

Article

Environmental Concerns of Agri-Food Product Consumers: Key Factors

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Abstract: Growing consumer interest in caring for the environment has motivated the development of multiple studies focused on discovering this variable's impact on purchasing behaviour. However, a major gap still exists between attitude and pro-environmental behaviour caused by the need for greater environmental awareness, among other things. Therefore, knowing the environmental issues that worry consumers of agrifood products is important. This work digs deeper into this issue by analysing these environmental concerns and examining differences between countries with different levels of environmental sensitivity. CAWI methodology has been used to conduct an online survey in four countries (Spain, Germany, the United Kingdom, and Denmark), with 3200 valid responses analysed using qualitative and quantitative techniques. The obtained results highlight the existence of 11 major environmental dimensions or issues for consumers of agri-food products. In addition, a correspondence analysis identifies two key factors, the first focused on a range of environmental problems of a more general nature and the second with greater interest focused on concern for biodiversity conservation. This study has implications for both the agri-food sector and European agricultural policy.

Keywords: environment; environmental concern; consumer behaviour; pro-environmental consumer; European countries; agri-food products; biodiversity



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1. Introduction

Caring for the environment and the need to reduce the damage done to nature are becoming two of the most important challenges of our time. Interest in environmental protection and nature conservation began to grow rapidly during the final years of the 20th century [1]. This is reflected in the growing demand for products that preserve the environment and in the development of European agricultural policy framed in the CAP and the European Green Deal, where the environment, sustainable natural resource management, climate change and biodiversity are seen as the cornerstones for granting public aid and for guaranteeing production and sustainable consumption [2].

Focusing on the market, the greater notoriety of the damage caused to nature by human activity and the need to preserve the environment to prevent irreversible consequences have raised consumers' environmental awareness of their purchasing behaviour [3,4], and consumers are increasingly more interested in acquiring environmentally-friendly products [5–10]. Kumar and Ghodeswar [3] highlighted the growing number of consumers that not only take the consequences for the environment of their consumption actions into account but also propose to modify their purchase behaviour to reduce their environmental impact. In this line, Simon-Kuchers and Partners [11] state that globally, 63 out of every 100 consumers have made modest or significant changes in their consumption habits to make their behaviour less detrimental to the environment.

These challenges are especially relevant for the agri-food industry, which has a substantial environmental impact due to greenhouse gas emissions, deforestation, intensive water use, soil degradation, water pollution and diversity loss [12]. The literature points to

the need to develop more sustainable agriculture and stresses the importance of designing specific actions that favour agricultural sector management taking into account environmental protection, climate change and excessive natural resource use [13,14]. As a result, it is crucial to adopt more nature-friendly agricultural practices aligned with consumers with greater concern for the environment and the need to contribute to a more sustainable planet [15]. In short, the agri-food sector must consider these challenges an opportunity to be more competitive, sustainable and market-oriented.

In such a scenario, environmental concern is a key market variable and a useful criterion for segmenting the pro-environmental consumer market [16]. Consequently, continuing to explore this variable is important for discovering the most relevant dimensions or problems that determine consumers' environmental concerns. In line with this idea, Murgado et al. [17] identified biodiversity as a new dimension of environmental concern, concluding that consumer differences exist based on their degree of concern for biodiversity.

This work intends to dig deeper into the environmental concerns of consumers of agri-food products and to identify the dimensions or main nature problems that most concern them to be able to orientate both company marketing strategies and agricultural policies to improve sustainable market behaviour. Using a methodology that combines quantitative and qualitative techniques, we analyse consumers' environmental concerns in various European countries with different levels of environmental awareness (Spain, Germany, the United Kingdom, and Denmark). Our study's general objective is to identify the main environmental problems that concern consumers through a more coherent methodology with open-ended questions that enable respondents to give spontaneous answers that do not respond to suggestions, as has been the case in existing studies.

This methodology has enabled us to identify the concerns that consumers are conscious of—those that are in their consideration set—which is a fundamental aspect for finding out what consumers really think, the concerns that they have in mind, and what motivates their behaviour. Knowing this is important for orientating communication strategies more effectively and could affect the improvement of the current gap between consumers' attitudes to pro-environmental products and their purchase behaviour [18–20]. Consequently, communication focused on the environmental issues that concern consumers could contribute to strengthening the attitude towards environmental preservation and driving up environmental awareness, which would have a positive effect on purchasing behaviour [21–23].

2. Literature Review

The latest IBM report on sustainability [24] indicates that three of every four consumers (77%) stated their willingness to take more environmentally friendly decisions. This greater interest is also reflected in marketing and consumer behaviour studies. Works such as Esmaeilpour and Bahmiary [25], Hoang et al. [26], Ahmed et al. [27], and Kamalanon et al. [28] include the environmental concern variable as a mediator between consumer attitudes and purchase intention, and even directly as an antecedent to purchase intention.

Thus, several authors have pointed to environmental concern, defined as a strong attitude towards the preservation of the environment [29], as one of the main factors influencing pro-environmental purchasing behaviour [30–33] that can be used as a criterion in the segmentation or characterisation of green consumers [16,17].

Based on the definitions of environmental concern proposed by Dunlap et al. [34] and Arroyo et al. [35], it is reasonable to argue that the degree to which individuals are concerned about environmental problems and recognise the need to address them can influence their pro-environmental buying behaviour in different ways. In other words, consumers with a high degree of concern for the environment will have different pro-environmental purchase behaviour—understood as being “greener”—than those with a lower degree of concern.

However, the literature that analyses environmental concerns in relation to purchase behaviour offers contradictory results. Although there is evidence that the increase in

environmental concern positively affects behaviour [30–32], an exact conclusion cannot be established about its influence on actual purchase behaviour.

Multiple works have analysed the main environmental problems both in general terms and from the consumer perspective. The former include reports drawn up by public institutions and businesses [36,37] that conclude that citizens consider climate change, air pollution and the growing amount of waste to be the three main issues that affect nature.

With respect to consumer behaviour, a group of studies can be found that focus on analysing how environmental concerns can influence purchase behaviour and reduce the gaps between attitude, intention, and behaviour [28,38–42].

In other regards, Royne et al. [43] analysed the willingness of pro-environmental consumers to pay a higher price for pro-environmental products based on several socio-demographic variables, such as age, sex and ethnicity. These authors used a closed list of environmental problems [44] and concluded that consumers exhibiting the greatest concern for rubbish and waste as an environmental problem would be more predisposed to paying a higher price to purchase pro-environmental products.

Aregay et al. [45] studied the environmental concerns of residents of northern China, concluding that the decline in the ecological environment and water resources is not only considered the most relevant problem but that the perceived benefits from public investment in their restoration are as important or even more important than other socio-economic benefits. Boer and Aiking [46] measured the problems stated by European consumers concerning the EU's new "Farm to Fork" strategy and concluded that climate change and species extinction are the main problems that concern consumers. Räsänen et al. [47] studied the case of consumers of food products in Finland, finding several arguments (such as nutritional value, use of local resources, toxic impacts of the substances used in production, the impact of production on biodiversity, ecosystem services, and the climate) that can be used to drive an increase in ecological sustainability in said industry. Meanwhile, Tait et al. [48] addressed the attributes of sustainability that wine consumers in California most appreciate and identified that the presence of some specific attributes (such as the management of pesticides and water resources, the use of ecological grapes, how biodiversity is handled, etc.) can influence consumer choice not necessarily from a hedonic perspective, as not all of these attributes can be observed directly by consumers. Lastly, it should be highlighted that in particular, both Räsänen et al. [47] and Tait et al. [48] raise the possibility of focusing on the elements that consumers most appreciate to include them in marketing and communication strategies to have a positive effect on the behaviour of the consumers in question.

Other studies have analysed the environmental issues that most concern consumers to understand whether concerns exist that can influence the relationship between purchase intention and behaviour more positively. To segment the consumer market of the agri-food industry, Walley et al. [49] used socio-demographic variables to examine some industry-related problems or issues. These doubtlessly included some problems of an environmental nature, such as genetic modification, soil pollution, air pollution and animal welfare. These authors identified four segments, one of which showed a greater concern for environmental problems. In general, the focus was on genetic modification and its effects on nature, which is the issue of greatest concern for consumers.

Similarly, Tong et al. [50] concluded that concern for pollution had a significant effect on the predisposition to pay for ecological rice. Yuan Jen and Wang [51] found that consumers of meat made purchase decisions based on their sustainability concerns and classified them in general terms as food security, animal welfare, and the environment. In other respects, Laureti and Benedetti [52] concluded that people concerned about animal welfare, soil pollution and deforestation are the most predisposed to buying organic products daily. Among other concerns for consumers of organic foodstuffs, Worsley et al. [53] highlighted food, the environment, and animal welfare.

To summarise, this work intends to provide knowledge about agri-food consumers' environmental concerns by using a methodology that offers more detailed, highly nuanced

information on the environmental problems or dimensions that consumers consider decisive. This information can be highly useful for agri-food companies by acting as a basis for aligning sustainable practices with consumer concerns and for agricultural institutions designing policies to implement sustainable, environmentally friendly agriculture that responds to market demands.

3. Materials and Methods

Given our objective, our goal is to be able to determine the main environmental problems from the consumers' own spontaneous perspectives. The reason for this is that we will be able to find out what they are really thinking, as it is precisely their perceptions that we will subsequently seek to influence through the design of pertinent marketing and communication strategies. As Anderson and Narus [54] indicated, to influence consumer behaviour, it is necessary to know precisely what consumers value and what they can come to value.

Therefore, the first step in this research was to gather information on the problems based on consumer contributions. For this, it was decided to conduct an online survey in four European countries—Spain, Germany, the United Kingdom, and Denmark—using the CAWI methodology. These countries were selected for the different realities around their environmental awareness and the relative importance of agriculture in these states. The four surveys were carried out by a market research company that offers a consumer panel for surveys (a permanent sample in which the people selected for each survey are given stimuli to respond to surveys, such as points that can be exchanged for gifts).

In total, 800 subjects were randomly selected in each of these countries based on a consumer panel. The individuals surveyed had to meet a prior requirement to participate in the survey: they had to show a high level of concern for the environment. A filter question was, therefore, used on a five-point Likert scale. Only respondents who responded to this question with a 4 or 5 were selected. Several quotas were also set in each of the countries to ensure that the number of surveys was gender- and age-balanced (half of the respondents between the ages of 25 and 40 years and half between 41 and 65). One restriction was that the maximum number of respondents with higher education completed was set at 350, while a maximum of 160 respondents should be unemployed or exclusively homemakers. Lastly, all the respondents had to meet the requirement of being very environmentally aware.

In summary, restricted random sampling was conducted with a total of 3200 interviews and a maximum sample error approximated as MAS of + 3.52% for global percentages per country $p = q = 0.5$; $K = 2$ (Table 1).

The results analysed in this study correspond to a specific section of the survey, where the respondents had to answer an open-ended question to indicate the three main nature-related problems that concerned them as consumers of agri-food products. Open-ended questions are a widely used tool to understand respondents' experiences and perspectives, as the analysis of the responses can provide greater information and a deeper vision of participants' beliefs and experiences [55]. The choice of this tool therefore corresponds to the objective of collecting consumer perspectives on nature problems without presenting them with any pre-established categories, which enables the existing information to be increased and new categories to be considered that could be interesting for broadening knowledge on consumer concerns.

The second step consisted of organising and systematising the information gathered. As the number of consumers surveyed was 3200, with 3 responses obtained from each, the total number of responses received was 9600, meaning that a large amount of information had to be managed. The analysis stage was subdivided into two parts to better process the information: (1) the first part was qualitative; (2) the second was quantitative.

Table 1. Sample characteristics.

Scope: European level (Spain, Germany, UK, Denmark)		
Target: Urban buyers aged 25–65 years		
Type of interview: Online CAWI using a structured questionnaire		
Sample size: 3200 valid cases (800 per country)		
Type of sample Random: Restricted by age, gender, and education level		
Sample error: R.R.S. of + 3.52% for global percentages per country $p = q = 0.5$; $K = 2$.		
Demographic profile		
<i>Country</i>		
	Spain	800
	Germany	800
	United Kingdom	800
	Denmark	800
<i>Gender</i>		
	Male	1600 (400 per country)
	Female	1600 (400 per country)
<i>Age</i>		
	25 to 40 years	1600 (400 per country)
	Older than 40 years	1600 (400 per country)
<i>Level of education</i>		
	No higher education	150 max. (per country)
	With higher education	Between 300 and 350 max. (per country)

Firstly, to be able to analyse the information contributed by the consumers in their responses, qualitative coding, organisation and grouping methods had to be used to systematize the information into categories that were valid for the analysis.

NVivo qualitative analysis software was used for this as it allowed responses collected to open-ended questions to be imported into a data matrix, with each subject automatically codified as a case study. The word frequency function was then used to measure and logically sort the qualitative data [56]. After cleaning any “empty words” this function calculated the most frequent terms, which were considered to represent the participants’ perspectives, as supported by several studies cited in Feng and Behar-Horenstein [56]. The most frequent words were created as “hubs”—labels or codes which, in turn, labelled and extracted the content of the entire response in each cell through using the NVivo reference extraction function. Any possible duplicate codes for the same response had to be cleaned manually.

A three-stage coding process was used. Firstly, automatic coding was done based on word repetition in responses. The software then enabled a first grouping of responses in hierarchical nodes. Secondly, multiple researchers checked and refined the nodes manually using graphs and coding matrices to visualise the patterns and relationships among the responses. This ensured consistent coding that identified 52 environmental issue groups. Lastly, the third stage involved a conglomerate analysis to refine the node or category grouping process using a similar-word criterion and the Jaccard coefficient to measure similarity. The analysis results were also refined manually by multiple expert researchers in the matter. This enabled the responses to be grouped into 11 categories or key dimensions: (1) effects of human behaviour on nature; (2) energy supply issues; (3) atmospheric pollution; (4) nature pollution; (5) destruction of natural spaces; (6) effects on climate; (7) effects on species and biodiversity; (8) effects of overconsumption and the consequent scarcity of nature resources; (9) effects of economics and politics on nature; (10) problems associated with and derived from food production, and (11) sustainability and sustainable consumption. These 11 dimensions enabled the codes to be grouped into a total of 11 stem categories, along with three additional categories: (12) other (multiple or unclassified responses); (13) none, and (14) does not know/does not answer.

Secondly, the results obtained were measured to establish relationships of interest for the analysis. The codified results were exported to SPSS quantitative analysis software as a data matrix. It can be highlighted that for the analysis, three of the main problems mentioned in each of the responses were studied as single multiple-response variables. SPSS personalised tabs were mainly used to analyse these two variables, as they enable the new variables to be treated as categorical variables and frequency and crosstab analyses to be performed to visualise differences in results by country. Lastly, the Correspondence Analysis function was also used to describe the relationships between the main nature problem and country variables while simultaneously describing the relationships between the variables categories.

4. Results

In general terms (Table 2), the analysis showed that the main nature problems that concern consumers of agri-food products are nature pollution, the destruction of natural areas and the effects on the climate. Concern for species and biodiversity was also very relevant as the fifth problem in general terms and was mentioned spontaneously by 25.0% of consumers. The responses categorised in the categories None and Does not know /Does not answer are considered missing values for the analysis.

Table 2. Main problems that affect nature by country.

Categories	Country				
	Spain	Germany	United Kingdom	Denmark	Total
Human behaviour	27.9%	12.2%	25.8%	12.6%	19.7%
Energy sources	1.8%	5.6%	3.7%	3.7%	3.7%
Atmospheric pollution	8.9%	30.9%	7.6%	24.6%	17.9%
Nature pollution	65.1%	56.3%	58.7%	69.9%	62.5%
Destruction of natural areas	63.6%	36.1%	47.4%	40.9%	47.1%
Effects on climate	47.7%	45.9%	41.1%	38.8%	43.4%
Species and biodiversity	13.1%	24.9%	41.9%	20.1%	25.0%
Exploitation and consumption of resources	36.8%	29.5%	18.0%	31.7%	29.0%
Politics and economics	11.8%	9.3%	9.3%	7.5%	9.5%
Food production	6.5%	18.2%	18.3%	23.8%	16.6%
Sustainability	0.8%	7.9%	3.5%	1.8%	3.5%
Other	6.5%	9.8%	10.7%	10.4%	9.3%
Total	2320	2254	2225	2174	8973

Note: (1) the percentages in bold indicate the countries where the problems are most prevalent; (2) chi-square = 0.000 / Cramer's V = 0.282.

Significant differences can be observed when studying what occurs in the different countries. Although nature pollution is the main problem in all four countries, its importance differs from one to another, and it is significantly more important in Denmark and Spain than in Germany and the UK, with differences of around 10 percentage points. The greater importance found in Denmark and Spain is explained by the results observed in Table 3, which shows the differences between the subcategories comprising these problems. General pollution is much greater in Spain, as is raising awareness of the need to recycle more (almost insignificant for the other countries), whereas the problem related to rubbish and waste, plastic, chemicals, and toxins that are deposited in nature is much more significant in Denmark.

As is the case at the general level, the second-most important problem in Spain, the United Kingdom and Denmark is the destruction of natural areas, although the importance of this problem is significantly higher in Spain. Table 3 again shows that this difference can be explained by the clear incidence of the wildfire subcategory, which is almost insignificant in the other countries compared to Spain, where it is one of the most important problems (fifth-most important in all subcategories). Deforestation can also be highlighted in the remaining subcategories that make up the destruction of natural areas in Table 3.

This is a problem in all the countries and is in second place at the general level in all the subcategories.

In Germany, the second most important problem is related to effects on the climate, which is in third place in Spain and Denmark and fourth in the United Kingdom. The two subcategories that appear to most concern consumers are climate change (especially in Spain and Germany) and global warming (especially in the United Kingdom and Denmark).

Table 3. Subcategories of the main problems that affect nature by country.

Categories	Subcategories	Country				
		Spain	Germany	UK	Denmark	Total
Human behaviour	Disinformation and ignorance	4.4%	2.0%	4.1%	2.4%	3.2%
	Disinterest and indifference	6.5%	4.4%	5.3%	5.0%	5.3%
	Human beings	5.4%	2.0%	10.9%	1.4%	5.0%
	Lack of awareness	7.3%	1.7%	2.3%	1.1%	3.1%
	Bad practices	4.4%	2.0%	3.2%	2.8%	3.1%
Energy sources	Fossil fuels	0.9%	2.7%	2.7%	3.0%	2.3%
	Energy consumption	0.9%	2.9%	1.0%	0.7%	1.4%
Atmospheric pollution	Air pollution	2.3%	9.8%	3.3%	3.4%	4.7%
	Polluting emissions and gases	5.3%	17.8%	2.7%	18.4%	11.0%
	Health	0.5%	0.1%	0.3%	0.4%	0.3%
	Transport	0.9%	3.2%	1.3%	2.4%	1.9%
Nature pollution	Water pollution	4.1%	9.9%	5.3%	7.0%	6.6%
	General pollution	42.8%	22.5%	29.7%	31.9%	31.8%
	Rubbish and waste	6.8%	10.8%	8.9%	10.5%	9.2%
	Plastic	1.4%	7.4%	10.3%	12.6%	7.8%
	Chemicals and toxins	2.6%	4.4%	2.8%	6.0%	4.0%
	Recycling	7.4%	1.3%	1.8%	1.8%	3.1%
Destruction of natural areas	Environmental conservation and protection	10.9%	8.4%	10.4%	11.3%	10.2%
	Deforestation	26.7%	21.0%	25.4%	22.1%	23.8%
	Destruction of nature in general	5.9%	3.8%	5.3%	4.7%	4.9%
	Erosion and desertification	3.5%	0.9%	1.3%	0.3%	1.5%
	Wildfires	15.5%	0.6%	0.1%	0.7%	4.3%
	Urbanisation	1.1%	1.4%	4.9%	1.8%	2.3%
Effects on climate	Ozone hole and radiation	5.8%	3.3%	1.0%	1.4%	2.9%
	Global warming	11.1%	14.0%	21.5%	18.9%	16.3%
	Climate change	26.5%	24.1%	15.9%	15.1%	20.5%
	Natural disasters	2.0%	1.8%	0.5%	1.4%	1.4%
	Melting ice and rising sea level	2.3%	2.7%	2.2%	1.8%	2.2%
Species and biodiversity	Change of habitat	0.9%	1.0%	13.1%	2.1%	4.3%
	Animal welfare	2.6%	3.7%	4.6%	4.1%	3.7%
	Insects and pollinators	0.3%	4.2%	3.2%	0.8%	2.1%
	Species and biodiversity loss	9.4%	16.0%	21.1%	13.1%	14.9%
Exploitation and consumption of resources	Scarcity of water and drought	22.2%	5.2%	1.9%	5.4%	8.8%
	Scarcity of food	0.1%	0.6%	0.6%	0.1%	0.4%
	Overconsumption	1.5%	2.0%	3.5%	9.6%	4.1%
	Overexploitation and lack of resources	11.0%	17.2%	3.6%	10.2%	10.5%
	Overpopulation	2.0%	4.4%	8.4%	6.3%	5.2%
Politics and economics	Industry	1.5%	2.4%	2.2%	1.4%	1.9%
	Economic interests	5.1%	5.0%	5.3%	3.4%	4.7%
	Politics and legislation	5.1%	1.9%	1.8%	2.6%	2.9%

Table 3. Cont.

Categories	Subcategories	Country				
		Spain	Germany	UK	Denmark	Total
Food production	Food quality	0.5%	1.4%	1.2%	0.3%	0.8%
	Livestock farming and breeding	0.4%	3.0%	1.4%	2.0%	1.7%
	Pesticides and fertilisers	3.5%	6.2%	7.3%	16.3%	8.3%
	Agricultural practices	1.8%	6.5%	7.7%	5.0%	5.2%
	Transgenics	0.4%	1.0%	0.6%	0.3%	0.6%
Sustainability	Organic products	0.1%	1.3%	0.3%	0.3%	0.5%
	Ethical products	0.0%	1.0%	0.5%	0.0%	0.4%
	General sustainability	0.6%	5.6%	2.7%	1.6%	2.6%
Other	Various	5.4%	7.8%	9.8%	7.5%	7.6%
	Not classified	1.1%	2.0%	0.8%	2.9%	1.7%

Note: (1) the percentages in bold indicate the countries where the problems are most prevalent; (2) chi-square = 0.000/Cramer's V = 0.491.

Concern for species and biodiversity stands out in the United Kingdom, especially, where it is the third-most important problem, with markedly higher percentages that are double the results for the other countries. Therefore, the great relevance of this aspect for the United Kingdom is apparent, even more so considering that these are responses that consumers have given spontaneously. This is also a relatively important dimension in Germany and Denmark, with percentages similar to the average, although its importance falls notably in Spain. The relevance of this dimension in the United Kingdom is explained in Table 3 by the prevailing concern for species and biodiversity loss and habitat change where biodiversity develops. Despite species and biodiversity loss being a relevant category in all the countries, it is in fourth place out of all the sub-problems in Table 3 in the United Kingdom.

There are also some other problems that are interesting to observe. Human behaviour, for example—confirmed by disinformation, disinterest, lack of awareness, bad practices, and the influence of human beings on nature—stands out much more in Spain and the United Kingdom, which are the countries where greater percentages are concentrated in all of these subcategories. In contrast, atmospheric pollution stands out by a large margin in Germany and Denmark, where the incidence of air pollution and, especially, polluting emissions and gases are the two determining factors compared to the low percentages observed in the other two countries.

Despite standing out to a certain degree in Germany and Denmark, exploitation and consumption of resources is much greater in Spain, where the lack of water and drought is an enormously important issue (the third in importance among the subcategories in the country). For consumers in Germany, the most important problem in this case is the overexploitation and scarcity of resources at the general level, whereas for British consumers, it is overpopulation and for the Danish, overconsumption.

Concern for food production can mainly be observed in Denmark, where concern for pesticide and fertiliser use (Table 3) is especially relevant. However, this is much less important in Spain than in the other countries. Lastly, although concern for sustainability is not very relevant at the general level, its prevalence in Germany should be highlighted compared to the minimum percentages recorded in the other three countries.

A simple correspondence analysis was then performed to observe any significant between-country differences regarding the importance given to these environmental issues or problems that affect nature generally.

Firstly, as can be observed in Table 4, the chi-square is 0.000, which means that the results are significant, the two variables (environmental problems and countries) are independent, and—therefore—the proposed analysis could be performed. In addition,

three factors or dimensions were identified. The first two dimensions accumulate a portion of inertia of 90%, which implies that these two factors would explain 90% of the information and are therefore sufficient for the analysis to be performed.

Table 4. Summary of correspondence analysis.

Dimension	Singular Value	Inertia	Chi-Square	Sig.	Portion of Inertia		Singular Confidence Value	
					Computed for	Accumulated	Standard Deviation	Correlation 2
1	0.213	0.045			0.558	0.558	0.027	−0.056
2	0.167	0.028			0.341	0.900	0.030	
3	0.090	0.008			0.100	1.000		
Total		0.081	90.272	0.000 *	1.000	1.000		

* 30 degrees of freedom.

Once the factors on which the analysis is to be based have been identified and selected, the next step is to observe the environmental problems that comprise each dimension by computing the points' contributions to the inertia of the dimension. In the case of Factor 1, Table 5 indicates that the highest contributions made by points to the dimension's inertia are: air pollution (0.398), human behaviour (0.186), destruction of areas (0.154), and food production (0.121). Therefore, in this case, we are alluding to a factor of general environmental concern composed of several problems.

Table 5. General row scores. Symmetric normalisation.

Problem	Mass	Score in Dimension		Inertia	Contribution				
		1	2		Of the Point to the Dimension's Inertia		Of the Dimension to the Point's Inertia		Total
					1	2	1	2	
Human behaviour	0.071	−0.749	−0.242	0.009	0.186	0.025	0.908	0.074	0.982
Energy sources	0.013	0.733	−0.269	0.002	0.034	0.006	0.833	0.088	0.921
Atmospheric pollution	0.065	1.143	0.462	0.020	0.398	0.083	0.882	0.112	0.994
Nature pollution	0.225	−0.018	0.093	0.002	0.000	0.012	0.010	0.203	0.212
Destruction of natural areas	0.169	−0.441	0.117	0.007	0.154	0.014	0.947	0.052	0.999
Effects on climate	0.156	−0.040	0.067	0.001	0.001	0.004	0.063	0.143	0.206
Species and biodiversity	0.090	0.119	−1.054	0.017	0.006	0.600	0.016	0.984	1.000
Exploitation and consumption of resources	0.104	−0.034	0.559	0.005	0.001	0.196	0.005	0.995	1.000
Politics and economics	0.034	−0.242	0.079	0.001	0.009	0.001	0.561	0.046	0.607
Food production	0.060	0.654	−0.339	0.009	0.121	0.042	0.605	0.127	0.732
Sustainability	0.013	1.237	−0.491	0.008	0.090	0.018	0.533	0.066	0.599
Active total	1.000			0.081	1.000	1.000			

To a lesser extent, regarding Dimension 2, this factor is mainly comprised of the species and biodiversity environmental issue (0.600). In other words, we are alluding to a factor of specific concern for biodiversity conservation.

Figure 1 is a graph of the correspondence analysis based on environmental problems and countries. With regard to Dimension 1 (Factor 1), destruction of natural areas is observed to be a problem more closely connected with Spain and therefore of greater significance for said country's market. This concurs with what is indicated in Table 1 (63.6%). On the other hand, human behaviour is an issue that is given similar importance in Spain and the United Kingdom, again in line with Table 1 (27.9% and 25.85, respectively). Lastly, according to Table 1, air pollution is relevant in Denmark and Germany (24.6% and 30.9%, respectively), as is food production to a lesser extent (although more so in Denmark (23.8%)).

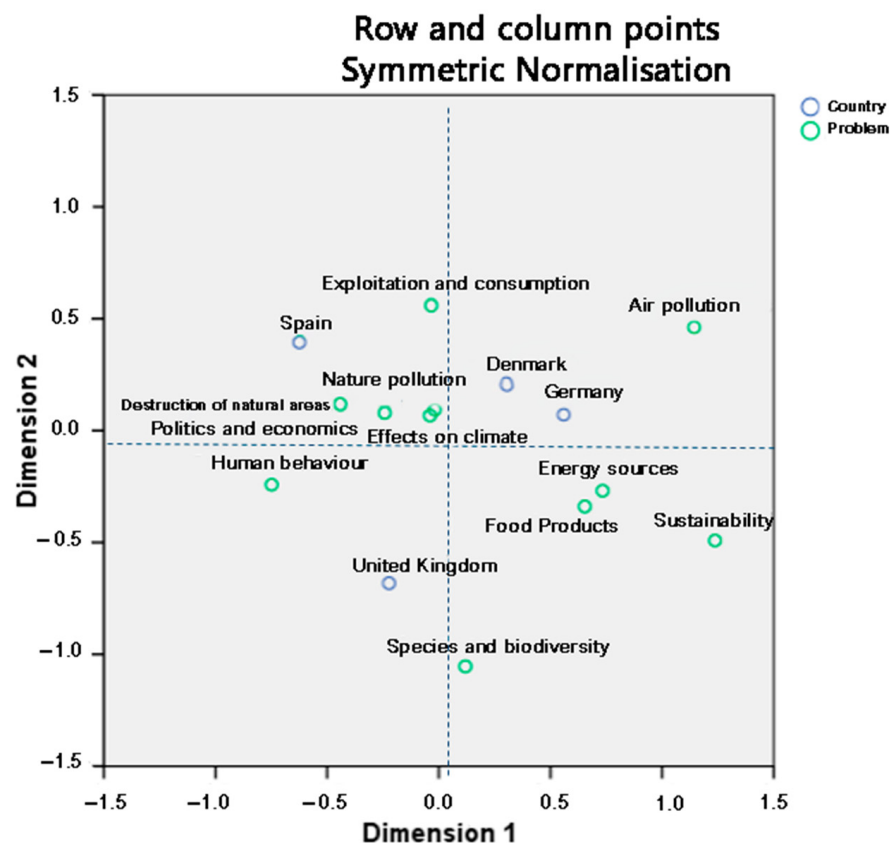


Figure 1. Correspondence analysis of main problems affecting nature.

Regarding Dimension 2 (Factor 2), species and biodiversity are a much greater problem in the United Kingdom and an aspect highlighted by Figure 1 (41.9%).

5. Discussion

As previously indicated, only a limited number of previous studies have focused on analysing the environmental problems that deeply concern consumers of agri-food products. Some studies are general in nature and descriptive and have been conducted by public bodies with an international scope [36,37].

In other respects, most of the existing works are based on closed lists of environmental problems, which to a certain degree introduces a bias into the responses given by consumers forced to take a position between different environmental options. Therefore, our work's main contribution lies in the methodology used, which has enabled us to collect spontaneous consumer responses.

Firstly, our study's main results highlight the existence of 11 key dimensions related to a range of environmental problems or issues. Those that stand out are the pollution of nature in general, the destruction of natural areas, the effects on the climate, the exploitation and consumption of resources, and biodiversity loss, among others. Some of the analysed works partially coincide with the results obtained, which shows the importance that some

specific issues related to climate change [36,37,46–48] or pollution in general [50] or of the air [36,37,57] or soil in particular [52] have for consumers.

In other regards, there are also works in the literature that highlight the concern that other emerging problems have for consumers, such as issues related to biodiversity loss [46–48,58], deforestation [52], the generation of rubbish and waste [43,44], and the management of water resources and water scarcity [48,58].

If we focus on biodiversity loss, its great importance for consumers is in line with what other works state, where it is considered one of the emerging concerns [17,46,59–64] and also one of the key indicators of environmental improvement due to its critical importance for the way that ecosystem systems work [65].

This greater concern for the loss of animal and vegetable species is also stated in several reports [36,66,67], which point to a considerable increase in consumer concern for biodiversity. Some studies [e.g., 61, 64] even express consumers' implicit intentions to pay for products that care for biodiversity, and their appreciation of the opportunity that caring for biodiversity represents as a differentiation and positioning strategy for company brands [62].

These results are relevant for various reasons: on the one hand, they confirm that diversity loss is an issue at the forefront of consumer's minds. As such, greater knowledge of its importance, as the main indicator of sustainability improvement, could drive greater environmental awareness and, ultimately, more sustainable purchase behaviour. On the other hand, the results have implications for the agri-food sector. The literature highlights the grave impacts that agri-food activity has on the environment by changing ecosystem composition, which results in major damage for animal and vegetable species and, therefore, an alarming effect on ecosystem services and the capacity for ecological resilience [15]. Consequently, biodiversity loss should be considered a key issue for minimising the environmental impact generated by this sector. In addition, adopting pro-environmental practices creates a scenario with multiple opportunities for the agri-food sector [68] that must be perceived as a source of competitive advantage and not a cost. These practices align with a growing demand from consumers who value the effort of companies to reduce their environmental impact and are willing to pay a surcharge for food that preserves the environment. Lastly, our results are also interesting for European agricultural policy, framed in the Common Agricultural Policy (CAP) and the European Green Deal. The CAP must evolve and adapt to both consumers' needs and the environmental goals that are currently considered crucial [69]. The adoption of a market-oriented focus is essential for defining these policies [70]. In this way, the environment, climate change and biodiversity will be the cornerstones of public aid grants.

6. Conclusions

The results obtained in this study indicate that the main environmental problems concerning consumers of agri-food products are nature pollution, effects on the climate, and the destruction of natural areas. It can also be concluded that species and biodiversity are another very interesting environmental issue to consumers.

In addition, differences have been observed to exist by country. In Spain, for example, the destruction of natural areas (mainly concerning wildfires and deforestation) and the exploitation and consumption of resources (mainly due to water scarcity and drought) are much more relevant problems than in the other countries. In Germany, there is much greater concern for atmospheric pollution (mainly due to concern for emissions and air pollution). In Denmark, there is a much higher prevalence of concern for food production (mainly for the effects of pesticide and fertiliser use). Lastly, in the United Kingdom, the preponderance of problems related to species and biodiversity stands out (mainly biodiversity loss). Without any doubt, some problems are much more important than others depending on the country, and these can be useful for designing and implementing effective marketing and communication strategies in the various international markets.

In line with the above, the correspondence analysis that was performed highlighted the existence of two key factors. On one hand, a general concern factor can be observed to exist focused on several environmental problems, and on the other, there is a specific concern factor that involves consumer interest in biodiversity.

In short, knowledge of the most prevalent problems for consumers in different countries will contribute to the design of more effective communication strategies both at the general level (such as nature pollution and climate change) and at a more specific level (focused on biodiversity) with messages adapted to the importance that they have in each country. Thus, the possibility emerges of analysing the impact of these messages on consumer behaviour to determine whether they include the problems that most concern consumers in different countries as key communication elements that help to drive the consumption of environmentally responsible products.

Furthermore, as explained in the discussion of the results, these findings have implications for both the agri-food sector and European agricultural policy as they contribute to defining the priorities that must be considered in the environmental field. It will then be possible to align consumer demands with environmental practices implemented by industry to promote the development of competitive and sustainable agriculture.

As far as the limitations of our study are concerned, we must indicate those commonly found in qualitative studies and the fact that we were working with survey responses in four different languages. This has required great efforts in translation, which could have involved a degree of bias. Additionally, an effort has been made to overcome the subjectivity caused by the open response coding and analysis process with researcher triangulation, which reduces individual bias.

As future research lines, we propose that this study's classification of environmental problems relevant to consumers should be used in other studies. This could even enable the development and validation of an associated scale. In addition, it would be interesting to replicate this study in countries on other continents, as this would identify other relevant environmental issues in different international markets. Lastly, we propose analysing how greater knowledge of these problems could influence attitude and pro-environmental behaviour.

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