cue "Frequency of food quality evaluation after purchasing" has predictive power for all environmental cues except for "Effect on rainforest, CO2 footprint": seven times only for the Romanian sample, two only for the Belgian one, and two for both (Table A.3, Annex). Consequently, the relevance of these eleven environmental cues (all tested, except for "Effect on rainforest, CO2 footprint") in conveying information about food quality increases with the frequency of quality evaluation after acquisition. This indicates to marketers that this moment is favorable to send consumers information that strengthens the connection between this type of environmental information and food quality (e.g., information on the package easily visible).

The fact that the "Importance of stopping environmental degradation" has predictive power for each environmental cue suggests that both Belgian and Romanian consumers can be stimulated to buy food with a lower negative environmental impact. The "Consequences of human activity on the environment state at country level" variable has predictive power on four environmental cues about pollution and biodiversity loss. This implies that people mainly connect the negative impact of human activity on the environment with pollution and loss of biodiversity when they evaluate food quality (Table A.3, Annex). Consequently, marketers should include reference loss of biodiversity and pollution to attract more consumers to environmentally-friendly food products.

Last but not least, the relevance of more than half of the environmental cues is predicted by the frequency of the "Purchase of organic food" and "Purchase of other organic products". Accordingly, this result implies that the more used consumers are to buy organic goods, the more meaningful the environmental cues will be for them. In this context, and considering the current global and competitive market, consumers of organic food and other organic products can be a target group more receptive to marketing campaigns that stress the relationship between environmental aspects and food quality. In Romania, the "Effect on rainforest, CO2 footprint" cue is ignored by consumers as a quality indicator. Thus, suppliers could be advised that simply adding a label about the product's effect on the rainforest and its CO2 footprint is not enough on the Romanian market. There, actions must be taken to build a connection between "Effect on rainforest, CO2 footprint" labels and food quality in consumers' minds.

Interestingly, being a "Product for diabetics" is a quality indicator for Romania consumers, while this cue is not found in the Belgian sample. An explanation can be rooted in the difference in the prevalence of diabetes in the adult population between these two countries. Romania ranked the 12th (with 8.8% of the adult population), while Belgium ranks the 25th (with 6.8% of the adult population) at the EU level in 2019 (Statista, 2021). Dietary quality significantly influences diabetes (He et al., 2020). This may be why Romanian consumers associate a "Product for diabetics" containing fewer carbohydrates and sweet ingredients with quality. Petrovici and Ritson (2006) reported that diet, influenced by economic hardship, was one of the factors responsible for differences between life expectancy in the Western European Union states and the Central and Eastern European ones. This context of the Romanian society suggests to marketers that diabetic/ dietetic food retail market has a good potential to be exploited.

6. Limitations

The contribution of this study should be considered in the context of its limitations. The samples are not representative at the country level, and they mainly comprise young, educated people. Although convenience samples are frequently encountered in consumer behavior studies (Konuk, 2018; Li et al., 2018), this study's findings should be viewed as preliminary, and future studies should collect larger and representative samples at the country level. The aim of the present study was to explore the underlying structure of the food quality evaluation and, thus, the EFA was used, while the CFA was not part of the analysis. A future study can collect new data and conduct CFA to verify the factor structure. Despite this limitation, the results of the EFA are informative and useful because they are the first step towards better understanding how consumers perceive food quality by showing how many dimensions the research instrument measures and what are the cues under each factor. Also, as a future research direction, a study on the interrelated effects between food quality cues will reveal more about the food quality perceptions in consumers' minds, for example, how the perception of the "Packaging material" influences the perception of being a "Natural" product. We also acknowledge that some of the cues do

not have the same meaning for all consumers and are dependent on second-level cues, as is the case of "Freshness" or "Natural product". In this context, further work is required to reveal more of the meaning of these complex concepts and to differentiate between consumers who rely only on a general claim supplied by producer or seller on the label (for example, "Organic product", "Natural product", or "Fresh apple juice") (Scholl-Grissemann, 2018) and consumers who use cues to define the characteristics of being "fresh" and "natural" extracted from other various sources, from experts (e.g., doctors) to peers' naïve beliefs (Homer & Mukherjee, 2019). Also, the inclusion of additional environmental cues can be useful in a future study. For example, consumer perception of the use of palm oil in relation to food quality perception is worthy of investigation because it is a well-known case of environmental damage (e.g., through the loss of biodiversity in favor of monoculture).

Despite these limitations, the data presented showed the relevance of a large number of quality cues used by consumers at the point-of-purchase and highlighted the role of several environmental cues to food quality evaluation. They can, thus, contribute to food quality and sustainability literature from a consumer perspective.

7. Concluding remarks

In a highly competitive market, the food industry can benefit from a deeper understanding of consumers' food quality evaluation to embed these cues in their products and communication campaigns. Therefore, we set out the exploration of food quality cues with two main aims in mind – to investigate the relations between a set of observed variables used by consumers to define food quality and to discover the role of environmental cues in food quality evaluation.

Overall, the EFA indicated that six distinct factors were underlying consumers' evaluation of food quality. It is noticeable that, in the present case, consumers perceive six groups of food quality cues which reflect their interest in the environment ("Environmental-Social" factor), in health ("Nutrition" and "Artificial" factors), and in aspects related to the use, choice, and other credence attributes of food (grouped within the "Convenience and suitability", "Sensory and first-sight", and "Trustworthiness and origin" factors). The structure of each factor gives indications regarding the meaning that the cues which compose it have for consumers in each country and also which of them are connected to each other by a perceived common feature and which are not. The observed differences in the questionnaire structure between the Belgian and the Romanian consumers reflect the need for adjusting the questionnaire to each national context to have a more accurate representation of consumers' evaluation of food quality.

Regression analyses signaled specific elements of consumer behavior that have the capacity to influence the relevance of environmental cues in food quality evaluation. The highest prediction power of independent variables was obtained for dependent variables "Animal welfare" in the Belgian sample and "Loss of biodiversity" in the Romanian one. Thus, they can be converted into intervention points for marketing actions targeting consumer sustainable behavior.

From a marketing perspective, the present contribution results can facilitate for producers and retailers the development of their business based on a consumer-led product development strategy. At the same time, the results offer them guidelines for contributing to environmental sustainability by considering the environmental aspects of consumer behavior that impact food quality evaluation in their marketing actions.

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Annex

Tables A.1–A.3, and Fig. A.1

Table A.1
Food quality evaluation questionnaire: questions and answer options.

Question			Answer options
I. Attention paid to food quality			
How much attention do you pay to food quality?			1=not at all to, . . ., 7 = a lot of attention
How often do you evaluate food quality during the buying process?			1=never, . . ., 7= always
How often do you evaluate food quality after purchase?			1=never, . . ., 7= always
II. Relevance of food quality cues			
Please indicate how relevant are each of the following aspects to indicate food quality			1= it cannot tell anything about food quality, . . ., 7= it tells a lot about food quality
1. Freshness	21. Salt	41. Allergens	
2. Ingredients	22. Proteins	42. Traditional product	
3. Taste	23. Processing type	43. Calories	
4. Hygiene	24. PDO, PGI, TSG labels*	44. Producer name	
5. Content: Other additives	25. Appearance	45. Familiarity for you	
6. Smell	26. Fat	46. EU product	
7. Content: Taste enhancers	27. Packaging material	47. Brand	

(*continued*)

8. Content: Preservatives	28. Country of origin	48. Price
9. Organic product*	29. Other pollution	49. Product from the mountain
10. Content: Coloring	30. ISO certification*	50. Storing instructions
11. Content: GMOs*	31. Expiration date	51. Quantity
12. Fertilizer, pesticides	32. Packaging: being recyclable and amount of packaging	52. Product for diabetics
13. Vitamins, minerals	33. Loss of biodiversity	53. Importer name
14. Content: Cloned animals	34. Fair Trade label	54. Product for children
15. Sugar	35. Product made of wild animals, plants	55. Availability
16. Animal welfare	36. Effect on rainforest, CO2 footprint	56. Easy preparation
17. Fibres	37. Generated waste fR	57. Cooking instructions
18. Local product	38. Resources used	58. The fact that many eat it
19. Free-range product	39. Social equity associated with it	59. Being new on the market
20. Natural product	40. Deforestation, reforestation associated with it	

III. Environmental concern	
Please indicate how often you have done the following activity: "Financial donations to environmental actions/ causes"	1= rarely/never; 2= from time to time; 3= often
Please indicate how often have you done the following activity: "Financial donations to social actions/ causes"	1= rarely/never; 2= from time to time; 3= often
Please indicate how often you have done the following activity: "Selective collection of waste"	1= rarely/never; 2= from time to time; 3= often
Please indicate how often you have done the following activity: "Purchase of organic food"	1= rarely/never; 2= from time to time; 3= often
Please indicate how often you have done the following activity: "Purchase of other organic products"	1= rarely/never; 2= from time to time; 3= often
Please indicate how often you have done the following activity: "Voluntary involvement in actions for environmental goals"	1= rarely/never; 2= from time to time; 3= often
Please indicate how often you have done the following activity: "Voluntary involvement in actions for social goals"	1= rarely/never; 2= from time to time; 3= often
Please indicate how important is the following for you: "To stop the environmental degradation"	1 = Not at all important, . . ., 4 = Average importance, . . ., 7 = Extremely important
Please indicate how you evaluate the following: "Consequences of human activity on the environment state at country level"	1= not at all grave; 2= low gravity; 3= average gravity; 4= high gravity; 5= extremely high gravity
Please indicate how you evaluate the following: "Consequences of human activity on the environment state at global level"	1= not at all grave; 2= low gravity; 3= average gravity; 4= high gravity; 5= extremely high gravity
IV. Demographics	
Gender	*1 = M; 2 = F*
Age	Open answer
Education level	1= undergraduate; 2= college; 3= master/ PhD
Average income/ month	1= max 250 euro 2 = 251–500 3 = 501–1000 4 = 1001–2000 5 = 2001–4000 6= over 4000
Do you have children living with you for whom you buy or cook food? (the youngest age was recorded in case of multiple answers)	1=yes, 0–5 years old 2=yes, 6–16 years old 3=yes, 17–24 4=yes >24 years old 5=no
Living environment	1= urban; 2= rural
Country	1= Belgium; 2= Romania

* These items were explained in the questionnaire.

Table A.2
Pattern matrix from the EFA for the Belgian and Romanian samples.

Belgian sample
Pattern Matrix[a]

	Factor 1	2	3	4	5	6
1= Environmental-Social; 2=Nutrition; 3=Convenience and suitability; 4=Artificial; 5=Sensory and first-sight; 6= Trustworthiness and origin (Quality labels)						
Items loading on the factors						
Loss of biodiversity	.931					
Waste generated along the food chain	.912					
Resources consumed along the food chain	.868					
Deforestation, reforestation	.862					
Other pollution generated along the food chain	.842					
Social equity	.827					
Packaging: being recyclable and amount of packaging	.813					
Animal welfare	.683					
Effect on rainforest, CO2 footprint	.621					
Fertilizers, Pesticides	.583					
Fairtrade	.578					
Packaging material	.433					
Proteins		.890				
Fibers		.888				
Vitamins, Minerals		.848				
Fat		.823				
Salt		.813				
Sugar		.811				
Calories		.716				
Processing type		.435				
Hygiene		.368				
Cooking instructions			.847			
New on the market			.794			
Easy preparation			.755			
Many people eat it			.715			
Familiarity with the product			.553			
Storing instructions			.531			
Availability			.506			
Expiration Date			.372			
Allergens			.305			
Content: Other artificial additives				.912		
Content: Taste enhancers				.895		
Content: Preservatives				.892		
Content: Coloring				.853		
Content: GMOs				.808		
Content: Cloned Animals				.748		
Smell					.817	
Appearance					.805	
Taste					.802	
Quantity					.487	
Freshness					.469	
Price					.328	
Product from the mountain						-0.714
Local product						-0.689
Traditional product						-0.682
Country of origin						-0.626
Producer						-0.614
Natural Product						-0.610
EU Product						-0.598
Free-range product						-0.555
Product made of wild animals, plants						-0.513
Importer						-0.470
PDO, PGO, TSG						-0.461
Brand						-0.450
ISO certifications						-0.338

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.
a. Rotation converged in 8 iterations.

Romanian sample
Pattern Matrix[a]

	Factor 1	2	3	4	5	6
1= Environmental-Social; 2=Nutrition; 3=Convenience and suitability; 4=Sensory and first-sight; 5= Trustworthiness and origin (Quality labels); 6=Artificial						
Items loading on the factors						
Waste generated along the food chain	.931					
Loss of biodiversity	.915					
Resources consumed along the food chain	.854					
Other pollution generated along the food chain	.841					
Animal welfare	.791					
Deforestation, reforestation	.788					
Packaging: being recyclable and amount of packaging	.779					
Fertilizers, Pesticides	.626					
Social equity	.605					
Packaging material	.528					
Salt		.850				
Sugar		.804				
Calories		.792				
Fat		.777				
Fibers		.742				
Proteins		.658				
Vitamins, minerals		.642				
Processing type		.300				
Cooking instructions			.838			
Easy preparation			.828			
New on the market			.821			
Many people eat it			.763			
Storing instructions			.705			
Smell				.866		
Taste				.847		
Appearance				.793		
Expiration date				.570		
Free-range product					.815	
Product made of wild animals, plants					.803	
Organic product					.740	
Product from the mountain					.722	
ISO certifications					.686	
PDO, PGO, TSG					.653	
Local product					.549	
Fairtrade					.481	
Country of origin					.415	
Product for diabetics					.338	
Content: Taste enhancers						.834
Content: Other artificial additives						.817
Content: Preservatives						.806
Content: Coloring						.780

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.
a. Rotation converged in 8 iterations.

Color codes of highlights: yellow highlight indicates that those items are present only in one country and missing in the other; green highlight indicates that those items appear in different factors in each country.

Table A.3
Results of standard linear regression tests.

(1) Independent variable*	(2) Dependent variable	(3) Standardized coefficients (beta)		(4) Unstandardized coefficients		(5) Standard error (SE)		(6) *p* for the independent variables		(7) R square		(8) p for the model	
		B**	Ro**	B	Ro	B	Ro	B	Ro	B	Ro	B	**Ro**
Frequency of food quality assessment after acquisition	Loss of biodiversity	0.142	0.151	0.274	.0153	0.118	0.053	0.006	0.004	0.366	0.447	0.000	0.000
Importance of stopping environmental degradation			0.236		0.339		0.086		0.000				
Consequences of human activity on the environment state at country level		0.114		0.275		0.118		0.020					
Selective collection of waste		-0.098		-0.935		0.447		0.037					
Voluntary involvement in actions for social goals		0.106		0.317		0.153		0.039					
Purchase of other organic products			0.187		0.475		0.177		0.008				
Frequency of food quality assessment after the acquisition	Waste generated along		0.138		0.141		0.054		0.010	0.299	0.422	0.000	0.000
Importance of stopping environmental degradation	the food chain	0.112	0.303	0.213	0.441	0.101	0.088	0.035	0.000				
Frequency of food quality assessment after acquisition	Resources consumed		0.163		0.163		0.054		0.003	0.296	0.407	0.000	0.000
Importance of stopping environmental degradation	along the food chain	0.140	0.253	0.259	0.362	0.098	0.087	0.008	0.000				
Purchase of other organic products			0.184		0.456		0.181		0.010				
Attention paid to food quality	Deforestation,	-0.117		-0.204		0.092		0.026		0.298	0.397	0.000	0.000
Frequency of food quality assessment after acquisition	reforestation		0.189		0.194		0.055		0.000				
Importance of stopping environmental degradation		0.142	0.172	0.272	0.251	0.101	0.089	0.007	0.005				
Voluntary involvement in actions for social goals		0.123		0.364		0.156		0.019					
Purchase of organic food		0.134		0.416		0.187		0.027					
Purchase of other organic products			0.147		0.379		0.185		0.041				
Frequency of food quality assessment after the acquisition	Other pollution gener-		0.115		0.119		0.056		0.034	0.329	0.385	0.000	0.000
Importance of stopping environmental degradation	ated along the food	0.153	0.253	0.290	0.371	0.099	0.090	0.004	0.000				
Consequences of human activity on the environment state at country level	chain	0.132		0.312		0.118		0.008					
Attention paid to food quality	Social equity	-0.0126		-0.231		0.087		0.015		0.344	0.438	0.000	0.000
Frequency of food quality assessment after acquisition			0.140		0.143		0.054		0.008				
Importance of stopping environmental degradation		0.164	0.316	0.303	0.459	0.096	0.087	0.002	0.000				
Voluntary involvement in actions for social goals		0.142		0.409		0.148		0.006					
Purchase of other organic products			0.139		0.356		0.180		0.049				
Frequency of food quality assessment during buying process	Packaging: being recy-		0.128		0.152		0.073		0.039	0.335	0.362	0.000	0.000
Frequency of food quality assessment after acquisition	clable and amount of		0.108		0.106		0.054		0.048				
Importance of stopping environmental degradation	packaging	0.145	0.193	0.273	0.271	0.098	0.087	0.006	0.002				
Voluntary involvement in actions for social goals		0.121		0.351		0.151		0.020					
Purchase of other organic products		0.114		0.270		0.137		0.049					
Frequency of food quality assessment after acquisition	Animal welfare	0.147		0.181		0.059		0.002		0.386	0.346	0.000	0.000
Importance of stopping environmental degradation		0.130	.0243	0.222	0.343	0.087	0.088	0.011	0.000				
Consequences of human activity on the environment state at country level		0.107		0.229		0.104		0.028					
Purchase of organic food		0.176		0.4487		0.162		0.003					
Attention paid to food quality	Effect on rainforest,	-0.122		-0.210		0.089		0.019		0.318		0.000	
Importance of stopping environmental degradation	CO2 footprint***	0.176		0.332		0.098		0.001					
Selective collection of waste		-0.104		-0.966		0.444		0.030					
Frequency of food quality assessment during the buying process	Use of fertilizers,		0.121		0.153		0.078		0.049	0.334	0.322	0.000	0.001
Frequency of food quality assessment after the acquisition	pesticides		0.120		0.123		0.057		0.032				
Importance of stopping environmental degradation		0.147	0.171	0.245	0.250	0.087	0.092	0.005	0.007				
Consequences of human activity on the environment state at country level		0.118		0.247		0.104		0.017					
Frequency of food quality assessment after the acquisition	Fairtrade label***									0.257		0.006	
Importance of stopping environmental degradation		0.108		0.193		0.095		0.043					
Purchase of other organic products		0.127		0.279		0.133		0.037					
Frequency of food quality assessment during buying process	Packaging material		0.128		0.147		0.070		0.037	0.286	0.317	0.001	0.001
Frequency of food quality assessment after acquisition		0.102	0.115	0.104	0.107	0.049	0.052	0.033	0.039				
Importance of stopping environmental degradation		0.126	0.150	0.130	0.198	0.097	0.083	0.018	0.018				

* Only the independent variables with prediction power are included in this table. The other independent variables included in the regression test and which did not have predictive power on any of the dependent variables were "Consequences of human activity on the environment state at country level", "Financial donations to environmental actions/ causes", "Financial donations to social actions/ causes", and "Voluntary involvement in actions for environmental goals".
** *B*=results for the Belgian sample, Ro=results for the Romanian sample.
*** These variables belong to the Environmental-Social factor only in the Belgian sample (Table A.2).

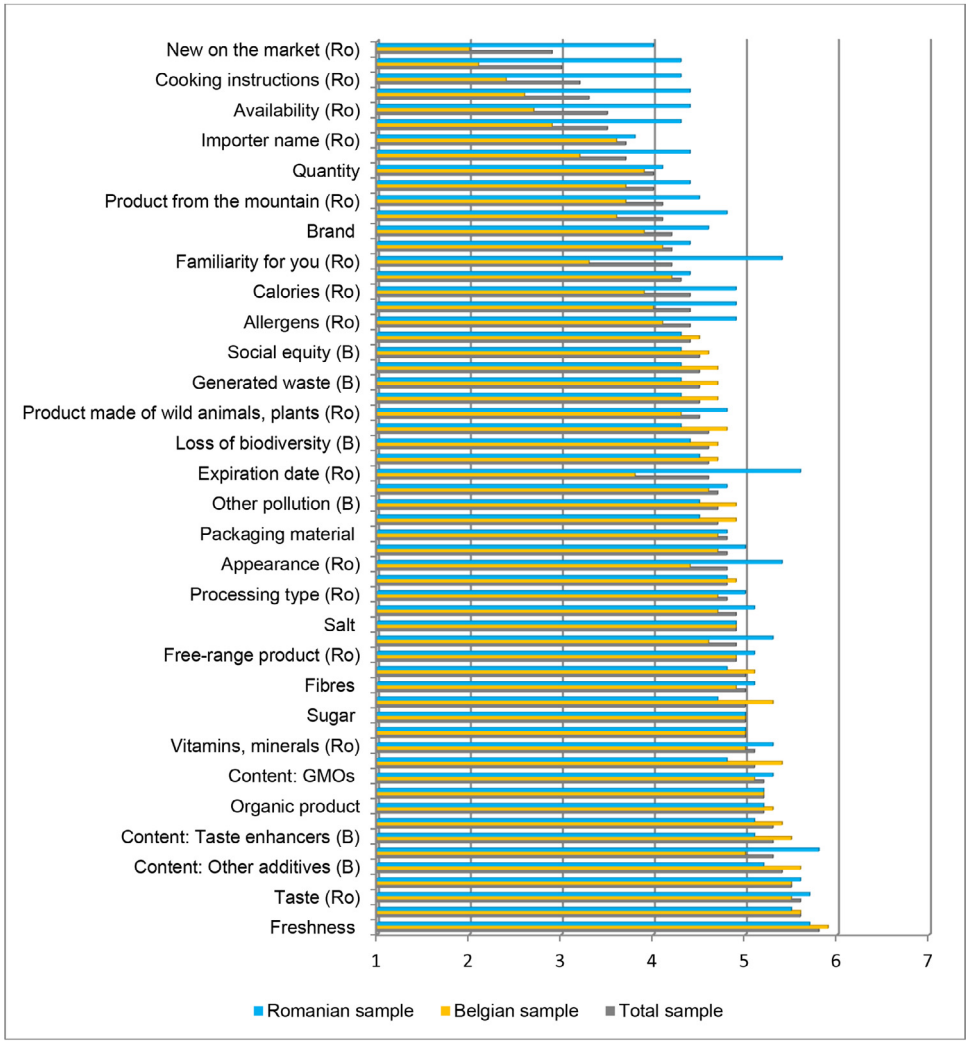

Fig. A.1. The histograms* with the distribution of the scores for the "Attention paid to food quality" by Belgians and Romanians**

* Prior to running the Mann-Whitney test, it must be determined whether the distribution of scores for both groups (Belgians and Romanians) of the independent variable have the same shape or a different shape. If the two distributions have a different shape, the Mann-Whitney U test is used to determine whether there are differences in the distributions of your two groups. The histograms were generated to observe these shapes.

** Belgians are represented in blue and coded with "1″; and Romanians are represented in green and coded with "2″.

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