Upcycled food choice motives and their association with hesitancy towards consumption of this type of food: a Swedish study

Hanieh Moshtaghian, Kim Bolton and Kamran Rousta
Swedish Centre for Resource Recovery, University of Boras, Boras, Sweden

Abstract

Purpose – This study investigates factors motivating upcycled food choices and assesses the association between these factors and hesitancy towards upcycled food consumption in a Swedish population.

Design/methodology/approach – An online food choice questionnaire was used. Participants (n = 682) were categorised into Inclined and Hesitant groups based on their intention to consume upcycled foods. The factors motivating upcycled food choices were identified using explanatory factor analyses. Independent *t*-tests assessed the differences in the mean importance score of factors between the two groups. The association between upcycled food choice factors and hesitancy towards consumption was evaluated by logistic regressions (adjusted for sociodemographic characteristics).

Findings – The most important upcycled food choice factor in both groups was ethical concerns, followed by natural content, sensory appeal, price, healthiness, familiarity and impression. The Inclined group's mean importance score for ethical concern was higher than the Hesitant group (p_{value}<0.001) and, except for natural content, the mean importance scores for the other factors were higher in the Hesitant group compared to the Inclined group (p_{value}<0.05). Participants who perceived ethical concern as an important factor had lower odds of hesitancy (Odds ratio = 0.39; 95%CI:0.26,0.59; p_{value}<0.001), and those who considered sensory appeal an important factor had higher odds of hesitancy (Odds ratio = 2.42; 95% CI:1.62,3.63; p_{value}<0.001) towards upcycled food consumption compared to participants who did not consider these as important factors.

Originality/value – This is the first study investigating health and non-health-related upcycled food choice motives using a food choice questionnaire. Identifying these motives helps food developers and researchers determine factors influencing upcycled food consumption.

Keywords Upcycled food, Waste to value food, Value-added surplus food, Food choice motives, Upcycled food acceptability

Paper type Research paper

1. Introduction

Food waste is a global concern, and its management is a challenge. The world's estimated annual edible food waste is 1.3 G tonnes (Food Agriculture Organization of the United Nations, 2013). Several strategies have been employed to manage food waste, and one of these strategies is upcycled food production (Moshtaghian *et al.*, 2021). Upcycled foods are defined as foods that use ingredients that otherwise would not have gone to human consumption, are procured and produced using verifiable supply chains and have a

positive impact on the environment (The Upcycled Foods Definition Task Force, 2020). These ingredients can be food industry by-products, damaged or imperfect food produce, and scraps from food preparation (The Upcycled Foods Definition Task Force, 2020). Therefore, upcycled foods are value-added products that repurpose ingredients that otherwise would be wasted (Spratt *et al.*, 2021). In the food waste management hierarchy, upcycled food production has been prioritised over animal feed production and other food waste management strategies except prevention and redistribution (Moshtaghian *et al.*, 2021).

According to the United Nations' Sustainable Development Goals, food waste (at the retail and consumer levels) and food losses (in production and supply chain, including post-harvest loss) should be reduced by 2030, and responsible consumption and production patterns should be ensured (United Nations, 2015). Furthermore, the Swedish National Food Agency has an action plan to reduce food loss and waste by 2030. This action plan supports developing innovative products that incorporate parts of unused foods and ingredients in food production, returning them to human consumption (Swedish National Food Agency, 2018). Hence, upcycled food production is an approach for achieving the United Nations Sustainable Development Goals and the Swedish National Food Agency action plan objectives by contributing to food waste management. However, upcycled food is a novel food category that differs from conventional and organic food categories (Bhatt *et al.*, 2018) and thus faces several challenges, including public acceptability (Moshtaghian *et al.*, 2021). Therefore, it is crucial to understand factors that motivate people to choose upcycled foods.

Food choice behaviour is complex (Evans and Cox, 2006), and several multidimensional health and non-health-related factors influence general food choices (Steptoe *et al.*, 1995). These factors include health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity and ethical concern (Steptoe *et al.*, 1995; Abdul Rahman *et al.*, 2013; Asma *et al.*, 2010; Januszewska *et al.*, 2011; Markovina *et al.*, 2015). For sustainable foods, general sustainability factors (i.e. animal and environmental welfare and other ethical concerns) and local and seasonal production aspects motivate food choices (Verain *et al.*, 2021), whereas, for foods produced by novel technologies, other factors such as food technology neophobia considered an important food choice factor (Cox and Evans, 2008). Hence, different food categories may have different food choice motives. Since food choice factors influence product acceptability in various ways (Evans and Cox, 2006), identifying the upcycled food choice factors can improve the acceptability of these products.

To our knowledge, most upcycled food studies only evaluated the impact of a few selected attributes on the acceptability of specific upcycled foods (Rahmani and Gil, 2018, Asioli and Grasso, 2021; Köpcke, 2020; Aschemann-Witzel and Peschel, 2019), and none of them investigated both health and non-health-related food choice factors. For example, some studies explored the association between sociodemographic factors such as age, gender, education and income and the acceptability of upcycled foods (Rahmani and Gil, 2018, Henchion *et al.*, 2016; Coderoni and Perito, 2020; Köpcke, 2020). Other studies investigated the impact of providing products' nutritional and environmental information (Asioli and Grasso, 2021), food technology neophobia, food waste awareness (Köpcke, 2020), sensory characteristics (Hellwig *et al.*, 2020), brand and product design (Aschemann-Witzel and Peschel, 2019) on the acceptability and purchasing intention of upcycled foods.

Therefore, most studies focused on the marketing aspect (e.g. purchasing intentions) and did not consider both health and non-health-related factors that motivate upcycled food choices according to consumption intention. This study investigates the upcycled food choice factors and assesses the association between these factors and hesitancy towards consuming upcycled foods in a Swedish population.

2. Methods

2.1 Questionnaire development

A questionnaire was developed to collect information on sociodemographic factors, attitudes towards upcycled foods and factors motivating upcycled food choices. The questions on sociodemographic indicators included age, gender, education, household income and living situation (Mousel and Tang, 2016). The question on the intention to consume upcycled food inquired if respondents definitely avoid, may avoid, may eat or definitely eat upcycled foods. For investigating factors influencing upcycled food choices, 51 items were adapted from previous food choice questionnaires (Steptoe *et al.*, 1995; Evans and Cox, 2006; Lockie *et al.*, 2002; Ares and Gámbaro, 2008; Abdul Rahman *et al.*, 2013; Asma *et al.*, 2010; Chen, 2007; Asraf Mohd-Any *et al.*, 2014; Lea *et al.*, 2006) and the literature on upcycled foods (The Upcycled Foods Definition Task Force, 2020; Aschemann-Witzel and Peschel, 2019; Coderoni and Perito, 2020). The question items focused on the importance of health and weight management, mood, convenience, sensory appeal, natural content, price, familiarity, ethical concern, impression, novelty, risk perception and food neophobia. Participants were asked about the importance of specific food choice items for upcycled foods. The response began with a statement (It is important to me that the upcycled food I eat . . .) followed by a list of food choice items (e.g. is nutritious). The participants scored the importance of each item from 1 to 5 (1 = not at all important, 2 = a little important, 3 = moderately important, 4 = important, 5 = very important).

In this questionnaire, upcycled foods were defined as foods that use ingredients that otherwise would not have gone to human consumption or would be wasted. It was mentioned that upcycled foods are made from damaged or imperfect food produce, by-products and scraps from food preparation. Some examples from the literature (Bhatt *et al.*, 2018; Peters, 2019) were also provided to help respondents' understanding, e.g. damaged bananas can be turned into banana chips, spent grain from breweries can be converted to flour and used in bakery products (e.g. bread), food industry tofu and soymilk by-products can be turned into flour and used in chocolate chip cookies, and carrot peels can be dried and added to a powdered soup mix rather than being discarded. A scientific panel assessed the preliminary questionnaire at the University of Boras, and some questions were clarified to facilitate participants' responses. The questionnaire was released in both English and Swedish languages.

2.2 Data collection and study population

The questionnaire was created on the SUNET survey domain, released on the University of Boras website and advertised on social media (e.g. Facebook, LinkedIn and Instagram) between the 1st of September and the 1st of December 2021. All adults aged 18 and over who lived in Sweden during the three months of data collection were eligible to participate. Six hundred and eighty-three individuals participated in the survey and informed consent was obtained from them. Of these, 682 participants provided information on their intention to consume upcycled foods and therefore were included in this study.

2.3 Statistical analyses

Based on participants' intention to consume upcycled foods, they were categorised into an Inclined group, who would definitely eat upcycled foods, and a Hesitant group, who would definitely avoid, may avoid or may eat upcycled foods. An explanatory factor analysis was used to identify the factors motivating food choices and efficiently extract a smaller number of items to assess relevant factors (Cox and Evans, 2008). A varimax rotation was selected for this factor analysis. Factors that included at least three items with a factor loading (coefficient) greater than 0.4 were included in the analysis (Samuels, 2017). The factor loading

coefficient indicates the strength of the correlation between each item and the corresponding factor (Yong and Pearce, 2013). The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy (with an acceptable level of 0.70 and above) and Bartlett's test of sphericity (with a significance value of $p < 0.05$) were also carried out to assess whether the set of analysed data is adequate, and the factor analysis is justified (Meyers *et al.*, 2006).

In the next step, the reliability of the identified factors was assessed. The reliability of factors with a Cronbach's alpha of 0.7 and more was considered acceptable, and the reliability of those with a Cronbach's alpha between 0.7 and 0.6 was deemed questionable (Verma and Abdel-Salam, 2019). Factors with Cronbach's alpha between 0.6 and 0.5 have poor and those with a Cronbach's alpha of less than 0.5 have unacceptable reliability (Verma and Abdel-Salam, 2019).

For each participant, the importance score of upcycled food choice factor was calculated by averaging the score of relevant items for the factor. Next, the population average importance score for each upcycled food choice item and each upcycled food choice factor was calculated and presented as the item's mean importance score and the factor's mean importance score, respectively. For comparison between the Hesitant and Inclined groups, the independent *t*-test was carried out to compare the mean importance score of upcycled food choice items and factors.

As mentioned previously, the importance score of 4 and 5 represented important and very important food choice items; therefore, the food choice factors with the mean importance score of 4 and above were considered important food choice factors. Next, for the purpose of conducting logistic regressions, participants were classified into two categories based on the mean importance score of each upcycled food choice factor: individuals who considered the upcycled food choice factor as important (mean importance score ≥4) and those who did not consider it as important (mean importance score <4). The logistic regression was performed to assess the association between the importance of food choice factors and hesitancy towards consuming upcycled foods. The logistic regression analyses were adjusted for age and gender (Model 1) and age, gender, education, household income and employment status (Model 2). Statistical analyses were performed in SPSS (Version 27, SPSS Inc., Chicago, IL, USA), and the statistical significance was set at $p_{value} < 0.05$.

3. Results
The sociodemographic characteristics of the participants are presented in Table 1. Most participants (78.6%) were inclined to consume upcycled foods, and the mean age of both Hesitant and Inclined groups was 48 years. 71.9 and 88.6% of participants in the Hesitant and

	Hesitant	Inclined
n	146	536
Female, n (%)	105 (71.90)	475 (88.62)
Age, mean (SD)	48 (17)	48 (15)
Postgraduate education, n (%)	59 (40.41)	136 (25.37)
Living alone, n (%)	37 (25.34)	128 (23.88)
Small household, n (%)	117 (80.14)	429 (80.04)
No children in household, n (%)	101 (69.18)	355 (66.23)
Full-time employment, n (%)	69 (47.26)	280 (52.24)
High household income, n (%)	36 (24.70)	161 (30.04)

Note(s): Small household: household consisting of 3 persons or less. High household income: household income of more than 55,000 SEK/month

Table 1.
Participants'
characteristics
according to their
intention for upcycled
food
consumption (n = 682)

Inclined groups were women, respectively. The proportion of people with full-time employment and high household income was higher in the Inclined group than in the Hesitant group. A higher proportion of Hesitant participants had postgraduate education and lived alone compared to Inclined participants.

In the explanatory factor analysis, the KMO measure of sampling adequacy was 0.87 (above the acceptable level of 0.70) and Bartlett's Test of Sphericity was statistically significant (chi-square: 9,093; $p_{value} < 0.001$), thus, factor analysis was justified. The findings of explanatory factor analyses and the reliability of upcycled food choice factors are shown in Table 2. The factor loading (coefficient) for food choice items ranged between 0.44 (declaration of country of origin) and 0.86 (inexpensive and cheap). The explanatory factor analyses identified seven upcycled food choice factors.

	Factor loading (coefficient)	Cronbach's alpha
Factor 1: Natural content		0.86
Additive-free	0.83	
Natural ingredients	0.80	
Non-genetically modified	0.74	
Unprocessed	0.72	
Natural goodness preservation	0.70	
Chemical and hormone-free certification	0.55	
Factor 2: Ethical concern		0.81
Environmentally friendly preparation	0.77	
Environmentally friendly packaging	0.75	
Food waste reduction	0.70	
Animal rights respect	0.67	
Human rights respect	0.64	
Local production	0.49	
Country of origin declaration	0.44	
Factor 3: Healthiness		0.80
High fibre content	0.76	
Low fat content	0.72	
Low energy content	0.68	
High protein content	0.60	
Rich in vitamins and minerals	0.56	
Nutritious food	0.54	
Factor 4: Familiarity		0.76
Familiar food	0.78	
Similar to usual food	0.77	
Eaten before	0.63	
Familiar ingredients	0.63	
Well-known brand	0.59	
Factor 5: Sensory appeal		0.76
Pleasant texture	0.77	
Nice smell	0.74	
Good taste	0.71	
Nice look	0.70	
Factor 6: Price		0.82
Inexpensive	0.86	
Cheap	0.86	
Value for money	0.76	
Factor 7: Impression		0.63
Trendy to friends	0.83	
Right impression to people	0.78	
Relatives' approval	0.55	

Table 2.
Explanatory factor analyses and reliability of upcycled food choice factors

Factor 1 consisted of six items (additive-free, natural ingredient, non-genetically modified, unprocessed, natural goodness preservation and chemical and hormone-free certification) and was labelled as natural content. Factor 2 consisted of seven items related to the ethical aspect of food, and factor 3 contained six health-related items. Factors 4 and 5 had five (familiarity-related) and four (sensory-related) items, respectively. Factors 6 and 7 had three items concerning price and impression, respectively. Therefore, seven factors were natural content, ethical concern, healthiness, familiarity, sensory appeal, price and impression. The details of these seven identified factors are presented in Appendix. Regarding the reliability of the upcycled food choice factors, the highest and lowest Cronbach's alpha belonged to the natural content (0.86) and impression (0.63), respectively.

Table 3 compares the Hesitant and Inclined participants according to the mean importance score of the food choice items. In the Hesitant group, the highest mean importance score belonged to good taste, followed by chemical and hormone-free certification and natural ingredients. In Inclined participants, contribution to food waste reduction, animal rights respect, and chemical and hormone-free certification had the highest mean importance scores, respectively. There was no statistically significant difference in the mean importance score between the Hesitant and Inclined groups for all items related to the natural content (p_{value}>0.05). In contrast, the mean importance scores of all items for familiarity, sensory appeal and impression differed significantly between these two groups (p_{value}<0.05). Regarding ethical concern, the mean importance score of the majority of food choice items (environmentally friendly preparation and packaging, contribution to food waste reduction, and respect for animal and human rights) differed significantly between Hesitant and Inclined participants (p_{value}<0.05). In terms of healthiness items, there was a statistically significant difference in the mean importance score of low fat, low energy and high protein content between these two groups (p_{value}<0.05). The mean importance score of inexpensiveness and cheapness also differed significantly between these two groups (p_{value}<0.05).

The mean importance score and ranking of upcycled food choice factors in Hesitant and Inclined participants are presented in Figure 1. The ranking of the factors was based on their relative importance, with the most important factors shown to the left. The ranking order of mean importance scores was the same in both Hesitant and Inclined participants. The ethical concern was the most important upcycled food choice factor in both groups, followed by natural content and sensory appeal. Impression was the least important factor in these two groups. The comparison of the two groups revealed that, except for natural content, the mean importance score of all other upcycled food choice factors was statistically significantly different between the Hesitant and Inclined groups. Inclined participants had a higher mean importance score for ethical concern compared to Hesitant participants (p_{value}<0.001), whereas Hesitant participants had a higher mean importance score for sensory appeal, price, healthiness, familiarity and impression (p_{value}<0.05).
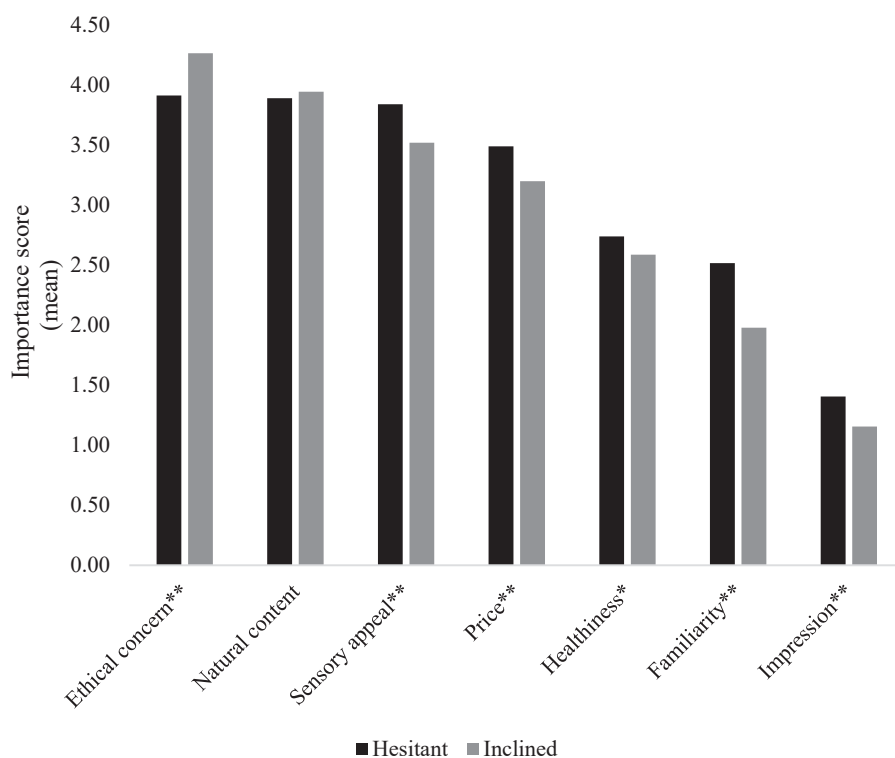
The association between the importance of upcycled food choice factors and hesitancy towards upcycled food consumption is shown in Table 4. In Model 1 (after adjusting the analyses for age and gender), there was a statistically significant association between the importance of ethical concern, healthiness and sensory appeal, and hesitancy towards upcycled food consumption. Participants who considered ethical concern an important upcycled food choice factor had 60% lower odds of hesitancy towards upcycled food consumption than those who did not consider it an important factor (Odds ratio = 0.40; 95%CI:0.27, 0.60; p_{value} <0.001). On the other hand, participants who deemed healthiness and sensory appeal as important factors had 2.4 times higher odds of hesitancy towards upcycled food consumption compared to those who did not regard these as important factors (Odds ratio $_{Healthiness}$ = 2.41; 95%CI: 1.07, 5.47; p_{value} = 0.035 and Odds ratio $_{Sensory\ appeal}$ = 2.44; 95%CI:1.66, 3.58; p_{value} <0.001).

However, after adjusting the analyses for several sociodemographic characteristics (Model 2), only the association between the importance of ethical concern and sensory appeal

	Importance score Mean (SD)		
	Hesitant n = 146	Inclined n = 536	p_{value}
Factor 1: Natural content			
Additive-free	3.71 (1.21)	3.75 (1.21)	0.727
Natural ingredients	4.19 (1.03)	4.27 (0.94)	0.329
Non-genetically modified	3.83 (1.42)	3.75 (1.45)	0.561
Unprocessed	3.44 (1.26)	3.58 (1.29)	0.270
Natural goodness preservation	3.92 (1.10)	3.87 (1.03)	0.615
Chemical and hormone-free certification	4.32 (1.05)	4.45 (0.99)	0.190
Factor 2: Ethical concern			
Environmentally friendly preparation	3.92 (1.03)	4.31 (0.85)	<0.001
Environmentally friendly packaging	3.82 (1.13)	4.33 (0.89)	<0.001
Food waste reduction	4.17 (1.01)	4.64 (0.63)	<0.001
Animal rights respect	4.02 (1.09)	4.49 (0.86)	<0.001
Human rights respect	4.06 (1.03)	4.37 (0.86)	<0.001
Local production	3.27 (1.03)	3.41 (0.99)	0.139
Country of origin declaration	4.13 (1.08)	4.29 (0.99)	0.081
Factor 3: Healthiness			
High fibre content	2.50 (1.12)	2.46 (1.09)	0.658
Low fat content	2.20 (1.11)	1.86 (1.03)	0.001
Low energy content	2.05 (1.09)	1.74 (0.91)	0.002
High protein content	2.56 (1.11)	2.26 (1.02)	0.002
Rich in vitamins and minerals	3.36 (1.11)	3.35 (1.06)	0.938
Nutritious food	3.69 (1.08)	3.84 (0.99)	0.119
Factor 4: Familiarity			
Familiar food	2.72 (1.11)	2.05 (0.95)	<0.001
Similar to usual food	2.52 (1.07)	2.03 (0.94)	<0.001
Eaten before	1.73 (0.96)	1.39 (0.69)	<0.001
Familiar ingredients	3.55 (1.14)	2.94 (1.17)	<0.001
Well-known brand	2.00 (1.05)	1.48 (0.78)	<0.001
Factor 5: Sensory appeal			
Pleasant texture	3.78 (0.99)	3.49 (1.09)	0.002
Nice smell	3.70 (0.95)	3.38 (1.11)	0.001
Good taste	4.56 (0.67)	4.37 (0.74)	0.005
Nice look	3.30 (1.00)	2.84 (1.07)	<0.001
Factor 6: Price			
Inexpensive	3.51 (1.07)	3.17 (0.96)	0.001
Cheap	3.11 (1.11)	2.68 (1.01)	<0.001
Value for money	3.86 (0.91)	3.74 (0.93)	0.173
Factor 7: Impression			
Trendy to friends	1.24 (0.67)	1.09 (0.36)	0.010
Right impression to people	1.53 (0.93)	1.26 (0.69)	0.001
Relatives' approval	1.44 (0.80)	1.12 (0.43)	<0.001

Table 3.
Comparison of mean importance score of upcycled food choice items between Hesitant and Inclined participants

and the hesitancy towards upcycled food consumption remained statistically significant. Participants who considered ethical concern an important factor had 61% lower odds of hesitancy (OR = 0.39; 95%CI:0.26, 0.59; p_{value} <0.001), and those who perceived sensory appeal as an important factor had 2.4 times higher odds of hesitancy (OR = 2.42; 95%CI:1.62, 3.63; p_{value} <0.001) towards upcycled food consumption compared to participants who did not deem these as important upcycled food choice factors.

Note(s): *Significant difference between two groups (P_{value} = 0.044)
**Significant difference between two groups (P_{value} < 0.001)

	Model 1[1]		Model 2[2]	
	OR (95%CI)	p_{value}	OR (95%CI)	p_{value}
Natural Content	1.12 (0.75, 1.68)	0.577	1.15 (0.75, 1.77)	0.527
Ethical concern	0.40 (0.27, 0.60)	<0.001	0.39 (0.26, 0.59)	<0.001
Healthiness	2.41 (1.07, 5.47)	0.035	2.23 (0.94, 5.31)	0.070
Familiarity	3.93 (0.76, 20.37)	0.104	3.32 (0.58, 18.94)	0.177
Sensory appeal	2.44 (1.66, 3.58)	<0.001	2.42 (1.62, 3.63)	<0.001
Price	1.38 (0.90, 2.12)	0.134	1.14 (0.72, 1.81)	0.565
Impression	4.70 (0.38, 57.60)	0.226	5.60 (0.46, 68.16)	0.177

Note(s): OR: odds ratio; CI: confidence interval
[1]Model 1 adjusted for age and gender
[2]Model 2 adjusted for age, gender, education, household income and employment status

4. Discussion
This study investigated factors motivating upcycled food choices and their association with
hesitancy towards consuming this type of food in an adult population in Sweden. The upcycled
food choice factors were the natural content, ethical concern, healthiness, familiarity, sensory

appeal, price and impression. The most important factor in both Hesitant and Inclined groups was the ethical concern followed by the natural content. The Inclined group's mean importance score for ethical concern was higher than the Hesitant group. On the other hand, the hesitant group's mean importance scores for healthiness, familiarity, sensory appeal, price and impression were higher than the Inclined group. Furthermore, participants who considered ethical concern an important upcycled food choice factor had lower odds of hesitancy towards upcycled food consumption. In contrast, those who perceived sensory appeal as an important factor had higher odds of hesitancy towards consuming this type of food.

Food choice motive studies identified more than nine factors influencing general food choices (Steptoe *et al.*, 1995; Abdul Rahman *et al.*, 2013; Asma *et al.*, 2010; Januszewska *et al.*, 2011; Markovina *et al.*, 2015). In contrast, this Swedish study identified seven factors that motivated upcycled food choices. Thus, it can be assumed that some general food choice factors such as mood may not be applicable to the upcycled food category. Studies that focused on other food categories such as organic (Lockie *et al.*, 2002), sustainable (Verain *et al.*, 2021) and novel technology-produced foods (Cox and Evans, 2008) also identified specific category-related factors. For example, a study with a focus on sustainability found local and traditional production, ethics and environment labelling, taste, price, environmental limitations, health, convenience, innovation and the absence of contaminants as important food choice factors (Sautron *et al.*, 2015).

The first identified upcycled food choice factor was natural content. Consumers relate naturalness to the ingredients' cultivation conditions (e.g. organic and food origin), food production and processing approach (technologically and ingredient-wise) and the final product properties (Román *et al.*, 2017). The natural content has also been identified as one of the general food choice motives (Steptoe *et al.*, 1995). Since upcycled foods contain by-products, damaged or imperfect food, and scraps from food preparation, they may go through various processing stages and become highly processed. Highly processed upcycled foods are perceived as less natural (Rahmani and Gil, 2018). This limitation can act as a barrier to upcycled food acceptability. The findings of the present study revealed that both Hesitant and Inclined participants perceived natural content as an important factor, and there was no significant difference between the groups.

Ethical concern was the most important factor that motivated upcycled food choices in both Hesitant and Inclined groups, and considering this motive as an important factor decreased the likelihood of hesitancy towards upcycled food consumption. Ethical concerns include ecological welfare (animal and environmental welfare) and political and religious values (Lindeman and Väänänen, 2000). This factor has also been identified as one of the general food choice factors (Steptoe *et al.*, 1995; Abdul Rahman *et al.*, 2013; Asma *et al.*, 2010; Januszewska *et al.*, 2011; Markovina *et al.*, 2015). Similarly, sustainable food choice motives found ethical concerns (animal and environmental welfare and local and seasonal production) as food choice factors (Verain *et al.*, 2021). In this Swedish study, participants believed that upcycled foods should meet ecological welfare and political values by taking into account some food features such as environmental benefits, animal and human rights respect and country of origin declaration. Fulfilling ethical concern values can improve the acceptability of upcycled foods. For example, informing consumers about the positive environmental impact of upcycled food increased their willingness to pay for this type of product (Asioli and Grasso, 2021; Coderoni and Perito, 2021). Some people have considered this characteristic of upcycled food as important as its healthiness (Asioli and Grasso, 2021).

The healthiness of upcycled foods affects consumer well-being and has been identified as another important factor. One of the main indicators of the healthiness of a food is its macronutrient and energy content, i.e. high protein and fiber content, and low fat (particularly saturated fat) and energy content (Julia and Hercberg, 2017). In this Swedish study, although there was a significant difference between the Hesitant and Inclined groups regarding the

importance score of fat, energy and protein content of upcycled foods, the mean importance scores were low (less than 2.6) in both groups. This finding may indicate the participants' views on the inclusion of upcycled foods in their diets. For example, they may consider these foods discretionary or occasionally consumed foods. Discretionary foods do not provide nutrients but add variety to the diet, and since these foods are high in fat, added sugar and salt, they should be consumed occasionally and in small quantities (Hadjikakou, 2017; National Health and Medical Research Council, 2013). It is worth mentioning that personal food-related goals, nutrition knowledge and the practical application of this knowledge form people's dietary habits (Worsley, 2002).

Familiarity was another factor motivating upcycled food choices, and its mean importance score in Hesitant participants was higher than in Inclined participants. Since upcycled foods are deemed novel foods, people have an aversion towards them (Coderoni and Perito, 2020). The unfamiliarity with the production process (Rahmani and Gil, 2018) and using new ingredients (Aschemann-Witzel and Peschel, 2019) results in the low acceptability of upcycled foods. The importance of familiarity suggests that consumers are less interested in food novelty (Szakály *et al.*, 2018); thus, more time is required to convince the public and change its perception to improve the acceptability of upcycled foods (Rahmani and Gil, 2018; Henchion *et al.*, 2016).

The sensory appeal was another upcycled food choice factor. Respondents who thought the sensory appeal was important were more likely to be hesitant towards upcycled food consumption. Several upcycled food studies have evaluated the sensory characteristics of upcycled foods and concluded that the sensory characteristics of most of these food products were inferior to their conventional alternatives (Grasso *et al.*, 2019; Hellwig *et al.*, 2020; Stelick *et al.*, 2021). However, it is possible to produce a sensory-appealing upcycled food (de Toledo *et al.*, 2017). People are more interested in buying upcycled foods with high quality and good taste (Yilmaz and Kahveci, 2022). Therefore, upcycled food production formulation plays a crucial role in the consumer acceptability of these foods.

Another factor motivating upcycled food choices was the price. The importance of price for the Inclined group was less than that for the Hesitant group. Some consumers are willing to pay a premium price for upcycled foods as they consider upcycled food production a compensation strategy to decrease wasted food; thus, they are willing to pay more for this effort (Köpcke, 2020). On the other hand, some consumers may not be interested in spending more if they perceive upcycled foods as suboptimal products due to their ingredients (McCarthy *et al.*, 2020). There is a relationship between quality and price, and a high price is often associated with high-quality products and vice versa (Erickson and Johansson, 1985). Consequently, the perceived quality of upcycled foods can affect the willingness to pay.

Impression was the least important upcycled food choice factor in both Hesitant and Inclined groups. The impression has not been identified as one of the factors motivating general food choices; however, it was found to influence attitudes towards consuming specific foods, such as those produced by novel technologies (Evans and Cox, 2006). The impression is about self-presentation, and it concerns the impression people's food consumption behaviour has on their acquaintances (Vartanian, 2015). People may change their eating habits to impress others (Vartanian, 2015). Therefore, having a positive impression on other people, including friends and families, may motivate some consumers to choose upcycled foods, but it is not as important as other upcycled food choice factors. It is worth mentioning that the findings of the impression as an upcycled food choice factor should be interpreted with caution because the reliability of this factor was in the questionable range (0.6 <Cronbach's alpha <0.7).

Identifying upcycled food choice factors facilitates the acceptability of these foods, which can support the circular economy. Several European initiatives encourage upcycled food production and invest in corporations that use edible suboptimal ingredients for food

production (Varese *et al.*, 2023). In addition to supporting circular economy initiatives, interventions in consumer experience, awareness and marketing promotions can also improve the public perception of suboptimal foods (Varese *et al.*, 2023), including upcycled foods. Most people are unaware of the consequences of food waste and management strategies; thus, increasing consumer knowledge of the potential uses of wasted food and its valorisation is crucial (Bux and Amicarelli, 2022).

Consumer education should focus on sustainable consumption and food waste management strategies (Bux and Amicarelli, 2022). Considering the food waste management aspect of upcycled foods can increase consumer purchasing intention (Yilmaz and Kahveci, 2022). Moreover, aiming education and marketing at appropriate target groups can facilitate the acceptability of upcycled foods. For example, generation X are less inclined to buy upcycled foods, whereas generations Y, Z and baby boomers are more likely to purchase these foods (Zhang *et al.*, 2021). Therefore, education campaigns can aim at generation X and marketing campaigns can focus on generations Y, Z and baby boomers.

This study has several strengths and limitations. It investigated a broad range of food choice items that could motivate consumers' upcycled food choices. The study had a relatively large sample size which can be considered a strength. The minimum required sample size for explanatory factor analyses is between 200 and 400, depending on the analyses condition (e.g. number of items per factor, communalities, etc.) (Knekta *et al.*, 2019; Fabrigar and Wegener, 2011). The study was conducted online to facilitate participation. The online survey on social media is a cheap and fast approach for reaching a subgroup of the population who are interested in the topic (Lehdonvirta *et al.*, 2021). However, since it uses non-probability sampling (river sampling), it may not be representative of the general population (Lehdonvirta *et al.*, 2021). Participation in an online survey also requires digital literacy and access to the Internet (Andrade, 2020); thus, these aspects can be considered limitations. Nevertheless, the study was conducted in late 2021 (around two years after the outbreak of the corona pandemic), and it can be assumed that the general public's computer skills have improved compared to previous years due to increased online activities.

Another limitation of this study could be the possibility of social-desirability bias, which is a limitation of most food and nutrition studies (Margetts and Nelson, 1997). We have tried to reduce this limitation by anonymous participation. Furthermore, most participants in both groups were women. Women are more risk-averse and health-conscious compared to men (Weber *et al.*, 2002; Ek, 2015; Bärebring *et al.*, 2020), which could affect the generalisation of findings to men. It is worth mentioning that the order of importance of upcycled food choice factors may be different in other countries, as seen in food choice motive studies. For example, the sensory appeal was the most important general food choice factor in Norway, Germany and the United Kingdom (Markovina *et al.*, 2015). In contrast, the price was the most important general food choice factor in Spain, Greece, Ireland, the Netherlands and Portugal, and natural content was the most important general food choice factor in Poland (Markovina *et al.*, 2015).

5. Conclusion

Most participants in this Swedish study were inclined to consume upcycled foods, but some food choice factors were associated with their hesitancy towards upcycled food consumption. Ethical concern, natural content, sensory appeal, price, healthiness, familiarity and impression were the main upcycled food choice factors in both Hesitant and Inclined participants. Considering the importance of ethical concern decreased the likelihood of hesitancy towards upcycled food consumption, while considering the importance of sensory appeal increased the likelihood of hesitancy towards consuming these foods.

Food developers and researchers should consider the upcycled food choice factors that encourage or discourage upcycled food consumption to improve the acceptability of these

products. The findings of this study can guide them to take into account these important factors when developing upcycled foods. It also encourages manufacturers to be transparent about upcycled ingredients, their sources, food production processes and safety protocols. The declaration of this information on food labels can also help consumer acceptability. Moreover, marketing campaigns should focus on consumer education, improving their knowledge of upcycled foods and the perception of important upcycled food choice factors.

Future studies should investigate the association between consumer sociodemographic and behavioural characteristics and their attitude towards upcycled foods to identify target groups for interventions and improve the acceptability of these foods. Additionally, since upcycled food choice factors may differ in other populations, similar studies should explore upcycled food choice factors in different countries and cultures.

References

Abdul Rahman, S., Muzaffar Ali Khan Khattak, M. and Rusyda Mansor, N. (2013), "Determinants of food choice among adults in an urban community", *Nutrition and Food Science*, Vol. 43 No. 5, pp. 413-421, doi: 10.1108/NFS-07-2012-0072.

Andrade, C. (2020), "The limitations of online surveys", *Indian Journal of Psychological Medicine*, Vol. 42 No. 6, pp. 575-576, doi: 10.1177/0253717620957496.

Ares, G. and Gámbaro, A. (2008), "Food choice and food consumption frequency for Uruguayan consumers", *International Journal of Food Sciences and Nutrition*, Vol. 59 No. 3, pp. 211-223, doi: 10.1080/09637480701497402.

Aschemann-Witzel, J. and Peschel, A.O. (2019), "How circular will you eat? The sustainability challenge in food and consumer reaction to either waste-to-value or yet underused novel ingredients in food", *Food Quality and Preference*, Vol. 77, pp. 15-20, doi: 10.1016/j.foodqual.2019.04.012.

Asioli, D. and Grasso, S. (2021), "Do consumers value food products containing upcycled ingredients? The effect of nutritional and environmental information", *Food Quality and Preference*, Vol. 91, 104194, doi: 10.1016/j.foodqual.2021.104194.

Asma, A., Nawalyah, A.G., Rokiah, M.Y. and Mohd Nasir, M.T. (2010), "Comparison of food choice motives between Malay husbands and wives in an urban community", *Malaysian Journal of Nutrition*, Vol. 16 No. 1, pp. 69-81.

Asraf Mohd-Any, A., Shahnaz Mahdzan, N. and Siang Cher, C. (2014), "Food choice motives of different ethnics and the foodies segment in Kuala Lumpur", *British Food Journal*, Vol. 116 No. 12, pp. 1879-1896, doi: 10.1108/BFJ-07-2013-0170.

Bärebring, L., Palmqvist, M., Winkvist, A. and Augustin, H. (2020), "Gender differences in perceived food healthiness and food avoidance in a Swedish population-based survey: a cross sectional study", *Nutrition Journal*, Vol. 19 No. 1, p. 140, doi: 10.1186/s12937-020-00659-0.

Bhatt, S., Lee, J., Deutsch, J., Ayaz, H., Fulton, B. and Suri, R. (2018), "From food waste to value-added surplus products (VASP): consumer acceptance of a novel food product category", *Journal of Consumer Behaviour*, Vol. 17 No. 1, pp. 57-63, doi: 10.1002/cb.1689.

Bux, C. and Amicarelli, V. (2022), "Separate collection and bio-waste valorization in the Italian poultry sector by material flow analysis", *Journal of Material Cycles and Waste Management*, Vol. 24 No. 2, pp. 811-823, doi: 10.1007/s10163-022-01366-0.

Chen, M.-F. (2007), "Consumer attitudes and purchase intentions in relation to organic foods in Taiwan: moderating effects of food-related personality traits", *Food Quality and Preference*, Vol. 18 No. 7, pp. 1008-1021, doi: 10.1016/j.foodqual.2007.04.004.

Coderoni, S. and Perito, M.A. (2020), "Sustainable consumption in the circular economy. An analysis of consumers' purchase intentions for waste-to-value food", *Journal of Cleaner Production*, Vol. 252, 119870, doi: 10.1016/j.jclepro.2019.119870.

Coderoni, S. and Perito, M.A. (2021), "Approaches for reducing wastes in the agricultural sector. An analysis of Millennials' willingness to buy food with upcycled ingredients", *Waste Management*, Vol. 126, pp. 283-290, doi: 10.1016/j.wasman.2021.03.018.

Cox, D.N. and Evans, G. (2008), "Construction and validation of a psychometric scale to measure consumers' fears of novel food technologies: the food technology neophobia scale", *Food Quality and Preference*, Vol. 19 No. 8, pp. 704-710, doi: 10.1016/j.foodqual.2008.04.005.

de Toledo, N.M.V., Nunes, L.P., da Silva, P.P.M., Spoto, M.H.F. and Canniatti-Brazaca, S.G. (2017), "Influence of pineapple, apple and melon by-products on cookies: physicochemical and sensory aspects", *International Journal of Food Science and Technology*, Vol. 52 No. 5, pp. 1185-1192, doi: 10.1111/ijfs.13383.

Ek, S. (2015), "Gender differences in health information behaviour: a Finnish population-based survey", *Health Promot Int*, Vol. 30 No. 3, pp. 736-745, doi: 10.1093/heapro/dat063.

Erickson, G.M. and Johansson, J.K. (1985), "The role of price in multi-attribute product evaluations", *Journal of Consumer Research*, Vol. 12 No. 2, pp. 195-199, doi: 10.1086/208508.

Evans, G. and Cox, D.N. (2006), "Australian consumers' antecedents of attitudes towards foods produced by novel technologies", *British Food Journal*, Vol. 108 No. 11, pp. 916-930, doi: 10.1108/00070700610709968.

Fabrigar, L.R. and Wegener, D.T. (2011), *Exploratory Factor Analysis*, Oxford University Press, New York.

Food Agriculture Organization of the United Nations (2013), *Food Wastage Footprint: Impacts on Natural Resources: Summary Report*, FAO, Rome.

Grasso, S., Omoarukhe, E., Wen, X., Papoutsis, K. and Methven, L. (2019), "The use of upcycled defatted sunflower seed flour as a functional ingredient in biscuits", *Foods*, Vol. 8 No. 8, p. 305, available at: https://www.mdpi.com/2304-8158/8/8/305

Hadjikakou, M. (2017), "Trimming the excess: environmental impacts of discretionary food consumption in Australia", *Ecological Economics*, Vol. 131, pp. 119-128, doi: 10.1016/j.ecolecon.2016.08.006.

Hellwig, C., Gmoser, R., Lundin, M., Taherzadeh, M.J. and Rousta, K. (2020), "Fungi burger from stale bread? A case study on perceptions of a novel protein-rich food product made from an edible fungus", *Foods*, Vol. 9 No. 8, p. 1112, available at: https://www.mdpi.com/2304-8158/9/8/1112

Henchion, M., McCarthy, M. and O'Callaghan, J. (2016), "Transforming beef by-products into valuable ingredients: which spell/recipe to use?", *Frontiers in Nutrition*, Vol. 3 No. 53, doi: 10.3389/fnut.2016.00053.

Januszewska, R., Pieniak, Z. and Verbeke, W. (2011), "Food choice questionnaire revisited in four countries. Does it still measure the same?", *Appetite*, Vol. 57 No. 1, pp. 94-98, doi: 10.1016/j.appet.2011.03.014.

Julia, C. and Hercberg, S. (2017), "Nutri-Score: evidence of the effectiveness of the French front-of-pack nutrition label", *Ernahrungs Umschau*, Vol. 64 No. 12, pp. 181-187.

Knekta, E., Runyon, C. and Eddy, S. (2019), "One size doesn't fit all: using factor analysis to gather validity evidence when using surveys in your research", *CBE-Life Sciences Education*, Vol. 18 No. 1, p. rm1, doi: 10.1187/cbe.18-04-0064.

Köpcke, J. (2020), "From waste to premium: consumers perception of value-added surplus products and their willingness to pay", available at: http://essay.utwente.nl/85249/ (accessed 29 January 2021).

Lea, E.J., Crawford, D. and Worsley, A. (2006), "Public views of the benefits and barriers to the consumption of a plant-based diet", *European Journal of Clinical Nutrition*, Vol. 60 No. 7, pp. 828-837, doi: 10.1038/sj.ejcn.1602387.

Lehdonvirta, V., Oksanen, A., Räsänen, P. and Blank, G. (2021), "Social media, web, and panel surveys: using non-probability samples in social and policy research", *Policy and Internet*, Vol. 13 No. 1, pp. 134-155, doi: 10.1002/poi3.238.

Lindeman, M. and Väänänen, M. (2000), "Measurement of ethical food choice motives", *Appetite*, Vol. 34 No. 1, pp. 55-59, doi: 10.1006/appe.1999.0293.

Lockie, S., Lyons, K., Lawrence, G. and Mummery, K. (2002), "Eating 'green': motivations behind organic food consumption in Australia", *Sociologia Ruralis*, Vol. 42 No. 1, pp. 23-40, doi: 10.1111/1467-9523.00200.

Margetts, B.M. and Nelson, M. (1997), *Design Concepts in Nutritional Epidemiology*, Oxford University Press, New York.

Markovina, J., Stewart-Knox, B.J., Rankin, A., Gibney, M., de Almeida, M.D.V., Fischer, A., Kuznesof, S.A., Poínhos, R., Panzone, L. and Frewer, L.J. (2015), "Food4Me study: validity and reliability of food choice questionnaire in 9 European countries", *Food Quality and Preference*, Vol. 45, pp. 26-32, doi: 10.1016/j.foodqual.2015.05.002.

McCarthy, B., Kapetanaki, A.B. and Wang, P. (2020), "Completing the food waste management loop: is there market potential for value-added surplus products (VASP)?", *Journal of Cleaner Production*, Vol. 256, 120435, doi: 10.1016/j.jclepro.2020.120435.

Meyers, L.S., Gamst, G. and Guarino, A.J. (2006), *Applied Multivariate Research: Design and Interpretation*, SAGE Publications, Thousand Oaks.

Moshtaghian, H., Bolton, K. and Rousta, K. (2021), "Challenges for upcycled foods: definition, inclusion in the food waste management hierarchy and public acceptability", *Foods*, Vol. 10 No. 11, p. 2874, available at: https://www.mdpi.com/2304-8158/10/11/2874

Mousel, T. and Tang, X. (2016), "Analysis of consumer behavior towards plant- based meat and dairy alternatives market in Sweden", Dissertation, available at: http://urn.kb.se/resolve?urn=urn: nbn:se:uu:diva-297183 (accessed 17 January 2021).

National Health and Medical Research Council (2013), *Australian Dietary Guidelines*, Commonwealth of Australia, Canberra.

Peters, A. (2019), "Everything you need to know about the booming business of fighting food waste", available at: https://www.fastcompany.com/90337075/inside-the-booming-business-of-fighting-food-waste (accessed 02 May 2020).

Rahmani, D. and Gil, J.M. (2018), "Valorisation of food surpluses and side-flows and citizens' understanding", REFRESH. Deliverable 1.7, available at: https://eu-refresh.org/valorisation-food-surpluses-and-side-flows-and-citizens%E2%80%99-understanding (accessed 15 January 2021).

Román, S., Sánchez-Siles, L.M. and Siegrist, M. (2017), "The importance of food naturalness for consumers: results of a systematic review", *Trends in Food Science and Technology*, Vol. 67, pp. 44-57, doi: 10.1016/j.tifs.2017.06.010.

Samuels, P. (2017), "Advice on exploratory factor analysis", available at: https://www.open-access.bcu. ac.uk/6076/ (accessed 9 June 2022).

Sautron, V., Péneau, S., Camilleri, G.M., Muller, L., Ruffieux, B., Hercberg, S. and Méjean, C. (2015), "Validity of a questionnaire measuring motives for choosing foods including sustainable concerns", *Appetite*, Vol. 87, pp. 90-97, doi: 10.1016/j.appet.2014.12.205.

Spratt, O., Suri, R. and Deutsch, J. (2021), "Defining upcycled food products", *Journal of Culinary Science and Technology*, Vol. 19 No. 6, pp. 485-496, doi: 10.1080/15428052.2020.1790074.

Stelick, A., Sogari, G., Rodolfi, M., Dando, R. and Paciulli, M. (2021), "Impact of sustainability and nutritional messaging on Italian consumers' purchase intent of cereal bars made with brewery spent grains", *Journal of Food Science*, Vol. 86 No. 2, pp. 531-539, doi: 10.1111/1750-3841.15601.

Steptoe, A., Pollard, T.M. and Wardle, J. (1995), "Development of a measure of the motives underlying the selection of food: the food choice questionnaire", *Appetite*, Vol. 25 No. 3, pp. 267-284, doi: 10.1006/appe.1995.0061.

Swedish National Food Agency (2018), "More to do more - Action plan for food loss and food waste reduction by 2030", available at: https://ec.europa.eu/food/sites/food/files/safety/docs/fw_lib_fwp-strat_national-strategy_sv_eng.pdf (accessed 29 May 2020).

Szakály, Z., Kontor, E., Kovács, S., Popp, J., Pető, K. and Polereczki, Z. (2018), "Adaptation of the food choice questionnaire: the case of Hungary", *British Food Journal*, Vol. 120 No. 7, pp. 1474-1488, doi: 10.1108/bfj-07-2017-0404.

The Upcycled Foods Definition Task Force (2020), "Defining upcycled foods", available at: https://www.chlpi.org/wp-content/uploads/2013/12/Upcycled-Food_Definition.pdf (accessed 15 January 2021).

United Nations (2015), *Transforming Our World: the 2030 Agenda for Sustainable Development*, United Nations, Department of Economic and Social Affairs, New York.

Varese, E., Cesarani, M.C. and Wojnarowska, M. (2023), "Consumers' perception of suboptimal food: strategies to reduce food waste", *British Food Journal*, Vol. 125 No. 1, pp. 361-378, doi: 10.1108/BFJ-07-2021-0809.

Vartanian, L.R. (2015), "Impression management and food intake. Current directions in research", *Appetite*, Vol. 86, pp. 74-80, doi: 10.1016/j.appet.2014.08.021.

Verain, M.C.D., Snoek, H.M., Onwezen, M.C., Reinders, M.J. and Bouwman, E.P. (2021), "Sustainable food choice motives: the development and cross-country validation of the Sustainable Food Choice Questionnaire (SUS-FCQ)", *Food Quality and Preference*, Vol. 93, 104267, doi: 10.1016/j.foodqual.2021.104267.

Verma, J.P. and Abdel-Salam, A.S.G. (2019), *Testing Statistical Assumptions in Research*, Wiley, Hoboken.

Weber, E.U., Blais, A.-R. and Betz, N.E. (2002), "A domain-specific risk-attitude scale: measuring risk perceptions and risk behaviors", *Journal of Behavioral Decision Making*, Vol. 15 No. 4, pp. 263-290, doi: 10.1002/bdm.414.

Worsley, A. (2002), "Nutrition knowledge and food consumption: can nutrition knowledge change food behaviour?", *Asia Pacific Journal of Clinical Nutrition*, Vol. 11 s3, pp. S579-S585, doi: 10.1046/j.1440-6047.11.supp3.7.x.

Yilmaz, E. and Kahveci, D. (2022), "Consumers' purchase intention for upcycled foods: insights from Turkey", *Future Foods*, Vol. 6, 100172, doi: 10.1016/j.fufo.2022.100172.

Yong, A.G. and Pearce, S. (2013), "A beginner's guide to factor analysis: focusing on exploratory factor analysis", *Tutorials in Quantitative Methods for Psychology*, Vol. 9 No. 2, pp. 79-94.

Zhang, J., Ye, H., Bhatt, S., Jeong, H., Deutsch, J., Ayaz, H. and Suri, R. (2021), "Addressing food waste: how to position upcycled foods to different generations", *Journal of Consumer Behaviour*, Vol. 20 No. 2, pp. 242-250, doi: 10.1002/cb.1844.

Corresponding author
Hanieh Moshtaghian can be contacted at: hanieh.moshtaghian@hb.se

Appendix

	Description[1]	Items[2,3]
Factor 1: Natural content	Deals with interest in unprocessed food and the use of additives	- Contains no additives - Contains natural ingredients - Is as unprocessed/minimally processed as possible - Is free from genetically modified ingredients - Is prepared in a way that preserves its natural goodness - Is certified free of chemical and hormone residues
Factor 2: Ethical concern	Relates to political correctness and environmental impact	- Is prepared in an environmentally friendly way - Is packaged in an environmentally friendly way - Helps the environment by reducing food waste - Has been produced in a way that animals' rights have been respected - Comes from a country in which human rights are respected - Is produced locally - Has the country of origin clearly marked
Factor 3: Healthiness	Deals with nutritional aspects, health benefits and attitudes that encourage good health	- Is high in fibre and roughage - Is low in fat - Is low in calories - Is high in protein - Contains a lot of vitamins and minerals - Is nutritious
Factor 4: Familiarity	Concerns the previous experience of dealing with food and habitual patterns	- Is familiar - Is similar to what I usually eat - Is not a food that I have never eaten before - Is made from ingredients that I know - Is from a well-known brand
Factor 5: Sensory appeal	Relates to the pleasure of eating through smell, vision, feel and taste	- Has a pleasant texture - Smells nice - Tastes good - Looks nice
Factor 6: Price	Deals with the economic factors	- Is not expensive - Is cheap - Is good value for money
Factor 7: Impression	Concerns the impression on friends, family and relatives	- Helps me to appear "trendy" to my friends - Would give people the right impression about me - Would meet relatives' approval

Note(s): [1]Descriptions of all factors except factor 7 were adapted from Asraf Mohd-Any *et al.* (2014)
[2]The response began with a statement (It is important to me that the upcycled food I eat …) followed by the food choice items
[3]Question items were adapted from previous questionnaires and literature (Steptoe *et al.*, 1995; Lockie *et al.*, 2002; Abdul Rahman *et al.*, 2013, The Upcycled Foods Definition Task Force, 2020; Chen, 2007; Ares and Gámbaro, 2008; Lea *et al.*, 2006; Evans and Cox, 2006)

Table A1.
Factors motivating upcycled food choices