

Information on the processing of organic food: consumers' perception

Processed
organic food
perception

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Abstract

Purpose – The study aimed to investigate consumers' views on criteria to be claimed for organic processed foods and information to be communicated.

Design/methodology/approach – An online survey was carried out among 439 adults living in Italy, users of processed organic food, to gather opinions on criteria that processing of organic food should meet and on the terms that best define “careful” processing. Next, a conjoint design was applied to examine the effects of five independent factors on consumers' ideal concept of “organic”; these were potential information on packaging, processing, additives and product quality, and the type of food product. Three products with different processing level were selected: an ultra-processed and multi-ingredient product (vegetable burger), a processed product preserved by canning (peas in glass jar) and a minimally processed product (bagged salad).

Findings – The findings highlight that consumers attach more importance to the organic food carrier than the informational messages. Information on the processing and packaging follows, with messages on quality and on additives seemingly of minor importance. Three clusters of respondents were identified: those driven primarily by the type of organic food (24.6%), those placing more emphasis on product processing (21.3%), and a third larger cluster (54.1%) who expressed almost equal importance to all the factors considered. As for the processing of organic products, “eco-friendly” was the best message.

Originality/value – This paper offers insights into what best outlines the ideal concept of “processed organic food” as seen by organic food consumers, to be communicated to better guide their purchasing decisions.

Keywords Careful processing, Communications, Consumer perception, Focus group, Conjoint design, Organic food

Paper type Research paper

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Highlights

- (1) The type of processed product is decisive in the perception of organic food.
- (2) More traditional products better fit with consumers' perception of organic food.
- (3) Organic food consumers attach more importance to information on processing than quality and use of additives.
- (4) Messages on the use of eco-friendly packaging materials have a positive impact.
- (5) Concise positive messages on environmental sustainability of processing are effective.

1. Introduction

It has been proposed to define the quality of organic foods based on process principles, and aspects and criteria related to the product, which can be evaluated through several parameters and indicators (Kahl *et al.*, 2014; Kahl and Baars, 2012). A framework for concept development, definition and evaluation of organic food quality, developed by the International Research Network for Food Quality and Health (FQH) (<https://www.fqhresearch.org/en/fqh-startseite.html>), identifies five fundamental principles underlying the production and quality of organic foods: naturalness, health, sustainability, process and product-oriented quality and a system approach (Kahl *et al.*, 2014; Kahl and Baars, 2012). Based on this, the Code of Practice for organic food processing – ProOrg project (2018–2021) (<https://www.proorgproject.com>) has developed a general assessment framework for the evaluation of food processing technologies for organic products. It includes environmental, social and economic sustainability describing process-related quality and nutritional and sensory quality aspects describing product-related quality (Meier *et al.*, 2021).

Research results on the motivations for food choices by organic food consumers show that all aspects mentioned above are part of the reasons for choice. The NutriNet-Santé large-scale cohort study on purchase motivations evidenced that “absence of contaminants”, “health”, “environmentally friendly consumption”, local and traditional production’ are the main reasons for food choice among consumers of organic foods (Baudry *et al.*, 2017). Ecological awareness and attitudes towards the environment and one’s health are found to play a significant role in influencing organic food willingness to pay of consumers (Katt and Meixner, 2020) and are highlighted as the main determinants of the intention to purchase organic food (Eberle *et al.*, 2022).

Other factors that influence consumers buying behaviour towards organic food products are consumer beliefs about what is considered desirable. For example, disease prevention, natural/unprocessed foods, as few additives as possible, and exclusive/special/select foods are values that have been found to be related to the amount of organic foods consumed (Vega-Zamora *et al.*, 2020).

Food processing and production are of medium to high concern for most European consumers due to lack of trust in how the product is processed (Meijer *et al.*, 2021). Consumers’ evaluation of food technologies often relies on intuitive and approximate processes due to consumers’ limited knowledge of the technologies implemented in food production (Siegrist and Hartmann, 2020). Recent research on consumers’ perception of organic food processing technologies has highlighted two groups of consumers who have different reactions: a group driven by strong ecological and environmental values and a general skepticism to higher processing levels and processing technologies, and another group that accept higher levels of processing to obtain benefits in terms of convenience, low environmental impact and nutritional value (Hüppe and Zander, 2021). Potential psychological barriers to acceptance of

highly processed food products relate to personality traits like food technology neophobia (Cox and Evans, 2008; Giordano *et al.*, 2018) to the perception of loss of naturalness (Román *et al.*, 2017) and concern about food safety risks for new emerging agri-food technologies (Frewer *et al.*, 2011; Meijer *et al.*, 2021).

Food labels show high importance in relation to consumers' purchasing intentions as consumers make inference and form their expectations about the products and their quality based on information conveyed by the product packaging through messages and claims (Biondi and Camanzi, 2020; Clement *et al.*, 2017). Processing "with care" is recommended by the EU Regulation 2018/848 on organic production and labelling of organic foods. Although food processing is not part of mandatory labelling, food processing claims can be used to convey to consumers information on the benefits of food processing technologies in relation to food safety, nutrients retention and quality attributes, including sensory quality. The principle of carefulness/careful processing is used by organic food producers/retailers in customer communication, and mostly refer to minimal technological processing. Simple and effective definition of careful processing could help consumers to consistently distinguish and evaluate alternative processing technologies (Kilic *et al.*, 2021).

Added to that is the growing attention of consumers toward environmental sustainability although there is still a notable discrepancy between favourable attitudes and actual food choices (Aschemann-Witzel and Zielke, 2017; Hartmann *et al.*, 2021; Vermeir *et al.*, 2020). Haws *et al.* (2014) introduced the concept of *green consumption* values, which refers to the ascription of values predicting consumers' environmentally sustainable consumption behaviours. They argued that green consumption values could be used to understand consumers' environmental protection behaviours (Haws *et al.*, 2014).

As far as we know, there are no studies that have jointly addressed the aforementioned aspects to identify which information (relating to processing, environment impact, quality) contributes most to outlining the ideal concept of "organic food".

This work was designed to investigate consumers' views on criteria to be claimed for organic processed foods and information to be communicated on the packaging. Overall, the aims were: (1) to investigate through an online conjoint experiment the relative importance (utilities) of a set of products characteristics resulting from focus group discussions on consumers' ideal concept of "organic"; (2) to explore individual differences in terms of socio-demographic and attitudinal characteristics (3) to identify concepts/meanings that consumers attach to a "careful" food processing.

2. Design and methods

2.1 Elicitation task

The research began with a qualitative approach, to elicit factors to be used in the successive quantitative study aimed at exploring the consumers' perception of organic food related to different level of processing.

2.1.1 Focus group interviews. One focus group with seven and one with eight volunteers were conducted to find out what consumers know/want to know about food processing and how to communicate it.

Participants were screened for being regular consumers of organic foods (at least once every fortnight or more), be responsible for grocery shopping or collaborating in the purchase of food. They were balanced by gender and in the 25–64 age range. Focus groups took place at CREA Research Centre on Food and Nutrition, Rome, Italy in a neutral environment. Each group interview lasted approximately 90 min and was verbatim transcribed. The participants were informed that the interviews would be recorded, and the information would be used for scientific purposes only. An interview guide was used for both the focus groups sessions. Two moderators facilitated the discussion.

The focus groups began with an introduction aimed at knowing what consumers think and perceive of the treatments implemented on organic foods. A technical explanation of food processing was given: “Organic food processing includes any physical or mechanical treatment, by which raw foodstuffs are made suitable for consumption, for example it may include washing, cutting, shelf-life extension techniques, preservation such as pasteurization, freezing, etc., packaging, and other treatments”. In a second phase, questions were asked to investigate aspects and criteria, related to food processing, that consumers want to be considered in organic food products. Images of food products were shown representing different levels of processing, or the same level of processing but different matrices, mono and multi-ingredient products, animal/vegetable products. Participants were shown a large sheet of paper with a small circle drawn in the centre: “This is the domain of organic food and the circle in the centre is your ideal of ‘organic’. How far from this circle would you place the products in front of you?” Once the products were entered, the moderator summed up by asking: “What aspects/factors/characteristics made you to set the products position (close/distant to your ideal of organic product)?”. The third step aimed to bring out what kind of information consumers want about organic processed foods, and how that information should be communicated on the package.

Two persons of the research team classified the focus transcript to identify the key concepts, from which a draft coding frame was developed and differences among key concepts were resolved after agreement was reached between the two staff members. The recurrence and completeness of quotes were used to determine the predominant themes (Ritchie *et al.*, 2013).

2.1.2 On-line items elicitation. In addition to the focus groups, an online survey on items elicitation with open-ended questions was conducted to obtain spontaneous answers from participants regarding what consumers know/want to know about food processing and how to communicate it. Sixty-one regular and occasional consumers of organic foods were randomly selected from volunteers consumers of organic products (24 M and 37 F; age range: 22–72 years; mean age: 48.9 years, SD: 15.2 years) to obtain additional information about the following:

- (1) *What criteria must the processing meet to be suitable for organic foods?*
- (2) *What terms do you think best define “careful processing”?*
- (3) *What are the best ways for you to communicate “careful processing”? If a symbol what?*
- (4) *What are the best ways for you to communicate about processing (e.g. websites, QR code, etc.)?*

The information elicited from the focus group and the on-line item’s elicitation study was used to design the quantitative survey.

2.2 Quantitative on-line survey

2.2.1 Participants characteristics. The survey was completed in January 2021 through on-line access panel of a market research agency by a sample of 439 Italian consumers of processed organic food (once every fortnight was the minimum required) responsible for food purchases in their household or cooperating in food purchases and do not working in the food or marketing sectors. Consumers were randomly recruited, through open invitations. There were quotas for gender (50% F, M), age (50% 25–49 years and 50–75 years) and geographic distribution (33% North, Central and South Italy plus Islands).

Participants received written information about the study in advance and gave written voluntary consent to participate. They were informed that their participation was voluntary and that their individual responses would remain confidential.

The socio-demographic characteristics of the final sample are presented in Table 1. It included 43.7% males and 56.3% females. The education level is high, with almost 50% of the respondents having a university degree. The majority declared to use organic product more times a week (44.2%) or every day or almost (19.4%).

2.2.2 Web based questionnaire. The self-administered on-line questionnaire was developed to investigate consumers' opinions on the information to be claimed on the label of organic processed foods and on the processing criteria to be respected for these products. The on-line questionnaire was designed considering the results of the focus groups and the elicitation study and it consisted of three sections introduced by a short paragraph explaining the purpose of the study. The questionnaire concluded with questions on food purchasing habits and some socio-demographic characteristics. The original questionnaire was in Italian.

The first section included five questions aimed at collecting opinions on the criteria that the food processing should meet to be suitable for organic products, on how the processing must be communicated on the package, and which terms best define a "careful processing". They were (1) *what are the most important criteria for you that the processing of an organic product should respect*; (2) *How important is it for you that information on the processing of an organic product is shown on the packaging*; (3) *How would you like processing information to be communicated on the packaging*; (4) *If it were a symbol to communicate information about the treatment, which symbol would you like*; (5) *How would you define, in a single term, an adequate processing for organic products* (Table S1 of the Supplementary material).

The second section included a rating-based conjoint analysis experiment. It consisted in showing the image of an organic food defined by a set of attributes and levels. The aim was to

	<i>n</i>	%
<i>Gender</i>		
Women	247	56.3
Men	192	43.7
<i>Age (years)</i>		
25–49	213	48.5
50–75	226	51.5
<i>Residence</i>		
North	116	26.4
Centre	112	25.5
South + Islands	117	26.7
Unknown	94	21.4
<i>Education</i>		
Primary	13	3.0
Secondary	209	47.6
Higher	217	49.4
<i>Consumption of organic products</i>		
Every day or almost	85	19.4
More times a week	194	44.2
Once a week	74	16.8
More times a month, but not every week	86	19.6

Note(s): *Data of Italian population for the range of age 25–75 years: W = 51.1% M = 48.9%; Yrs25–49 = 45.6% Yrs50–75 = 54.4%; North = 46.5%; Centre = 19.9%, South + Islands = 33.6%; Education (age 25–64 years): Secondary = 62.9%; Higher = 20.1% (ISTAT, 2023 Census <https://www.istat.it/>)

Source(s): Authors' work

Table 1.
Socio-demographic characteristics of the consumers (overall sample of 439 subjects)*

determine how organic food consumers' value different product attributes and to identify their role in determining respondents' perception of organic food.

In the third session of the questionnaire the six items of the GREEN scale by [Haws et al. \(2014\)](#) were included to measure the respondents' attitudes towards the potential environmental impact of their own purchases and consumption behaviours. For a positive orientation in the choice of green products, key indicators of the GREEN scale are the environmental commitment, awareness of the influence of individual decisions on environment, green purchasing habits, concern for waste and concern for hostile actions against the environment by others. All the responses were rated on a seven-point Likert scale (from 1 = *strongly disagree* to 7 = *strongly agree*).

2.2.3 Conjoint design. Each product profile consisted of five attributes/factors with potential significance for information to be claimed on the label of organic processed foods. [Table 2](#) shows the factor levels used in the study. The first factor was the product type. For our study we selected as carriers three plant-based processed organic products with different degree of processing (according to NOVA classification) ([Monteiro et al., 2019a, b](#)), they were: (1) *vegetable burger* (ultra-processed and multi-ingredient); (2) *canned peas (in glass jar)* (processed); (3) *bagged salad* (minimally processed). The other four factors were chosen based on a review of the scientific literature on information on front-package related to environmental sustainability ([Midmore et al., 2011](#)) and then discussed among the co-authors of this paper. The selected four factors were the potential information that could appear on the product packaging related to: (1) packaging (3 levels); (2) processing (3 levels); (3) additives (2 levels); (4) quality (2 levels). As the number of possible different combinations to present was very large ($56 = 3 \times 3 \times 2 \times 2 \times 3$), to reduce the number of product profiles to be evaluated per participant, a fractional factorial design was used to effectively test the effect of attributes on the adherence of the product profile to their perception of organic product. To construct the fractional factorial plan, an orthogonal array design was applied, so that the independent contributions of all the main effects were balanced, assuming negligible interactions ([Wind and Green, 1975](#)).

Therefore, participants evaluated a total of 16 product profiles ([Table S2](#) of the Supplementary material). All the information was presented using cards with images like the ones shown in [Appendix](#). A rating-based conjoint was applied. Images of product profiles were presented to participants on computer screen. They were asked to score their perceived "organic food" concept of the different images "How close this product comes to your ideal of organic food?", using a 7-point structured scale labelled "not at all" on the left and "very much" on the right. Part-worth utilities were estimated using Ordinary Least Squares regression analysis to establish the relative importance of the attributes and the part-worth of each of their levels.

The averaged relative importance that the respondents gave to the different attributes and the utility values obtained for each level of the selected factors were determined.

After conjoint analysis, a post hoc cluster analysis based on the pattern of individual utilities was applied to identify distinct segments of respondents to provide additional insights into differences between consumer groups and to explore their idea of organic food related to different level of processing and significance for information claimed on the label of processed organic foods. A two-stage cluster analysis procedure was performed. In the first stage, the hierarchical Ward method was adopted to identify the optimal number of groups. In the second stage, the non-hierarchical k-means algorithm was applied to form the clusters ([Hair et al., 2010](#)). One-way analysis of variance (ANOVA) was performed to check significant differences ($p < 0.05$) between mean scores in the cluster and in the rest of the sample. Chi-squared tests were applied to check significant differences ($p < 0.01$) between percentage frequencies of the other variables.

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Factor	Levels	Description
Packaging	No message	–
	Concise positive Informative message (Objective description on use of environmentally friendly materials)	Packaged with environmentally friendly materials (for <i>vegetable burger</i>) Packaged with recyclable, environmentally friendly materials (for <i>peas in glass jar</i>) Packaged with environmentally friendly materials (for <i>bagged salad</i>)
	Neutral Informative message (Objective description of the material or its disposal)	Packaged in plastic tray and with cardboard wrapper (for <i>vegetable burger</i>) Packaged in glass to be disposed of according to the rules of separate collection (for <i>peas in glass jar</i>) Plastic packaging to be disposed of according to the rules of separate collection (for <i>bagged salad</i>)
Processing	No message	–
	Concise positive informative message (Objective description on environmental sustainability of the processing)	Processed with low electricity consumption to reduce the environmental impact (for <i>vegetable burger</i>) Raw materials coming from fields located near the company to reduce the transport environmental impact (for <i>peas in glass jar</i>) Raw materials coming from fields located near the company to reduce the transport environmental impact (for <i>bagged salad</i>)
	Neutral Informative message (Objective description referring to specific steps of the processing without referring to the environmental impact)	Ingredients previously processed and transported to the company for preparation of the final product (for <i>vegetable burger</i>) Product pre-treated by blanching prior to canning, that require the use of electricity to produce the necessary heat (for <i>peas in glass</i>) Product washed with plenty of water to remove impurities and reduce the microbial load (for <i>bagged salad</i>)
Additives	No message	–
	Concise positive informative message	Additives approved by the European legislation on organic products (<i>vegetable burger</i>) No additives except salt (<i>peas in glass jar</i>) Additive free (<i>bagged salad</i>)
Quality	No message	–
	Concise positive informative message	The processing does not damage the essential amino acid content (<i>vegetable burger</i>) Freshly picked products (<i>peas in glass jar</i>) Fresh as freshly picked (<i>bagged salad</i>)
Product	Vegetable burger	Ultra-processed and multi-ingredient
	Canned peas	Processed
	Bagged salad	Minimally processed

Source(s): Authors work

Table 2.
Factor levels used in the conjoint design using product type as a factor

Socio-demographic characteristics of the overall sample and clusters of consumers were summarized using descriptive statistics and categorical variables were reported as percentages. Continuous variables were reported as mean and standard deviation and differences analysed by ANOVA.

All the statistical analyses and the orthogonal array design were performed using the Statistical Package for the Social Sciences version 25.0 (SPSS Inc., Chicago, IL, USA).

3. Results

3.1 Elicitation task

The results of the focus groups underlined the relevance of environmental sustainability and nutritional quality in the formation of organic food concept. Ultra-processed and multi-ingredient products have been cited as factors that are believed to “distance a food product from the concept of ‘organic product’”. Organic equates to “minimal handling and processing” and expects “limited loss of nutritional and sensory characteristics” and “low environmental impact”. Furthermore, consumers think that “in multi-ingredient products, additives are more likely to be added”, and that organic foods have “inferior nutritional quality”. Regarding the information to be received on food processing, most people report “confusion on the labels”, that “the organic label provides information on organic production, but it is not known what is behind the processing”; about importance of “learning on additives, to make comparisons”, about “product certification up to the shelf”, and about use of “sustainable packaging”.

The results of the web-based questionnaire revealed that “maintaining organic product integrity” (11 respondents out of 61; 18.0%), “nutritional quality” (7; 11.5%) and “no use of chemicals and additives” (6; 9.8%) were the most important criteria indicated by the respondents that a processing of organic products should claim.

A “simple and clear information label” on the package was deemed suitable to communicate “careful processing” (39; 63.9%). A green symbol, such as a plant or tree, was chosen for communicating proper processing for organic products (11; 18.0%). QR Code (30; 49.2%) and website (12; 19.7%) were identified as best ways to communicate with customers. “Respectful” (7; 11.5%) (of the environment and minimally invasive), “natural” (5; 8.2%) and “accurate” (4; 6.5%) were the terms best associated with a careful processing for organic food products.

3.2 Quantitative on-line survey

3.2.1 *Influences of information on the “organic product” concept.* Table 3 shows the utilities and the average importance scores of the “organic product” concept resulting from the Conjoint Analysis. With reference to the importance of each attribute, the data highlight that consumers consider the food product type as the most important factor. This is followed by information on processing and packaging, while apparently less importance has been given to messages on quality and additives.

The utilities assigned to each level of the attribute evidence that the “peas in glass jar” was the product that best conveyed the idea of “organic product” by consumers. Vegetable burger, on the other hand, as an example of ultra-processed organic product, was far from their idea of what a truly organic product should be”.

For the informational attributes related to the “packaging” and “processing” the positive message had a definite positive impact, against a negative impact of a neutral informative message and the absence of message. A simple and synthetic descriptive message that informs about the *environmentally friendly materials used for packaging* or about some process steps having a low impact on the environment (e.g. “Processed with low electricity consumption to reduce the environmental impact”; “Raw materials coming from fields located near the company to reduce the transport environmental impact”) had a more positive impact on the perception of organic (utilities estimates = 0.159 and = 0.428, respectively).

A neutral informative message describing the material (e.g. *Packaged in plastic tray and with cardboard wrapper*) or describing instructions for disposal of the packaging (e.g.

Factors	Levels	Utility estimates	S.E.
Packaging	No message	-0.125	0.131
	Concise positive informative message	0.159	0.154
	Neutral informative message	-0.034	0.154
Processing	No message	-0.158	0.131
	Concise positive informative message	0.428	0.154
	Neutral informative message	-0.270	0.154
Additives	No message	-0.129	0.098
	Concise positive informative message	0.129	0.098
Quality	No message	-0.239	0.098
	Concise positive informative message	0.239	0.098
Product	Vegetable burger (ultra-processed, multi-ingredient)	-0.317	0.131
	Peas in glass jar (processed)	0.305	0.154
	Bagged salad (minimally processed)	0.011	0.154
Constant		4.694	0.114
Relative importance		(%)	
Packaging information		20.403	
Processing information		23.835	
Additive information		12.441	
Quality information		13.861	
Product		29.460	

Table 3.
Utilities and averaged
importance scores of
the “organic product”
concept (overall sample
of 439 subjects)

Source(s): Authors work

“Packaged in glass to be disposed of according to the rules of separate collection”) or some steps of the processing (“Ingredients previously processed and transported to the company for preparation of the final product”) had a negative impact on the perception of organic (utilities estimates = -0.034). The same was for the attributes “information on additives” and “information on product quality”: a positive message on the packaging impacted positively consumers’ concept of organic food than the absence of a message.

3.2.2 Participants’ segmentation. A post hoc cluster analysis based on the pattern of individual utilities was applied to identify distinct segments of respondents, to provide further insights into differences between consumer groups and to link consumers’ characteristics with their perception of organic for specific attributes of packaged organic foods. Three clusters were derived. The analysis of variance showed that all segments differed significantly ($p < 0.05$) from each other with respect to the utility variables generated by the conjoint analysis and used to determine the segmentation, except for the attribute “information on additives” (not significant). [Table 4](#) shows the results of the cluster analysis on the pattern individual utilities. From the estimated utilities of individual attributes, we can see that cluster 3, compared to the other two clusters, showed a stronger perception of “organic” when a concise positive information on packaging was provided regarding the use of environmentally friendly materials for packaging, or information related to processing having a positive impact on the environment. In contrast, for the same group of respondents, a stronger negative impact on their ideal concept of organic was found when information on materials used for packaging was missing or when a generic descriptive message on processing was provided.

The descriptive profiles of the consumer clusters are shown in [Table 5](#). The differences between the three clusters were not statistically significant, except that Cluster 2 is characterized by fewer respondents being primarily responsible for food purchases and a higher number of respondents sharing food purchases with someone else ($X^2 = 24.4$; $p < 0.001$). Cluster 3 was composed by a higher percentage (not statistically significant; $p > 0.05$) of female respondents (60.1%), of young people (25–49 years, 58.7%) and of

Factors	Levels	Cluster 1	Cluster 2	Cluster 3	F	Sign
		(n = 233; 54.1%)	(n = 106; 24.6%)	(n = 92; 21.3%)		
Packaging	No message	-0.16	0.15	-0.37	47.75	<0.001
	Concise positive informative message	0.10	-0.02	0.52	46.60	<0.001
	Neutral informative message	0.06	-0.14	-0.15	11.15	<0.001
Processing	No message	-0.15	-0.10	-0.25	3.76	<0.05
	Concise positive informative message	0.18	0.37	1.13	217.14	<0.001
	Neutral informative message	-0.03	-0.26	-0.88	140.75	<0.001
Additives	No message	-0.13	-0.14	-0.11	0.19	ns
	Concise positive informative message	0.13	0.14	0.11	0.19	ns
Quality	No message	-0.22	-0.21	-0.32	3.96	<0.05
	Concise positive informative message	0.22	0.21	0.32	3.96	<0.05
Product	Vegetable burger (ultra-processed, multi- ingredient)	0.04	-1.13	-0.27	201.65	<0.001
	Peas in glass jar (processed)	0.16	0.77	0.13	41.55	<0.001
	Bagged salad (minimally processed)	-0.20	0.37	0.14	34.04	<0.001

Table 4.
Conjoint analysis
results for the three-
cluster solution of the
respondents

Source(s): Authors' work

respondents with a degree or doctoral degree (62.0%). Moreover, compared to the other two clusters, cluster 3 included slightly more respondents who frequently buy organic foods (every day or almost every day + several days a week = 65.2 vs 62.1% for cluster 2 and 63.1% for cluster 1; not statistically significant; $p > 0.05$). They also seem to be more inclined to spend a lot of time shopping for food (33.7 vs 26.4% and 18.45%, respectively, for cluster 2 and cluster 1) (not statistically significant; $p > 0.05$). Respondents from all the clusters, declared to purchase organic food products more frequently in traditional supermarkets (79.8% in cluster 1, 76.4% in cluster 2 and 76.1% in cluster 3) than in specialized organic shops (45.1%, 29.2% and 45.7%, respectively).

Furthermore, with reference to the GREEN scale (Cronbach's $\alpha = 0.91$), on average, the three segments of respondents appeared to have positive attitudes towards the potential environmental impact of their purchasing and consumption behaviours (mean rating ≥ 5.8), with slightly higher values for cluster 3 (mean = 6.03; $F = 6.02$; $p < 0.003$).

3.2.3 Consumers view on communication of careful processing. As regards the respondents' attitudes towards process information [Figures 1a and 1b](#), most of the respondents prefer information messages on the packaging ([Figure 1a](#)). A significant difference on symbol's preference was observed among the clusters ($\chi^2 = 24.76$; $p < 0.05$) ([Figure 1b](#)). If it were a symbol or image as a mean of communication of the processing, *a hand holding a seedling* was the most frequently choice (33%, 28.3 and 24.9% for cluster 2, 3 and 1, respectively; $\chi^2 = 24.76$; $p < 0.05$).

Compared to the other two clusters, cluster 3 comprises a higher percentage of respondents who stated that a suitable process to be used for organic food should be termed as "eco-friendly process" (48.9% of respondents, vs 27 and 30%, respectively, for cluster 1 and cluster 2; $\chi^2 = 34.05$; $p < 0.005$) ([Figure 2](#)).

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Characteristic	Category	Cluster 1 (<i>n</i> = 233) (%)	Cluster 2 (<i>n</i> = 106) (%)	Cluster 3 (<i>n</i> = 92) (%)	
Gender	F	57.9	48.1	60.1	
	M	42.1	51.9	39.1	ns
Age	25–49 year	45.9	45.3	58.7	
	50–75 yrs	57.1	54.7	41.3	ns
Geographic area	Northern Italy	38.1	27.5	30.1	
	Central Italy	32.5	33.7	31.7	
	Southern Italy + Islands	29.4	38.7	38.1	ns
Instruction	Degree or PHDs	45.5	49.1	62.0	
	High school diploma	51.9	48.1	33.7	
	Primary school diploma	2.6	2.8	4.3	ns
Food purchase responsibility	I am the main responsible for food purchases	78.5	56.6	71.7	
	I am primarily responsible, but occasionally someone else takes care of food purchases	3.0	3.8	8.7	
	I share food purchases with someone else (same extent)	18.5	39.6	19.6	$\chi^2 = 24.4;$ $p < 0.001$
Frequency of organic food purchase	Every day or almost every day	20.6	15.1	19.6	
	Several times a week	42.5	46.2	45.6	
	Once a week	18.0	19.0	14.1	
	Several times a month, but not every week	18.9	21.7	20.65	ns
Attitudes towards food shopping (1 answer)	I get bored doing the food shopping, therefore I try to fix it as soon as possible	4.3	1.9	2.2	
	I would like to spend time shopping for food, but I am almost always in a hurry	22.3	21.7	15.2	
	Shopping for food relaxes me and I like to spend time choosing food	54.9	50	48.9	
	I spend a lot of time shopping because I am demanding in the choice of products	18.4	26.4	33.7	ns
Place of purchase (3 answers)	Solidarity buying groups	<i>n</i> 19 8.2	<i>n</i> 5 4.7	<i>n</i> 4 4.3	
	Fair trade points of sale	28 12.0	9 8.5	14 15.2	
	Websites for online food shopping	31 13.3	9 8.5	9 9.8	
	Traditional supermarkets	186 79.8	81 76.4	70 76.1	
	Shops specializing in organic products	105 45.1	31 29.2	42 45.7	
	Local market	53 22.7	35 33.0	15 16.3	
	Direct Selling Markets (Farmers/Producers Markets)	80 34.3	41 38.7	32 4.8	
	Directly from the farmer/producer on the farm	35 15.0	35 33.0	23 25.0	ns
Green attitude*	Mean (SD)	5.8 (1.04)	6.0 (0.91)	6.3 (0.76)	$F = 6.02;$ $p < 0.003$

Note(s): *Mean ratings of the six items of the green scale by [Haws et al. \(2014\)](#)

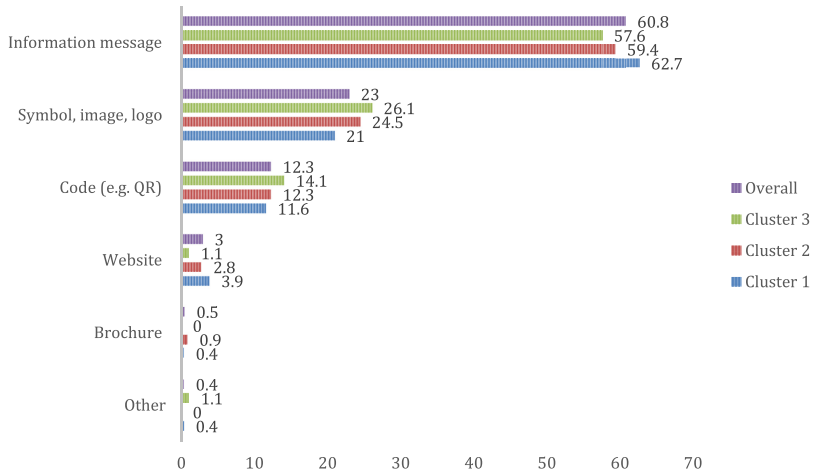
- It is important to me that the products I use do not harm the environment
 - I consider the potential environmental impact of my actions when making many of my decisions
 - My purchase habits are affected by my concern for our environment
 - I am concerned about wasting the resources of our planet
 - I would describe myself as environmentally responsible
 - I am willing to be inconvenienced in order to take actions that are more environmentally friendly
- (Seven-point scale ranging from 1 = “strongly disagree” to 7 = “strongly agree”, with a neutral central point 4 = “neither agree nor disagree”)

Data on 431 respondents

Source(s): Authors work

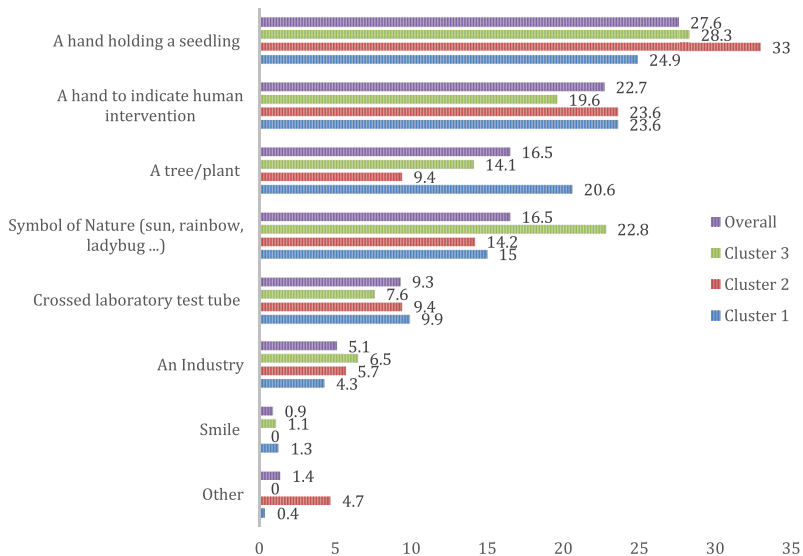
Table 5.
Characteristics of the
three clusters of
respondents

How would you like the information on the processing to be communicated on the packaging? ($\chi^2 = 8.74, ns$)



(a)

If it were a symbol to communicate information on the processing, which symbol would you like? ($\chi^2 = 24.76, p < 0.05$)



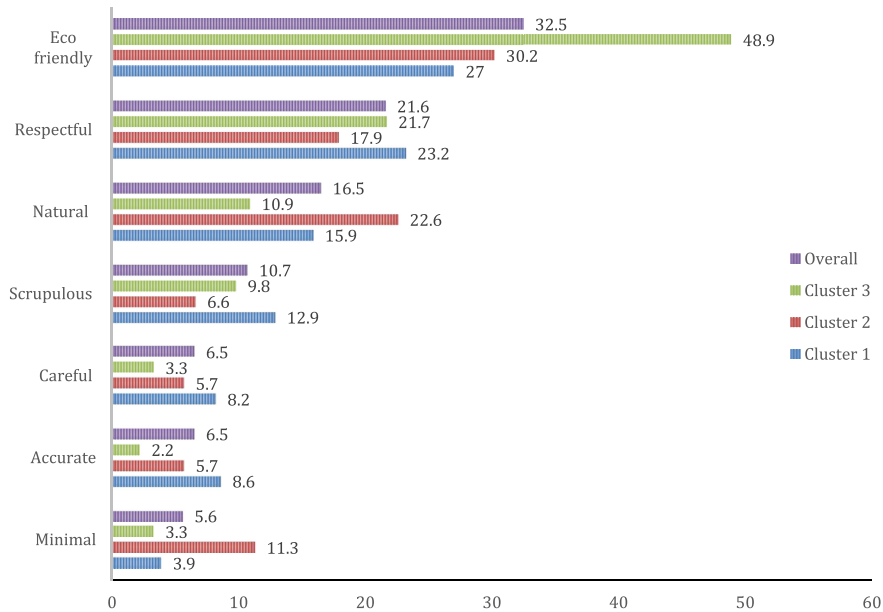
(b)

Figure 1.
Views on information to be communicated on food products packaging by each cluster

Source(s): Authors work

How would you define, with a single term, an adequate processing for organic products?
($\chi^2 = 34.05, p < 0.005$)

Processed
organic food
perception



Source(s): Authors work

Figure 2.
Views on the definition
of a suitable process to
be used by each cluster

4. Discussion

4.1 Influence of the conjoint variables on consumers' ideal concept of organic food

The overall results of this paper highlight that the product type has the strongest relative importance to participants compared to the other factors considered in the conjoint design. The highest adherence to consumers' concept of organic foods, at aggregated level, was attributed to the *peas in glass jar*, while the lowest for the *vegetable burger*, which means that, overall, the ultra-processed and multi-ingredient product was considered by the respondents quite far from their ideal concept of organic food. The participants may have linked the organic food concept to simpler and more familiar products, rather than a multi-ingredient, ultra-processed product.

In addition, there was disagreement among the identified groups of organic consumers on the adherence of the bagged salad – as an example of minimally processed food – to the ideal concept of organic product. Indeed, the utility value was negative for the respondents in cluster 1 and positive particularly for the respondents in cluster 2. Based on the above considerations, we expected consumers to generally associate a minimally processed product (bagged salad) to the ideal concept of organic food, but the results only partially confirmed this. However, cluster 1 was tendentially composed of the lowest percentage of people who declared to spend a lot of time on grocery shopping and the highest percentage of those who tried to fix their spending as soon as possible. They see the bagged salad more as a convenience food solution rather than an organic salad (Desquilbet *et al.*, 2018).

Moreover, the results showed that the presence of environmental sustainability cues linked to product processing and packaging have positively influenced the response of consumers of organic food with respect to their belief of organic for a food product.

Our findings suggest that consumers involved in purchasing organic food could be motivated by the environmental impact of their food choices. Indeed, environmental concern is one of the major motivation factors for organic consumers (Diagourtas *et al.*, 2023) in countries with a developed and mature organic food market and has proven influencing consumers' willingness to pay for organic foods (Katt and Meixner, 2020) and consumers' purchase intention towards organic food (Eberle *et al.*, 2022). Furthermore, positive environmental beliefs relating to organic products have also been observed in exploratory consumer research (Danner and Menapace, 2020). These findings may have important implications for food marketers who can profit from environmental sustainability claims, because by emphasizing the environmental benefits of organic food products, they can create positive expectations, enhance consumer confidence in the brand and positive attitudes toward the products, thus increasing purchase intention. However, consumers increasingly want to consider the diverse and interlinked facets of sustainability when they make purchasing decisions (Bangsa and Schlegelmilch, 2020). Thus, the need for a multidimensional sustainability labelling scheme that takes into account all the different sustainability goals needs to be developed (Torma and Thøgersen, 2021).

Referring to the segments of subjects, in line with our expectations, information labels on environmental sustainability have been more appreciated by consumers with a generally higher level of education and greener attitudes, i.e. consumers belonging to cluster 3. With reference to demographic variables our results show no gender or age effects.

Clear communication on preservatives (i.e. "additive free" or "approved by the European legislation of organic products") had less value on the consumers' concept of organic food. This is likely due to consumers' awareness that organic products are grown without the use of synthetic pesticides or chemical fertilizers and produced without the use of artificial preservatives or irradiation. Analogous results were also found for the communication on product quality. The utility values of all respondents indicated the confident effect of a positive information message, with apparently little importance attached to the concept of organic food, probably because consumers *a priori* assume that organic products are high quality products (Kahl *et al.*, 2012; Lamonaca *et al.*, 2022).

4.2 Communication of "careful" processing

Based on previous research a definition of careful processing has been attempted (Kretzschmar and Schmid, 2011). Consumers' understanding of careful processing concerns environmentally friendly products, naturally produced, minimally processed, which preserve the natural taste of foods and with greater retention of nutrients (Hüppe and Zander, 2021). A simple definition of careful processing referring to the preservation of nutritional and sensory quality, negligible use of additives, minimal health risk and minimal impact on environment was effective in allowing consumers to consistently distinguish and rate different processing technologies (Kilic *et al.*, 2021).

In our survey, in agreement with other research insights (Sörqvist *et al.*, 2015), a clear information message as "eco-friendly" regarding the processing of organic products appeared to be the best message to communicate to consumers, mainly in people with more positive attitudes toward organic products.

4.3 Study limitations

Some noticeable limitations can be identified in the current study that open room for future research. The data sets were collected from samples that are not fully representative of the general population because of the limited size and characteristics of the sample studied, which limits the generalizability of the findings. Therefore, some caution is required in generalizing the results to the overall consumers' population.

Further, the study only investigated in the Italian context, so future studies could consider more factors such as culture, geographical location of the country in a cross-cultural investigation.

The study was conducted during the outbreak of the coronavirus disease (COVID-19). Due to this condition, we have been obliged to change the data collection procedure and to adopt an online one. The online setting of the survey could cause hypothetical bias.

5. Conclusions and implications for food marketing

In conclusion, any food product has a complex meaning represented by more objective and subjective factors often strongly correlated. Indeed, regarding the first research objective of our study, the type of product, with its complexity, had a great relevance in the consumer's perception of the meaning of organic. Specifically, the type of ultra-processed and multi-ingredient product had a negative impact on the perception of organic. Even for the bagged salad, the plastic material of the bag might have negatively affected consumers' perception. While a more traditional product, like canned peas, fits better with consumers' perception of organic food. The concise positive messages on environmental sustainability of processing and packaging were also powerful. The findings of this study on the negative impact that multi-processed and multi-ingredient products have on consumers' ideal concept of organic and on the positive effect of environmentally friendly processing and packaging cue, may have relevant implications. From a managerial point of view, these results can help organic food marketers and retailers to design appropriate marketing strategies based on ethical attributes that meet consumer demand. Furthermore, may be useful for adopting more effective communication strategies, by companies and governments, to strengthen environmental awareness and conscious consumption of consumers linked to the purchase of organic foods.

As for our second research objective, to explore consumer segments displaying different attitudes, environmental sustainability information labels related to processing and packaging had more appeal to people with higher education level and greener attitudes. For segments of consumers with sustainable and ethical attitudes, claims about environmental benefits can generate positive expectations.

As regard the third objective of the research, that of identifying the best concepts for communicating to consumers the "careful processing" of organic products, a simple informative message such as "eco-friendly" proved to be the best message to communicate. Food marketers could profit from the eco-friendly claim because it can create positive expectations, satisfying consumers' positive attitudes related to environmental protection and ethical values, positively correlated with organic food purchase intention and ultimately with the frequency of consumption.

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Ultra-processed and multi-ingredient (vegetable burger)



Processed: peas in glass jar



Minimally processed: bagged salad



Figure A1. Processed food products selected for the conjoint analysis

Source(s): Authors work

Supplementary Material

Processed
organic food
perception

	<i>n</i>	(n = 439)	%
<i>Q1 What are the most important criteria for you that the processing of an organic product should satisfy (3 answers)</i>			
Preserve the integrity of the organic product	196		44.6
Respect for the environment	273		62.2
Preserve the nutritional quality	159		36.2
Preserve the sensory quality	70		15.9
No chemicals	224		51.0
Minimum processing	58		13.2
Protect consumers' health	149		33.9
Maintain the natural characteristics of the product	145		33.0
Other	1		0.2
		Mean	(SD)
<i>Q2 How important is it for you that information on the processing of an organic product is shown on the packaging?</i>		6.0	(1.09)
	<i>n</i>		%
<i>Q3 How would you like the information on the processing to be communicated on the packaging? (1 answer)</i>			
Written information message on the packaging	266		60.6
Code (e.g. QR)	53		12.1
Symbol, image, logo	101		23.0
Website	14		3.2
Brochure	2		0.5
I do not care about it being communicated	1		0.2
Other	2		0.45
<i>Q4 If it were a symbol to communicate information on the processing, which symbol would you like? (1 answer)</i>			
An Industry	23		5.2
A tree/plant	74		16.9
Crossed laboratory test tube	40		9.1
A hand holding a seedling	120		27.3
A hand that indicates the intervention of man	98		22.3
Smile	4		0.9
Symbol of Nature (sun, rainbow, ladybug . . .)	74		16.9
Other	6		1.4
<i>Q5 How would you define, with a single term, a comfortable processing for organic products? (1 answer)</i>			
Respectful	95		21.6
Careful	29		6.6
Accurate	28		6.4
Scrupulous/meticulous	48		10.9
Eco friendly	143		32.6
Minimum	24		5.5
Natural	71		16.2
Other	1		0.2

Source(s): Authors' work

Table S1.
Frequency of
responses to the first
session of the survey
questionnaire

BFJ

	Product	Packaging	Processing	Additives	Quality
1	Vegetable burger	No message	No message	No message	The processing does not damage the essential amino acid content
2	Bagged salad	Plastic packaging to be disposed according to the rules of separate collection	Product washed with plenty of water to remove impurities and reduce the microbial load	No message	No message
3	Vegetable burger	No message	Processed with low electricity consumption to reduce the environmental impact	No message	No message
4	Vegetable burger	Packaged in plastic tray and with cardboard wrapper	No message	Additives approved by the European legislation on organic products	The processing does not damage the essential amino acid content
5	Peas in glass jar	Packaged in glass to be disposed of according to the rules of separate collection (of your municipality)	No message	No message	Freshly picked products
6	Vegetable burger	No message	Ingredients previously processed and transported to the company for preparation of the final product	No message	The processing does not damage the essential amino acid content
7	Peas in glass jar	Packaged with recyclable, environmentally friendly materials	Raw materials coming from fields located near the company to reduce the transport environmental impact	No message	Freshly picked products
8	Vegetable burger	Packaged with environmentally friendly materials	No message	Additives approved by the European legislation on organic products	No message
9	Bagged salad	No message	No message	Additive free	Fresh as freshly picked
10	Peas in glass jar	No message	No message	No additives except salt	
11	Peas in glass jar	No message	Product pre-treated by blanching prior to canning, that require the use of electricity to produce the necessary heat	No additives except salt	No message

Table S2.
Products profiles

(continued)

	Product	Packaging	Processing	Additives	Quality	Processed organic food perception
12	Vegetable burger	Packaged with environmentally friendly materials	Ingredients previously processed and transported to the company for preparation of the final product	Additives approved by the European legislation on organic products	The processing does not damage the essential amino acid content	
13	Bagged salad	No message	Raw materials coming from fields located near the company to reduce the transport environmental impact	Additive free	Fresh as freshly picked	
14	Vegetable burger	No message	No message	No message	No message	
15	Vegetable burger	Packaged in plastic tray and with cardboard wrapper	Processed with low electricity consumption to reduce the environmental impact	Additives approved by the European legislation on organic products	No message	
16	Bagged salad	Packaged with environmentally friendly materials	No message	No message	No message	
<p>Note(s): 16 Stimuli evaluated for “ideal concept of <i>organic food</i>” ranging from 1 as “not at all” to 7 as “very much”</p> <p>Source(s): Authors work</p>						

Table S2.

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