The perceived value of oat milk and the food-choice motives of young, urban people

Merja Halme
Department of Information and Service Management,
Aalto University School of Business, Espoo, Finland
Anna-Maija Pirttilä-Backman
Faculty of Social Sciences, Social Psychology, University of Helsinki,
Helsinki, Finland, and
Trang Pham
Department of Information and Service Management,
Aalto University School of Business, Espoo, Finland

Abstract

Purpose – Both governments and the food industry are interested in plant-based products. New products are advertised as climate-friendly, with plant-based materials increasingly replacing animal-based content. In Finland, oat milk dominates the plant-based milk market. The authors studied what features young and urban users of plant-based and cow's milk value in oat milk for coffee and how the preferences of the users relate to ethical food-choice motives.

Design/methodology/approach – In total, 308 students filled in an e-questionnaire. The survey used best-worst scaling (BWS), a discrete choice approach, to measure the perceived values related to oat milk characteristics. The ethical motives were measured by a version of the Lindeman and Väänänen scale. Also the respondents' diets were asked. Preference clusters were identified and viewed with the ethical food-choice motives and diets.

Findings – The respondent group that exclusively used cow's milk attached more value to taste, added nutritional elements, discounts and recommendations by friends. The rest of the respondents attached more value to origin and sustainability-related features of oat milk. In the six-cluster solution, one extreme cluster was valuing taste and the other was valuing sustainability-related issues. All the ethical food-choice motives: ecological welfare, political values and religion were (roughly) the higher the cluster valued sustainability-related items. The respondents eating meat were more likely to belong to the clusters valuing taste than non-meat eaters that belong more likely to clusters valuing sustainability-related features.

Originality/value – Very few earlier studies have explored the heterogeneity of valuations of plant-based products and the products' relationship with ethical food-choice motives.

Keywords Food choice, Plant-based milk, Ethical food choice motives, Milk, Oat milk

Paper type Research paper

1. Introduction

Governments attempt to manage challenges, such as fast-growing health budgets and threats related to climate change, by promoting healthier and more sustainable diets (Pieniak *et al.*, 2016; Hoek *et al.*, 2017). The industry has supported innovations and the manufacture of plant-based alternatives to dairy and meat products. Global sales of plant-based milk, for example, more than doubled between 2009 and 2015 (Whipp and Daneshkhu, 2016). Sales of cow's milk

remain relatively flat, falling 3.5% in the five years to 2017 (Terazono, 2018). The trends are watched intensively in the financial world: a search within the Financial Times for the phrase "plant-based dairy," for example, has produced numerous hits for the last two to three years.

More and more innovative food products are being launched in the market. The customers' perceptions of and preferences for new products are changing. What are the factors that drive consumers to use new types of plant-based food products? How do consumers adopting different kinds of diets use the new plant-based products? Our focus in this study is on plant-based milk for coffee, and more specifically, on oat milk that dominates the plant-based milk market in Finland, our target country. In Finland the milk consumption is high, i.e. 90% of the inhabitants use milk in some form, which offers vast potential for plant-based milk products. Oat milk is a product that is suitable for everyday use and there are various brands available; sales are constantly on the rise –e.g. the oat-based company Oatly's turnover grew each year by 100% during 2019–2021 and the majority of its turnover originated from milk for coffee (af Heurlin, 2021).

The market for plant-based milk varies from country to country. It is heterogeneous in the USA, for example, where soy and almond milk are the most popular (Dairy altenatives market size, n.d.). However, the situation is different in Finland. Not only is oat milk the market leader, but according to NielsenIQ Finland its market share is 75% (inhome purchasing in value) in the plant-based milk sector (Salmirinne, 2021). Cardello et al. (2022b) call for more studies in plant-based beverages that they find understudied relative to plant-based meat alternatives. Additional information carries all the more weight as Cardello et al. (2022a) report the finding that plant-based milk has the highest willingness-to-consume ratings in their study of plant-based products.

To our knowledge, the only previous studies focusing on what drives the choice or perception of plant-based milk are those conducted by McCarthy et al. (2019), Haas et al. (2019) and Jaeger and Giacalone (2021) all of which also studied cow milk. According to the first, USA-based study, the most valued features in plant-based milk were the sugar level, plant source and package size, whereas fat and protein content and the brand were valued less. The second study, carried out in Austria, measured the ratings of various attributes of soymilk: being healthy, digestible, light, energy-rich and allergy-free were rated more highly than being fresh, good for the bones, natural, value-for-money, rich in minerals and tasty. In the third, USA based study, the plant-based milk was found more modern and unique and less traditional than cow milk.

New plant-based product innovations are typically marketed under the slogan of sustainable development. Ethical choices constitute a significant incentive to consume these products. According to McCarthy et al. (2019), for example, the motivation underlying plant-based milk consumption in the USA is to stop the mistreatment of animals and to save the environment (Dairy alternatives market size, n.d.). Haas et al. (2019) reported similar results. Nevertheless, there are core features other than those related to sustainability that drive the use of plant-based products.

Many studies have shown that price and taste are among the strongest predictors of food-choice intentions (Connors et al., 1996; Arvola et al., 1999; Steenhuis et al., 2011). According to Lusk and Briggeman's (2009) widely adopted scale inspired by Schwartz' value model (1994), there are eleven food values, or abstract food-related features, consequences and "end states" of food consumption, that can predict food choices. This scale serves as the starting point for determining the relevant features of oat milk. Narrowing the scope of oat milk makes it more convenient for respondents who are asked to assess a product that is more or less familiar to them. We used the best-worst scaling (BWS) to determine the perceived value of different features of oat milk. We assumed that the perceived values are heterogeneous across respondents, driven by several personal and social factors such as the motives behind ethical food choices.

Researchers worldwide have focused on customers' understanding of ethical food motives (Lindeman and Väänänen, 2000; Auger and Devinney, 2007; Mäkiniemi, Pirttilä-Backman

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and Pieri, 2011). However, there is a lack of research on the role of ethical factors in the motivation to use different plant-based products and on how motivation relates to the perceived value of product features. The relationship of ethical food-choice motives and product characteristics has been studied earlier by, e.g. Pohjanheimo and Sandell (2009) in the case of drinking yoghurt – they did find connections. Lindeman and Väänänen (2000) concluded that three considerations guided ethical food choices: ecological welfare (animal welfare and environmental protection), political values and religion.

Young people are a critical group for the formation of future food trends. Education strengthens favorable attitudes toward sustainability in Finland (Bask *et al.*, 2020) where young people tend to live independently quite early (Iacovou, 2011). Oat milk is a product especially for the city-based consumers (af Heurlin, 2021). Therefore, students were a suitable target group in this study.

1.1 Research questions

Our objective was to study the perceived value of different features of oat milk for coffee among young and highly educated people. Owing to the various possible and changing ways of life by the young we wished to have some insight into the heterogeneity of their perceived values. Clustering the preference data allows us to find different groups that may need their individual plant-based milk products and plant-based milk promotion strategies. We posed the following questions:

How do consumers of plant-based and cow milk differ in how they perceive the value of certain features of oat milk?

How can we describe heterogeneity in how respondents perceive the value of certain features of oat milk?

Is there an association between how respondents perceived the value of certain features of oat milk and their ethical food motivations?

2. Methods and materials

2.1 Questionnaire parts and participants

Data were gathered using an e-questionnaire. The accompanying e-mail informed that the survey concerned their food choices. First, the respondents were asked to give their informed consent and to answer general socio-demographic questions, questions related to diet, use of milk in coffee as well as ethical food motivations. The final section included questions related to the perceived value of oat milk and its features (BWS questions).

We collected information on gender, age and field of study. The diet question included five alternative responses: eat meat, cut down on meat, eat fish but not meat, eat no meat or fish and vegan. The "milk for coffee" alternatives were cow's milk, plant-based milk, oat milk, or no milk and more than one option could be chosen.

The survey link was sent in 2019 to 4,354 Aalto university students at all levels (BA, MA and PhD) who consented to receive these kinds of e-mails. A total of 654 people opened the link, of which 308 finished the questionnaire. Table 1 provides the details of the sample.

2.2 The scale of ethical food motivations

The Lindeman and Väänänen (2000) scale of ethical food-choice motivations that we adopted has been used extensively and extended. We kept the scale simple and brief. It comprises three parts: ecological welfare (including animal welfare and environmental protection), political values and religion. The word "sustainability" is not used at all in the scale; this is why we conducted a pilot study that incorporated three items that included it. The factor structure of the extended scale was based on data from 18 participants. All the new three

	Frequency	%
Gender		
Male	144	47
Female	164	53
Age		
below 20 yrs	22	7
20–24	146	47
25–29	98	32
30–34	24	8
35–39	11	4
40–44	3	1
45–49	4	1
Field		
Technical	176	57
Arts-related	46	15
Business	86	28
Diet		
Meat eater	140	45
Cutting down on meat	90	29
Fish no meat	34	11
No meat or fish	23	7
Vegan	21	7
In coffee I use		
Plant-based milk (oat or other)	139	45
Cow's milk	121	40
Both plant and cow's milk	48	15
Source(s): Authors' work		

Table 1.
Sample description
(N = 308)

items loaded strongly on the ecological welfare factor, which is why we added only one new item to the original scale, namely "Is in line with sustainable development". The items are rated on a six-point Likert scale. Appendix 1 shows the final scale of the questionnaire.

2.3 Measuring the perceived value of the oat milk features

2.3.1 Selection of the features. The starting point for selecting the features of oat milk among the items studied was Lusk and Briggeman's (2009) list of food values. Although abstract in character, these values (see Table 2, first column) include obvious features that seem essential to all commercial food products: taste, price and origin. We drew an initial list of 11 potential features based on Lusk and Briggeman (2009) for the pilot study, the nutritional details being represented by several features. The goal was to determine if the features should be included in the final questionnaire and, in particular, to assess how much detailed nutritional information was required.

In the pilot study, six students from Aalto University responded to a questionnaire that included the 11 potential elements. The respondents' unanimous message was that detailed nutritional information was of little interest in the questionnaire due to the small amount of oat milk typically consumed daily in coffee. Given this consensus, we decided to discontinue this pilot study. Table 2 includes the final set of the elements measured by BWS.

Taste was represented by two items in the final survey. We wanted to assess how much lower the perceived value of "satisfactory taste" was than that of "good taste". The price discount to be included was set at 20% so that it would be sufficiently high for a relatively

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Column1	Column2
Lusk and Briggeman's (2009) values (unless otherwise indicated)	*Current study*
Naturalness (the extent to which the food is produced without the use of modern technologies)	Organic
Taste (the extent to which consumption of the food is appealing to the senses)	The taste is satisfactory
	The taste is good
Price (the price that is paid for the food)	20% cheaper than the typical price of oat milk
Safety (the extent to which consumption of the food will not cause illness)	Not included
Convenience (the ease with which the food is cooked and/or consumed)	Not included
Nutrition (amount and type of fat, protein, vitamins, etc.)	Added calcium, protein, and vitamins
Tradition (preserving traditional consumption patterns)	Not included
Origin (where the agricultural commodities were grown)	Origin: Finland
	Origin: EU, country not specified
Fairness (the extent to which all parties involved in the production of the food equally benefit)	Not included
Appearance (the extent to which the food is appealing)	Adds good foam to coffee
Environmental Impact (effect of food production on the environment)	Lower carbon footprint than typical oat milk
	Entirely plant-based package
Other than Lusk and Briggeman	
Peer opinion (Helm, 2003; Wangenheim and Bayón, 2007)	Recommended by other people
Known brand (Kuang Chi *et al.*, 2009; Oh, 2000; Tuorila *et al.*, 2001)	You know the brand
Source(s): Authors' work	

Table 2.
The final list of plant-based milk items in the current study compared with Lusk and Briggeman's (2009) list of values

inexpensive product. Finland was chosen as the origin because it was apparently the most preferred – the image of domestic food production is high. There are also brands from other European countries on the market, which is why we also included Europe as the origin. The foam produced by adding milk to coffee is often present in advertising. The environmental impact was phrased at a general level to include the carbon footprint. A plant-based package was included, because they seem to be heavily advertised in numerous product categories (see, Rokka and Uusitalo, 2008). Moreover, when the survey was conducted, there was a visible advertisement in the media that drew attention to the small carbon footprint of some oat milk packages.

Lusk and Briggeman's (2009) "convenience" value is not represented among the items because oat milk can be used in coffee without any preparation. We also excluded tradition because the product is untraditional. "Safety" is represented by origin – a European or Finnish origin guarantees safety standards. Finally, we excluded "fair" because the circumstances related to the production of oat milk are not discussed in public. The two features of oat milk that we chose to include outside Lusk and Briggeman's list were peer opinion and brand, both of which are related to risk reduction in the purchase. The final number of items in the survey was 12.

2.3.2 Best-worst scaling (BWS). To measure the values of different features, we adopted the BWS approach (Finn and Louviere, 1992). Respondents were asked repeatedly to choose from among sets of three or more alternatives, the most and least valued item (alternative). The approach is scale-free and forces respondents to ponder tradeoffs among the features; thus, it lacks the problems of traditional rating scales (Auger *et al.*, 2007). The starting point was to define the set of items to be valued. BWS resembles choice-based conjoint analysis in terms of estimating consumers' value functions but relies on single items in the choice instead

of product profiles (e.g. Brodock *et al.*, 2021). Respondents respond to questions that include typically 3–6 alternatives and choose the most and least valued among them (for more information of the method see Lusk and Briggerman (2009)).

The values for the alternative studied are typically estimated on the respondent level using Hierarchical Bayes (HB) estimation (Lenk *et al.*, 1996). The fit of the value functions estimated in accordance with the observed responses was measured using the root likelihood (RLH). The value functions can also be estimated at the segment level using latent class analysis (LCA), for example, which we introduce later.

The items may be features of a product or service, the value of which needs to be assessed. Instead of ranking or rating the alternatives directly, the respondent was asked to select two options (s) from a small subset of alternatives. BWS tasks rely on an individual's ability to consistently identify extreme options consistently (Marley and Louviere, 2005).

The number of items J in the choice task is typically between three and seven. Each item should appear at least thrice in a task, a rule that serves as a guideline for setting the minimum number of questions to be asked.

We chose to apply BWS to the survey because of the growing number of discrete choice applications in the literature, its ability to efficiently collect data about preferences and the possibility of assessing the fit of the value functions.

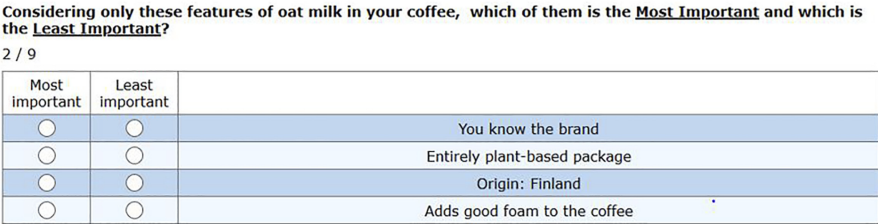The following steps are followed in the BWS approach.

(1) Choosing the items to compare, in the sequel called BWS items;

(2) Deciding the number of questions and items within each question;

(3) Preparing the description of the items (e.g. text and pictures);

(4) Collecting the data and

(5) Analyzing the preferences.

Figure 1 shows one possible choice task a survey respondent faced.

To ensure that a respondent saw each BWS item at least three times in the choice tasks we performed nine tasks.

2.3.3 Latent class analysis and Hierarchical Bayes estimation. We were interested in the potential and expected heterogeneity of the perceived values of oat milk features. We used LCA and identified clusters of respondents with homogeneous preferences, with each cluster having heterogeneous preferences compared to the others.

Both the item values across the clusters and the cluster sizes are defined simultaneously in the LCA (Desarbo *et al.*, 1995). The probability of each respondent belonging to each cluster is estimated. The highest probability of a respondent belonging to some cluster is typically close to one, which eases the determination of cluster membership (see also Widmar *et al.*, 2019). The most common goodness-of-solution measures are information criteria: information criterion (IC), Bayesian information criterion (BIC) and Akaike information criterion (AIC) and

Considering only these features of oat milk in your coffee, which of them is the <u>**Most Important**</u> and which is the <u>**Least Important**</u>?

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Most important	Least important	
○	○	You know the brand
○	○	Entirely plant-based package
○	○	Origin: Finland
○	○	Adds good foam to the coffee

Figure 1.
Example screen of the BWS part

Source(s): Authors work

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specifically consistent Akaike information criterion (CAIC) (Desarbo *et al.*, 1995), which reaches the minimum with some number of clusters. Clustering is carried out for different numbers of clusters in repeated trials (to avoid local optima) and the solutions with the lowest CAICs reveal the candidates for the best clustering solution, which also needs to be managerially interpretable.

The perceived values of the BWS items for each respondent were estimated by HB (Lenk *et al.*, 1996) and were scaled to a sum of 100. In the presence of nine choice tasks (example in Figure 1) with four alternatives in each the minimum fit statistics (0.336) to achieve 95% (Identifying 'bad' respondents, no date) correct classification of random respondents was achieved by 98.4% of the respondents. The last BWS part quite efficiently screens random respondents – it truly requires respondents' attention. However, some checks also for the earlier questionnaire parts were carried out such as checks for repeating of patterns of numbers.

It is possible, but not academically plausible, to compare these perceived value figures using traditional statistical testing, given that HB is a Bayesian method. An elegant way of comparing means across groups is to directly use the results of the HB estimation process and make pair-wise comparisons across different iterations after convergence, considering the perceived value averages of the groups–in our case, users of plant and cow's milk. It is simply a matter of comparing, for each iteration, which of the two groups' value average is higher. For example, if the average of the oat milk users is higher in 95% of, say, 10,000 iterations after convergence, it is said to be higher with a confidence rate of 95% and that the mean of the cow's milk users is higher with a confidence rate of five percent. The confidence required to determine whether one is greater/smaller than the other is typically 95%.

The software used were Discover, HB estimation and LCA (Sawtooth Software).

3. Results
3.1 The perceived value of the oat milk features and ethical food motivations
First, we calculated the average perceived value of the BWS items. Both taste items had high scores of 16.3 (satisfactory taste) and 18.6 (good taste), The next most highly valued items were "a lower carbon footprint than typical oat milk" (11.3), "20-percent-lower price" (9.0), "added calcium, protein and vitamins" (8.4), "organic" (8.4), "origin Finland" (7.5), "plant-based package" (6.5) and "origin EU" (5.7). The rest of the items were low in value: "has good foam" (3.8), "recommended by friends" (3.4) and "you know the brand" (3.0).

It was found that 45% of the respondents exclusively used plant-based milk (the large majority used only oat milk and only a few relied on other plant-based products), 40% used only cow's milk and 15% used both (see Table 1). This last group "both milks" is rather small to be analyzed separately; therefore, we compared pairwise the perceived values of all the three groups using covariates in the HB estimation. As expected, the most divergent group pairing was the users of plant-based and cow's milk. At a confidence level of at least 95% the perceived values of these two groups differed on every item except "you know the brand" (we omit the confidence figures because we present later almost the same figures regarding the two milk-user groups used in the sequel). The "both milks" group differed from the users of plant-based milk with respect to two items (confidence): the plant-based group placed a higher value on "lower carbon footprint" (96%) and "plant-based packaging" (97%). The "both milks" group differed from the users of cow's milk, who attached a higher value to "satisfactory taste" (99%), "added calcium protein and vitamins" (100%) and valued "origin Finland" more highly. Note further that "a good taste" (valued more by the cow's milk group) and a "lower carbon footprint" (valued more by the "both milks group) were close to the 95-percent confidence threshold. We concluded that it was appropriate to tentatively combine the plant-based with the "both milks" group. For the sake of simplicity, we labeled that group the "oat milk group".

Next, we compared the average values of the items across the oat milk (plant-based milk and "both milks" groups combined) and cow's milk groups. The latter had a higher perceived value (confidence; see Subsection 2.3.3) for a satisfactory taste (100%), a good taste (99.9%), added calcium, protein and vitamins (100%), a discount of 20% (98%) and recommended by friends (94%). The users of oat milk valued a Finnish origin (100%), an EU origin (100%), organic origin (99%), a small carbon footprint (100%) and ecological packaging (100%) more highly. Thus, apart from brand and foaminess, valued rather low on average, all items differed across the compared groups.

As for the ethical food motivations, principal component analysis with varimax rotation identified three components with eigenvalues exceeding 1. The largest loadings related to all the questions were as expected, although there were four questions that loaded on two factors, with the second largest loading exceeding 0.3, a very common threshold. We ran a confirmatory factor analysis (CFA) after deleting these questions, but the model fit was poor. As a remedy, we deleted two additional questions with the second largest loading in the range of 0.27–0.29. The CFA fit measures for this model were CFE = 0.987, RMSEA = 0.7, cfi = 0.99 and PCMIN/DF = 3.5, but χ^2 was significant. Therefore, we used this model (the final questions concerning ethical motivation are listed in Appendix 2). The AIC value was lower in the final model than in other models.

We ran Welch's variance-weighted ANOVA for the ethical motivations in three groups: users of cow's, plant-based and "both milks" (the two latter groups were already tentatively combined due to the similarity in their perceived values of the oat milk features). We expected that the averages for ethical motivations in the two combined groups could be similar. According to Welch's variance-weighted ANOVA of the three groups, ecological welfare (F(2) = 11.76, $p < 0.0001$) and political values (F(2) = 10.55, $p < 0.0001$) were significant and the results of Tukey's Studentized Range post-hoc test revealed a difference between the cow's milk group and the other two (plant-based and both milks groups) - its averages for ecological welfare and political values were lower. The latter two groups did not differ in ethical food motivations, which further supported our decision to combine them in the group we labeled the oat milk group.

Nine percent of the cow's milk group did not eat meat at all. To avoid dealing with overly small groups, we divided the diet into three such classes whose preferences related to the BWS items were different: meat eaters, those cutting on meat and non-meat eaters (who may eat fish). Among the oat milk group, 28/36% were meat eaters/cutting on meat and among the cow's milk group the corresponding figures were 72/19%. Gender and milk use were dependent ($\chi^2(1) = 15.1$, $p < 0.0001$): 74% of the women used oat milk compared with 46% of the men.

3.2 Segmentation by LC analysis

We used LCA to cluster the data experimenting with different numbers of clusters. The CAIC measures were minimal, with a seven-cluster solution. However, the difference in CAIC compared with the six-cluster solution was minor (CAIC for six clusters 11,529 vs. seven 11,470). The seven-cluster solution produces several small clusters (below 10%). We adopted the six-cluster solution. The six clusters were arranged in decreasing order with respect to the perceived value of "taste satisfactory". The value of "taste good" also decreased almost monotonously, similarly as the values of "organic", "small carbon footprint" and "ecological packaging" increased. It seems that valuing taste means valuing less the sustainable items and that people who value taste attach value also to peer opinion and the brand. Table 3 presents the six-cluster solution.

Group 1: extreme in that the highest (among the groups) esteem is expressed for taste and the lowest for sustainability-related items. Foam is also appreciated the most among the groups. There is little interest in the origin, but the cheaper price, recommendation of others and brand familiarity also attract the highest esteem among the groups.

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Cluster	1	2	3	4	5	6
Size (%)	13.9	20.4	24.8	16.7	9.9	14.3
The taste is satisfactory	21.7	19.6	18.5	15.8	7.2	6.3
The taste is good	23.6	21.2	20.3	22.8	6.2	8.2
It adds good foam to coffee	13	3.2	0.7	9.2	2.5	0.6
Origin Finland	5	1.5	11.9	7.1	2.3	19.2
Origin EU, country not specified	4.1	1.1	8.9	6.4	2.6	9.6
Added calcium protein and vitamins	5.2	14.9	6.2	3.5	20.9	3.8
Organic	1.4	5.2	2.4	9.7	14.3	12.7
A lower carbon footprint than typical oat milk	1.6	7.6	12.6	11.8	17.1	19.5
20% cheaper than typical oat milk	15.1	15	10.3	1.8	8.4	5.2
Entirely plant-based packaging	1.3	3.5	5.1	6.4	14.9	12.1
Recommended by other people	4.6	4.6	1.2	3.1	2	1.3
You know the brand	3.4	2.6	1.7	2.3	1.7	1.6
Source(s): Authors' work						

Table 3.
The values of the BWS
items across the six
clusters

Group 2: added calcium, protein and vitamins, as well as the cheaper price, are valued the highest among the groups. Taste has a high perceived value whereas sustainability and foam do not. Recommendations are valued, but not the origin.

Group 3: foam does not add value, but the country of origin does, especially if it is Finland. Among the sustainability items a smaller carbon footprint is appreciated, as are eco-packaging and a lower price to some extent.

Group 4: a specific characteristic of this group is that, unlike in the other groups, there is a wide difference in the perceived value of "the taste is satisfactory" and "the taste is good", the latter being valued more highly. The foam is also much appreciated. The sustainability items have solid, high perceived values.

Group 5: what is specific to this group is that a higher value is attached to added calcium and vitamins than in the other groups. Taste is not highly valued, but sustainability is.

Group 6: is at the other extreme, with the lowest perceived values for taste and the highest for sustainability items. It differs from Group 5 in that added nutrients are not highly valued, whereas a Finnish origin is.

3.3 Profiling the groups

Table 4 presents the cluster averages of the ethical motivations. Welch's variance-weighted ANOVA produced $F_{(5)} = 5.48$ and $F_{(5)} = 11.21$ for ecological welfare and political values, respectively and for both $p = <0.0001$; the corresponding values for religion are $F_{(5)} = 2.86$;

Cluster	Ecological	Political	Religion
all	3.5	2.9	1.1
1	2.6	2.5	0.4
2	3.3	2.1	1.2
3	3.3	3.3	0.9
4	3.7	3.4	0.9
5	3.8	2.4	1.2
6	3.9	3.5	1.5
Source(s): Authors' work			

Table 4.
Averages for ethical
food motives across
clusters

p = 0.02. The clusters were arranged in a specific order (roughly, with an increasing preference for sustainability and a decreasing preference for taste). The ecological-welfare average increases monotonically from groups 1 to 6, the political values are roughly increasing with one notable exception and the same goes for religion. There is an increasing trend in all three ethical motivations, hand-in-hand with an increase in perceived values attached to sustainability items in oat milk and a decrease in the value attached to taste.

One notable exception to the patterns is cluster 5, with a high perceived value attached to the sustainability items as well as "added calcium, protein and vitamins": this cluster attached little value to the political motive.

Finally, we considered the relationships among the perceived value of oat-milk items and the diet in three categories (meat eater, cutting on meat, no meat), as well as the milk type. Cluster membership and diet were dependent ($\chi^2(10)$ = 33.78, p = 0.0002), as were cluster membership and the use of oat/cow's milk ($\chi^2(5)$ = 31.24, p < 0.0001). Of the meat eaters, 48% belonged to Clusters 1 or 2 in terms of valuing taste, compared to only 19/28% of those cutting on meat/non-meat eaters. 40% of those who used oat milk belonged to clusters 4–6 in terms of valuing sustainability, compared to only 24% of those who used cow's milk. Thus, it seems that meat eaters appreciate the taste of oat milk, whereas those cutting on meat/non-meat eaters attach much more value to sustainability. The oat milk group members belong, either solely or to some extent, to clusters that appreciate sustainability items.

Gender and cluster membership were dependent ($\chi^2(5)$ = 13.0, p = 0.02): males had a lower probability (31%) of belonging to clusters 4–6 than females (47%).

4. Discussion

The question of food choice is currently under constant discussion, specifically related to ongoing debates on health and climate change. Numerous products are advertised as more climate-friendly than others, with plant-based materials increasingly replacing animal-based content. Very little research has been conducted on the features that are valued in plant-based milk – McCarthy *et al.* (2019) and, to some extent, Haas *et al.* (2019) and Jaeger and Giacalone (2021) being lonely pioneers in the field.

Our first task was to explore the differences in the values of oat milk features across consumers of both plant-based and cow's milk. Oat milk is available throughout the Helsinki metropolitan area in cafés that students visit – thus the respondents had plenty of opportunities to taste it and many of them probably did.

The cow's milk group (55%) attached more value than the oat milk group (plant-based milk and both milks) to "a satisfactory taste," "a good taste," "added calcium, protein and vitamins," "20% discount" and "recommended by friends". They seemed to value a good or at least a satisfactory taste and were concerned about the nutritional value of oat milk. They would be more motivated by discounts and recommendations from friends than those who were already habitual users of oat milk.

The oat milk group attached more value than the cow's milk group to "origin Finland," "origin EU," "organic," "a small carbon footprint" and "ecological packaging". It may be that they had already established the habit and no longer attached importance to taste or the opinions of other people, placing more emphasis on the origin and the sustainability features of oat milk. Apart from brand and foam the value of all the items differed across the oat and cow's milk groups. The former also placed more value on making an ethical food choice, ecological welfare and political issues, which is in line with findings from earlier studies (Haas *et al.*, 2019; McCarthy *et al.*, 2019).

We studied the heterogeneous values of oat milk features using LCA and ended up with a six-group solution. It seemed that the two extremes of the groups rated taste high/environment low (Cluster 1) and environment high/taste low (Cluster 6). Clusters 2–4 were

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arranged in such a way that, in general, the perceived value of a "satisfactory taste" decreased and that of environmental issues increased. There were clusters that attached a high perceived value to added calcium, protein and vitamins (group 5) or foam (1 and 4) and Finnish or EU origins (3 and 6), for example. The 20% lower price was valued by groups 1–3, groups that placed a high value on taste and a low value on the environment.

Thus, the sustainability features (and taste) gave us an intuitive basis on which to arrange the clusters. Our third research question concerned the relationship between the perceived value of the different features under study and ethical food-choice motives. It turned out that the monotonous increase from group one to six applied not only to ecological welfare, but also (with minor exceptions) to political values and religion. Thus, we observe that, in general, an increase in the value attached to sustainability features is accompanied with a simultaneous strengthening of the three ethical motives considered. Parallel to this, taste seems to have a bigger role when the ethical motivations (especially the ecological) decrease.

Diet and whether the respondent used oat or cow's milk were related to the cluster memberships such that users of oat milk and non-meat eaters were more likely to belong to clusters 4–6 in terms of valuing sustainability features. When we looked more closely at the relationship between the demographics and the clusters, we noted that the females had a higher probability to belong to groups 4–6 than males. It has been reported that females in Finland are more positively disposed towards sustainable consumption (Bask *et al.*, 2012). Comparison of the results with the findings of McCarthy *et al.* (2019) from the USA is challenging, however, despite the similarity of the preference-elicitation methods used. First, we focused exclusively on milk for coffee, the volume of which is rather low. The sugar level played an important role in the USA study, but it was not included among the features we chose. We discovered that the amount of sugar did not differ a lot across all the numerous oat-milk products we reviewed. McCarthy *et al.* (2017) studied different plant sources whereas we focused only on oat milk due to its dominance in the local market. The outcome in both studies was that brand was not very important. However, McCarthy *et al.* (2019) only discuss aggregate results and do not deal with the heterogeneity of preferences. As for (Haas *et al.*, 2019), comparison with the current study is even more challenging in that they measured the image of soy milk in terms of ratings rather than perceived value.

4.1 Limitations

Our respondents were young, urban people studying in a large university in the Helsinki metropolitan area. However, the students represented different fields (economics, the arts, engineering). The number of items in BWS cannot be too large, which limits the level of detail in the results. Mindful of this, we carefully chose the items based on Lusk and Briggeman (2009) and the results of a pilot study.

Our study is also restricted to one country where plant-based milks are "marketed as healthy, tasty and functional, as well as sustainable and plant-based" (Laitinen, 2020, p. 2) and some plant-based milk brands are positioned to be parts of a new food system leading away from animal-based products. The study results may prove useful in terms of assessing market potential for different new products.

Finally, we are aware that plant sources of milk vary in different countries, as do the amounts of protein and sugar levels, for example, which may limit the generalizability of our findings.

4.2 Topics for further study

We found that all three types of ethical motivations (ecological welfare, political values and religion) correlated positively with the perceived value of the sustainability features we measured. There is thus a need to enhance understanding of ethical motivations and their interconnections in the current environment, as well as the supply of food products.

Oat is a strong traditional and locally cultivated grain in Finland, and its use in new products to replace dairy is strongly growing. There is thus a need for research that will extend to plant products with less familiar ingredients.

Studies related to plant-based products also need to reach beyond young, highly educated consumers. As new plant-based substitutes for meat and dairy products enter the market, ordinary consumers who are not early innovators Rogers (1976) will need to make choices among numerous old and new products that vary along several dimensions, not simply in being more or less ethical. Furthermore, families with small children are raising future active consumers and are establishing food-consumption habits. The increasingly elderly population and its needs and priorities should also be studied in more detail. In general, populations are becoming more heterogeneous in many countries and future studies should consider this.

Finally, free warm school meals, heavily subsidized student food and (often subsidized) workplace meals play an important nutritional role in Finland and offer consumers the opportunity to taste new foods. Thus, there is a need for more detailed research on the use of plant-based food items and their adoption in the kitchens of major food suppliers.

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Appendix 1

The scale for food-choice motivation in the survey.

It is important that the food that I normally eat.

(1) has been produced in a way that animals have not experienced pain

(2) has been produced in such a way that has respected animals' rights

(3) has been prepared in an environmentally friendly way

(4) has been prepared in a way that does not shaken the balance of nature

(5) has been packaged in an environmentally friendly way

(6) comes from a country I approve politically

(7) comes from a country where human rights are not violated

(8) has the country of origin clearly marked

(9) has been prepared in a way that does not conflict with my political values

(10) is not forbidden in my religion

(11) is in harmony with my religious views

(12) is in line with sustainable development

Source(s): Authors work

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Appendix 2
The final measurement scale after CFA.
 It is important that the food that I normally eat.

(1) has been produced in a way that animals have not experienced pain

(2) has been produced in such a way that has respected animals' rights

(3) comes from a country I approve politically

(4) has the country of origin clearly marked

(5) is not forbidden in my religion

(6) is in harmony with my religious views

Source(s): Authors work

Corresponding author
Merja Halme can be contacted at: merja.halme@aalto.fi