

Zero-Waste and Upcycled Food Startups: Gen Z's Approach to the Circular Economy



Sunil Kumar

Deputy Director – Culinary Arts, School of Culinary and Hotel Management, Manav Rachna International Institute of Research and Studies (MRIIRS), Faridabad, India, Contact- ksunil12@gmail.com, ORCID ID- <https://orcid.org/0009-0006-2286-7619>

Abstract

Upcycled food turns ingredients that would otherwise be wasted into new products, and much of this market is led by startups that depend on young consumers. This study examines what drives Generation Z's intention to buy upcycled food in India, using an extended Theory of Planned Behaviour. Survey data from 44 respondents aged 18–29 were analysed with partial least squares structural equation modelling. Trust in zero-waste startups was the only significant driver of attitude ($\beta = 0.58$, $p = .001$), and subjective norm was the only significant driver of purchase intention ($\beta = 0.67$, $p < .001$). Attitude did not significantly predict intention, and environmental concern, perceived risk and social media influence did not significantly shape attitude. The model explained 56% of the variance in attitude and 59% in purchase intention. Half of the respondents had never heard the term “upcycled food”, and 77% would not pay more for it than for a regular product. The findings suggest that startups should build credibility through certification and transparency and use peer and family approval, instead of relying on environmental messaging alone. Because the sample is small and skewed toward male students, the results are preliminary.

Keywords: Upcycled Food, Generation Z, Circular Economy, Theory of Planned Behaviour, Trust

1. Introduction

Food waste is one of the most pressing sustainability problems of our time. In 2022, the world wasted 1.05 billion tonnes of food, about 19% of all food available to consumers, in addition to the 13% lost earlier in the supply chain (Gatto & Chepeliev, 2024; United

Nations Environment Programme [UNEP], 2024). Households generate about 60% of this waste, and food loss and waste together account for an estimated 8–10% of global greenhouse gas emissions (UNEP, 2024).

Households generate 60% of the food the world wastes

Food wasted in 2022 by sector (million tonnes)

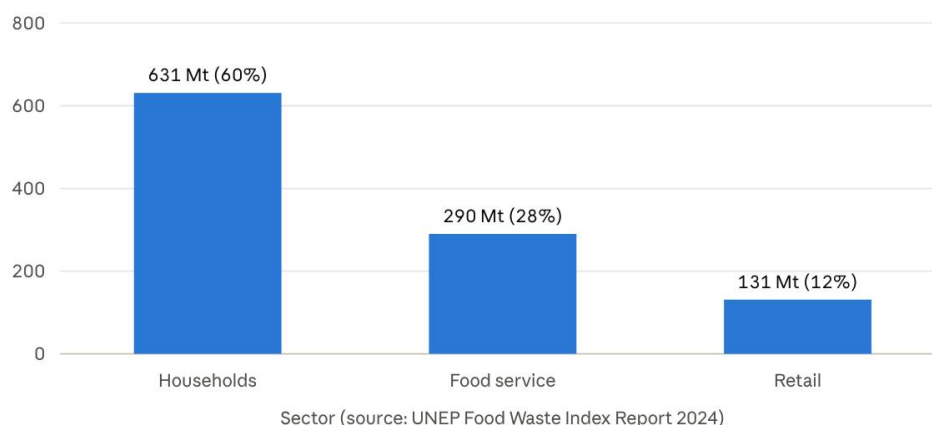


Fig.1. Global Food Waste by Sector, 2022

Note. Mt = million tonnes. Data from United Nations Environment Programme (2024).

The circular economy, which aims to keep resources in use for as long as possible, offers a framework for turning this waste into value (Tamasiga et al., 2022).

Upcycled food is one of its most visible applications (Aschemann-Witzel et al., 2023; Bangar et al., 2024). In 2020, an expert task force defined upcycled foods

as those that use ingredients that would otherwise not have gone to human consumption, are procured and produced through verifiable supply chains, and have a positive environmental impact (Upcycled Food Definition Task Force, 2020).

Startups have led much of this innovation, building business models around surplus bread, fruit peels, spent grain and other by-products (Van Opstal & Borms, 2023). Industry estimates value the upcycled food products market at nearly USD 39 billion in 2024, with projected growth to over USD 65 billion by 2032 (Institute of Food Technologists [IFT], 2026). Yet the success of these ventures depends on

whether consumers are willing to buy food made from what was once considered waste (Lu et al., 2024; Zaman et al., 2026).

Generation Z, born roughly between 1997 and 2012, is central to this question. Studies suggest that Gen Z consumers are more attentive to sustainability and circular economy principles than earlier cohorts and more likely to support environmentally responsible brands (Qi et al., 2025; Robichaud & Yu, 2022). However, their sustainable intentions are often limited by budget, habit and scepticism (Gomes et al., 2023), and they are far from a uniform group.

Gen Z leads older cohorts in willingness to buy upcycled products

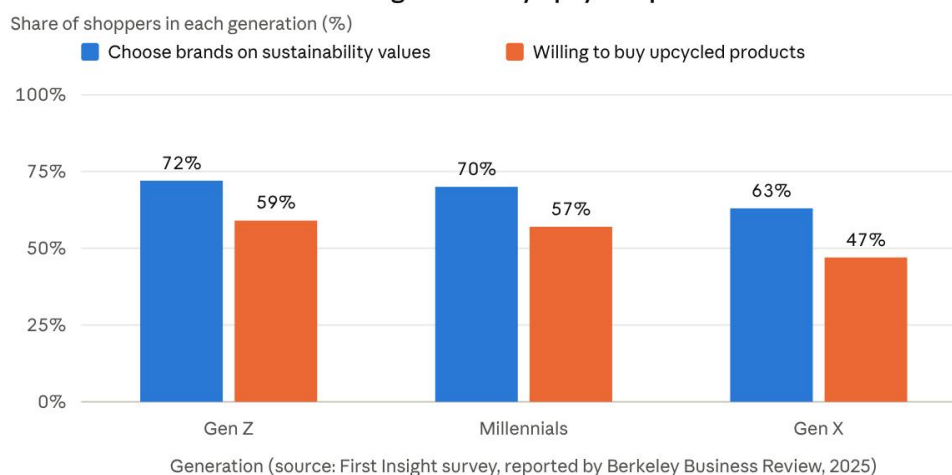


Fig.2. Sustainability-Driven Purchasing and Willingness to Buy Upcycled Products, by Generation

Note. Industry survey data from First Insight, as reported by Berkeley Business Review (2025).

Research on consumer acceptance of upcycled food has grown quickly, but it is concentrated in Europe and the United States, and few studies focus on young consumers (Lu et al., 2024). Evidence from India, which has one of the world's largest Gen Z populations and a fast-growing startup ecosystem, is especially scarce, even though Indian studies have long applied the TPB to young consumers' green purchases (Paul et al., 2016; Singh & Verma, 2017; Yadav & Pathak, 2016). The role of trust in startups and social media, two forces that strongly shape Gen Z's choices, has also received little attention.

This study addresses these gaps by extending the Theory of Planned Behaviour (Ajzen, 1991) to explain Gen Z's intention to buy upcycled food products in India. It asks two questions:

•**RQ1:** How do attitude and subjective norm influence Gen Z consumers' intention to buy upcycled food?

•**RQ2:** How do environmental concern, perceived risk, trust in zero-waste startups and social media influence shape Gen Z's attitude toward upcycled food?

The study contributes to theory by testing an extended TPB model in an under-studied cohort and market. For practice, it offers upcycled food startups evidence on how to communicate with and build trust among young consumers.

2. Literature review and hypotheses

The model extends the Theory of Planned Behaviour with four antecedents of attitude, giving six hypotheses (H1–H6). Perceived behavioural control, the third TPB predictor, is not included in the tested model because its measurement items were revised during data collection (see Section 4.3). Items in [square brackets] are author names still to be completed from the linked sources in the reference list.

2.1 Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB) holds that behavioural intention is shaped by three factors: attitude toward the behaviour, subjective norm, and perceived behavioural control (Ajzen, 1991). It is the most widely used framework for explaining sustainable food choices, and it has recently been

applied to upcycled food in Italy (Zaman et al., 2026), China (Gan et al., 2026) and Taiwan (Chen & Chao,

2025). It also performs well across Western and non-Western food cultures (Randall et al., 2024).

Attitude and norms predict intention in every study, while control varies

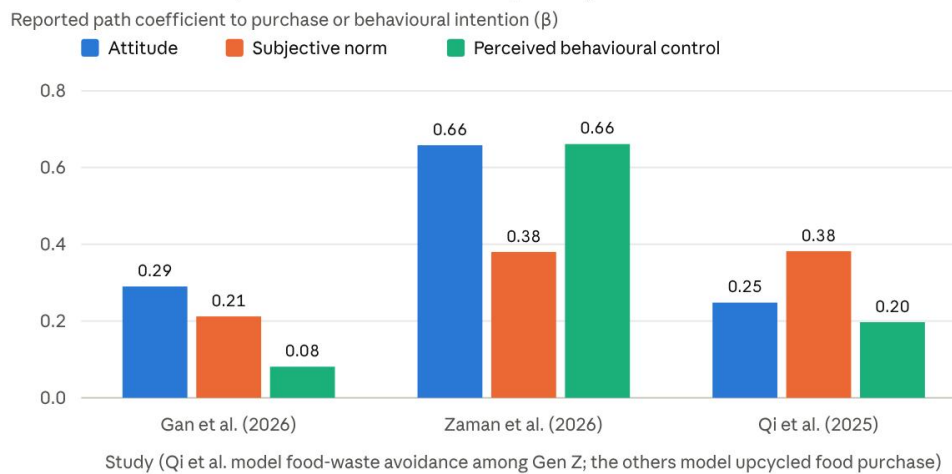


Fig.3. Path Coefficients From the Theory of Planned Behaviour in Recent Studies

Note. Data from Gan et al. (2026), $n = 418$, China; Zaman et al. (2026), $n = 904$, Italy (Model 1); and Qi et al. (2025), $n = 417$, Generation Z, China. Coefficients come from different models and scales, so they show direction and relative size rather than directly comparable effects.

2.2 Attitude and purchase intention

Attitude is a person's overall positive or negative evaluation of performing a behaviour. In upcycled food research, attitude is consistently the strongest predictor of purchase intention. A survey of 406 Chinese consumers found that attitude positively influenced purchase intention and also mediated the effects of environmental awareness and product knowledge [author, 2026a]. Similar results were reported for a representative sample of 904 Italian consumers (Zaman et al., 2026), although that study also noted the attitude–intention gap common to “green” foods (Vermeir & Verbeke, 2006; Zaman et al., 2026).

H1: Attitude toward upcycled food positively influences Gen Z's purchase intention.

2.3 Subjective norm

Subjective norm is the perceived social pressure from important others to perform a behaviour. Younger consumers are more easily influenced by peers when trying novel foods (Coderoni & Perito, 2020; Lu et al., 2024), which makes social approval especially relevant for Gen Z. Among Chinese Gen Z, subjective norm was the strongest predictor of food-waste avoidance intention (Qi et al., 2025), and social media further amplifies peer norms among young consumers (Xie & Madni, 2023). A study of 418 Chinese consumers found that subjective norm had a significant positive effect on intention to buy upcycled food (Gan et al., 2026).

H2: Subjective norm positively influences Gen Z's intention to buy upcycled food.

2.4 Environmental concern

Environmental concern is the degree to which a person is aware of environmental problems and willing to act on them. Consumers who see upcycling as a way to reduce food waste evaluate upcycled products more favourably, and environmental awareness has been shown to strengthen attitude toward upcycled food [author, 2026a]. In a representative sample of 904 Italians, environmental concern was the strongest driver of attitude toward upcycled food (Zaman et al., 2026), echoing findings for young Indian consumers of green products (Yadav & Pathak, 2016). Younger generations are generally more sensitive to sustainability, which makes them less reluctant to buy upcycled products (Chiaraluce et al., 2024).

H3: Environmental concern positively influences Gen Z's attitude toward upcycled food.

2.5 Perceived risk

Perceived risk captures concerns about the safety, hygiene and taste of food made from by-products. Fear of unfamiliar foods and food technologies reduces acceptance of upcycled products (Cattaneo et al., 2019; Coderoni & Perito, 2020; Perito et al., 2020), and disgust and doubts about quality remain common barriers (D'Souza et al., 2025; Hellali & Korai, 2023; Lu et al., 2024). Consumers with

traditional food preferences are also less inclined toward upcycled products (Grasso & Asioli, 2020). Younger consumers tend to be less neophobic (Coderoni & Perito, 2021), but risk perceptions are still expected to weaken attitude.

H4: Perceived risk negatively influences Gen Z's attitude toward upcycled food.

2.6 Trust in zero-waste startups

Most upcycled products are sold by young brands without an established reputation, so consumers must rely on the company's claims about sourcing and safety. Transparency about the upcycled origin of ingredients can improve consumer response (Peschel & Aschemann-Witzel, 2020), and information about circular-economy benefits raised young consumers' perceived value of upcycled foods (Cela et al., 2024). The formal definition of upcycled food itself requires verifiable supply chains, which underlines the role of credible claims (Upcycled Food Definition Task Force, 2020). Trust is especially important for Gen Z, among whom scepticism about sustainability claims and

greenwashing is a recurring theme [author, 2026d].

H5: Trust in zero-waste food startups positively influences Gen Z's attitude toward upcycled food.

2.7 Social media influence

Gen Z discovers and evaluates products largely through social media, where zero-waste food has become a visible trend (Salková et al., 2023). Influencer marketing has been shown to raise sustainable food purchase intention in a study of 628 consumers (Wu et al., 2023), and social media influence shaped Gen Z's organic food choices in a PLS-SEM study of 400 respondents in Pakistan [author, 2023a]. Exposure to credible sustainability content is expected to build more favourable attitudes toward upcycled food, in line with evidence that social media shapes young consumers' green consumption through norms and perceived value (Xie & Madni, 2023).

H6: Social media influence positively influences Gen Z's attitude toward upcycled food.

Table 1: Summary of Hypotheses

Hypothesis	Path	Expected sign
H1	Attitude → Purchase intention	+
H2	Subjective norm → Purchase intention	+
H3	Environmental concern → Attitude	+
H4	Perceived risk → Attitude	–
H5	Trust in startups → Attitude	+
H6	Social media influence → Attitude	+

3. Conceptual model

Four factors shape attitude, which drives intention alongside subjective norm

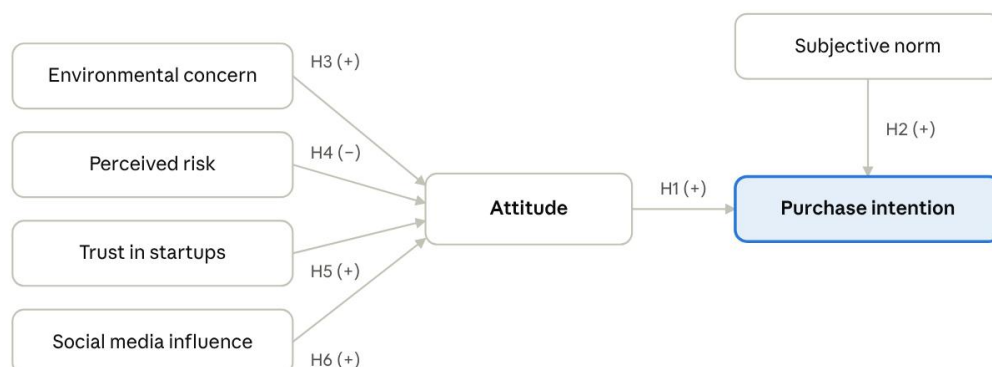


Fig.4. Conceptual Model and Hypotheses

Note. H1–H6 = hypotheses; signs show the expected direction of each path.

Environmental concern, perceived risk, trust in startups and social media influence act on purchase intention through attitude, while subjective norm acts on it directly.

4. Methodology

4.1 Research design

The study uses a quantitative, cross-sectional survey design. Hypotheses were tested with partial least squares structural equation modelling (PLS-SEM), which suits prediction-oriented models with several latent constructs and moderate sample sizes (Hair et al., 2019).

Screening and cleaning precede a two-stage PLS-SEM analysis

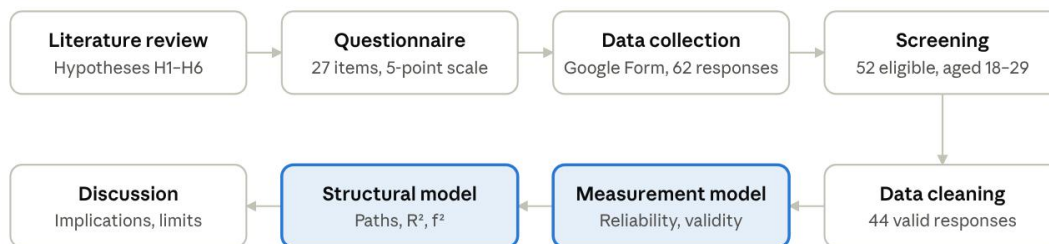


Fig.5. Research Process

Note. The two highlighted stages form the PLS-SEM analysis.

4.2 Sample and data collection

The target population was Indian consumers of Generation Z aged 18–29. Data were collected through a Google Form shared via WhatsApp groups, email and social media between 27 and 30 September 2026, using purposive and snowball sampling. Screening questions ended the survey for anyone who declined consent or was outside the 18–29 age range.

Of 62 responses received, 2 declined consent and 8 were outside the age range (1 under 18 and 7 aged 30 or above), leaving 52 eligible respondents. Eight of these gave an identical answer to every scale item (straight-lining) and were removed, giving a final sample of 44. This exceeds the 10-times rule minimum of 40 for this model, in which four structural paths point at attitude. By the inverse square root method, however, a sample of 44 can reliably detect only path coefficients of about 0.37 or larger (Kock & Hadaya, 2018). The results should therefore be read as preliminary.

4.3 Measurement instrument

The questionnaire had four sections: demographics, awareness and past behaviour, construct measures, and willingness to pay. A short definition of upcycled food with examples was shown before the construct measures so that all respondents shared a common understanding.

Seven constructs were analysed, each measured with 3–4 items on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree), 27 items in total. Items for attitude, subjective norm and purchase intention

followed the standard TPB format (Ajzen, 1991), and the remaining items were adapted from prior studies on upcycled and sustainable food [add source for each construct]. Perceived behavioural control was also measured, but its items were reworded after the first 24 responses had been received. To keep measurement identical for all respondents, this construct was excluded from the analysis.

4.4 Data analysis

Data were analysed with the PLS path modelling algorithm (Mode A, factorial weighting scheme) in two stages [estimated in Python; re-run in SmartPLS 4 before submission and name the software here]. The measurement model was assessed through indicator loadings ($\geq .70$), Cronbach's alpha and composite reliability ($\geq .70$), average variance extracted ($\geq .50$), and discriminant validity using the Fornell–Larcker criterion and the heterotrait–monotrait (HTMT) ratio (Fornell & Larcker, 1981; Henseler et al., 2015).

The structural model was assessed using bootstrapping with 5,000 subsamples to test path significance, together with R^2 and f^2 values and inner variance inflation factors (VIFs; Hair et al., 2019). Common method bias was checked with Harman's single-factor test and full collinearity VIFs (Kock, 2015; Podsakoff et al., 2003).

5. Results

5.1 Respondent profile

The final sample comprised 44 respondents (Table 2). Most were students (82%) and undergraduates (77%), and men outnumbered women by almost three to one. Respondents were split evenly between

the 18–21 and 22–25 age groups, and 57% lived in a metro city. Most came from North India, mainly Uttar Pradesh, Bihar, Delhi and Haryana.

Table 2: Respondent Profile (N = 44)

Characteristic	Category	n	%
Age	18–21	21	47.7
	22–25	21	47.7
	26–29	2	4.5
Gender	Male	32	72.7
	Female	12	27.3
Education	Undergraduate	34	77.3
	Postgraduate	8	18.2
	Higher secondary	2	4.5
Occupation	Student	36	81.8
	Employed (full-time)	6	13.6
	Employed (part-time)	1	2.3
	Not working	1	2.3
Residence	Metro city	25	56.8
	Tier 2 / Tier 3 city	8	18.2
	Rural	6	13.6
	Semi-urban	5	11.4
Diet	Non-vegetarian	29	65.9
	Vegetarian	13	29.5
	Eggetarian	2	4.5

Awareness of the concept was limited, as in other markets: Grasso et al. (2023) found that familiarity with upcycled foods was low in both the United States and China. Half of the respondents (50%) had never heard the term “upcycled food” before the survey, 39% had, and 11% were not sure. Even so, 57% reported having bought a product made from

surplus food or by-products at least once, and 23% said they could name an upcycled or zero-waste food brand. Most respondents (61%) buy products labelled as sustainable only “sometimes”.

Social media was by far the main source of information about new sustainable food products, named by 86% of respondents (Fig. 6).

Social media is where Gen Z learns about sustainable food

Share of respondents naming each source (%; multiple answers allowed)

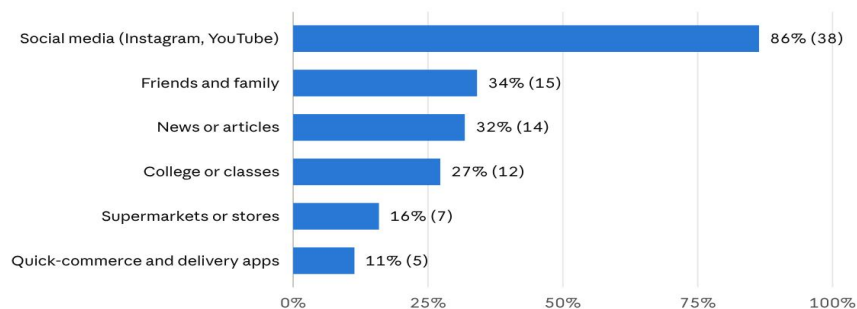


Fig.6. Sources of Information About Sustainable Food Products

Note. N = 44. Respondents could select more than one source.

Respondents were price-sensitive (Fig. 7). About half (52%) would pay only the same price as a regular

product and a further 25% would buy only if the upcycled product were cheaper. Only 23% would pay any premium.

Three in four would not pay more for upcycled food

Price respondents would pay compared with a regular product (% of respondents)

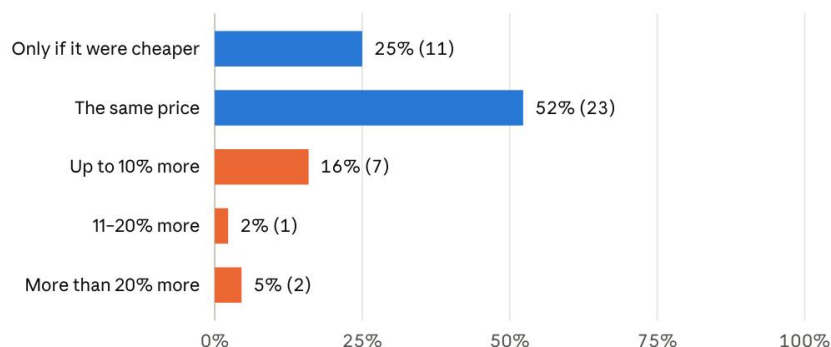


Fig.7. Willingness to Pay for Upcycled Food Compared With a Regular Product

Note. N = 44. The first two bars show respondents who would not pay a premium.

5.2 Measurement model

All seven constructs met the reliability and convergent validity criteria (Table 3). Indicator

loadings ranged from .75 to .96, Cronbach's alpha from .80 to .94, composite reliability from .87 to .96, and average variance extracted (AVE) from .63 to .85.

Table 3: Reliability and Convergent Validity

Construct	Items	Loadings	Cronbach's α	CR	AVE	M	SD
Environmental concern	4	.76-.94	.91	.94	.79	3.96	0.87
Perceived risk	4	.83-.91	.90	.93	.77	2.73	0.85
Trust in startups	4	.87-.96	.93	.95	.82	3.62	0.97
Social media influence	3	.84-.91	.84	.90	.76	3.42	0.86
Attitude	4	.89-.95	.94	.96	.85	3.85	0.90
Subjective norm	4	.75-.85	.80	.87	.63	3.54	0.72
Purchase intention	4	.83-.94	.91	.94	.80	3.56	0.81

Note. CR = composite reliability; AVE = average variance extracted.

Environmental concern and attitude had the highest mean scores, and perceived risk was the only construct below the neutral midpoint (Fig. 8).

Concern and attitude are high, while perceived risk is below neutral

Mean construct score (1 = strongly disagree, 5 = strongly agree)

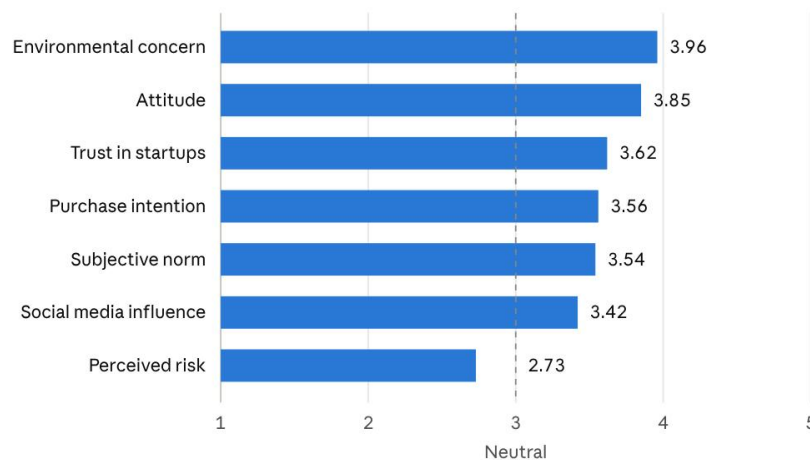


Fig.8. Mean Scores by Construct

Note. N = 44.

Discriminant validity was acceptable but not clean (Table 4). The Fornell–Larcker criterion was met for every construct: the lowest square root of AVE (.79, subjective norm) exceeded that construct's highest

correlation ($r = .76$). Twenty of the 21 HTMT ratios were below 0.85. The ratio between subjective norm and trust in startups was 0.86, slightly above the conservative 0.85 threshold but below the more liberal 0.90 threshold (Henseler et al., 2015).

Table 4: Discriminant Validity: HTMT Ratios

	EC	RP	TR	SMI	ATT	SN
RP	0.18					
TR	0.68	0.12				
SMI	0.42	0.20	0.57			
ATT	0.58	0.28	0.75	0.35		
SN	0.66	0.16	0.86	0.73	0.78	
PI	0.62	0.10	0.78	0.61	0.63	0.84

Note. EC = environmental concern; RP = perceived risk; TR = trust in startups; SMI = social media influence; ATT = attitude; SN = subjective norm; PI = purchase intention.

For common method bias, Harman's single factor explained 44.6% of the variance, below the 50% threshold. Full collinearity VIFs ranged from 1.22 to 3.84. Two of them, subjective norm (3.84) and trust in startups (3.32), exceeded the 3.3 guideline (Kock, 2015), so some common method variance cannot be ruled out.

5.3 Structural model

Inner VIFs ranged from 1.07 to 1.98, so collinearity among predictors was not a concern. The model explained 56% of the variance in attitude ($R^2 = .56$, adjusted $R^2 = .51$) and 59% of the variance in purchase intention ($R^2 = .59$, adjusted $R^2 = .57$).

Two of the six paths were significant (Table 5 and Fig. 9). Subjective norm had a strong positive effect on purchase intention ($\beta = 0.67$, $t = 5.82$, $p < .001$), and trust in startups had a strong positive effect on attitude ($\beta = 0.58$, $t = 3.19$, $p = .001$). Both effect sizes were large ($f^2 = 0.59$ and 0.38).

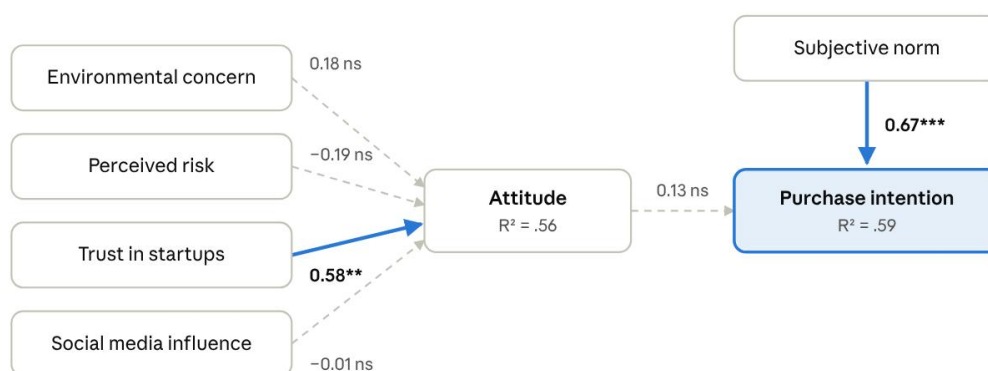
Attitude did not significantly predict purchase intention ($\beta = 0.13$, $p = .296$). Environmental concern ($\beta = 0.18$), perceived risk ($\beta = -0.19$) and social media influence ($\beta = -0.01$) did not significantly predict attitude, although the first two were in the hypothesised direction. No indirect effect through attitude was significant.

Table 5: Structural Model Results and Hypothesis Tests

H	Path	β	t	p	95% CI	f^2	Result
H1	Attitude → Purchase intention	0.13	1.04	.296	[-0.12, 0.37]	0.02	Not supported
H2	Subjective norm → Purchase intention	0.67	5.82	< .001	[0.45, 0.90]	0.59	Supported
H3	Environmental concern → Attitude	0.18	1.04	.300	[-0.14, 0.52]	0.04	Not supported
H4	Perceived risk → Attitude	-0.19	1.43	.152	[-0.44, 0.09]	0.08	Not supported
H5	Trust in startups → Attitude	0.58	3.19	.001	[0.22, 0.92]	0.38	Supported
H6	Social media influence → Attitude	-0.01	0.11	.916	[-0.34, 0.19]	0.00	Not supported

Note. N = 44. Bootstrapping with 5,000 subsamples; CI = percentile confidence interval; t values are absolute.

Trust shapes attitude, but subjective norm drives purchase intention



Solid lines: significant paths. Dashed lines: not significant (ns). **p < .01, ***p < .001.

Fig.9. Structural Model With Path Coefficients

Note. Values on the paths are standardised coefficients (β). R^2 = variance explained; ns = not significant.

p < .01. *p < .001.

5.4 Additional analyses

Three descriptive views and one alternative model were examined to see whether the main conclusions hold. These analyses are exploratory.

Response distribution. Fig. 10 shows how responses were spread across the five answer categories. Agreement was highest for environmental concern (69% of item responses were “agree” or “strongly agree”) and attitude (67%), and lowest for perceived risk (21%).

Most respondents agree on concern and attitude, and few perceive risk

Share of all item responses in each answer category (%)

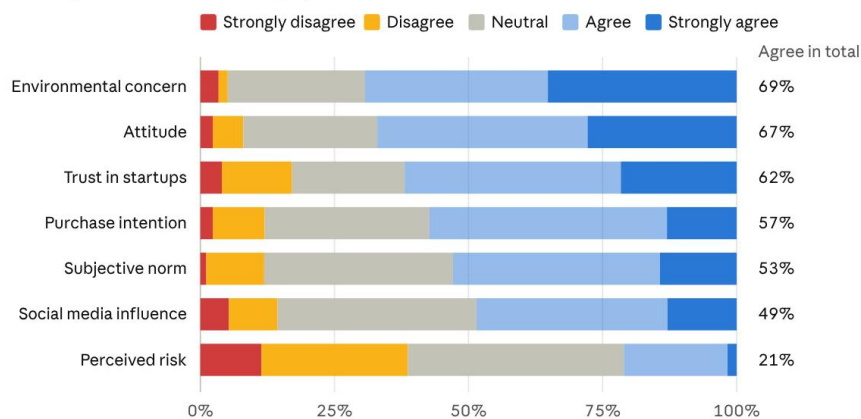


Fig.10. Distribution of Responses by Construct

Note. N = 44. Percentages are based on all item responses for each construct.

Correlations among constructs. Purchase intention correlated most strongly with subjective norm ($r = .76$) and trust in startups ($r = .72$), and hardly at all

with perceived risk ($r = .04$; Fig. 11). Perceived risk was the only construct with negative correlations, the largest being with attitude ($r = -.27$).

Trust and subjective norm correlate most strongly with purchase intention

Correlation between construct scores (r); darker blue = stronger positive, orange = negative



Column labels are construct abbreviations, defined in the note.

Fig.11. Correlations Among Construct Scores

Note. N = 44. Values are Pearson correlations between construct scores from the measurement model. EC = environmental concern; RP = perceived risk; TR = trust in startups; SMI = social media influence; ATT = attitude; SN = subjective norm.

Awareness and evaluation. Respondents who had heard the term “upcycled food” before the survey reported a more favourable attitude than those who had not ($M = 4.25$ vs. 3.60), Welch’s $t(30.8) = 2.57$, $p = .015$ (Fig. 12). Their purchase intention was also higher ($M = 3.87$ vs. 3.43), but this difference fell just short of significance, $t(36.2) = 2.02$, $p = .051$. The “not sure” group ($n = 5$) was too small to test.

Respondents who knew the term rate upcycled food higher

Mean score (1 = strongly disagree, 5 = strongly agree)

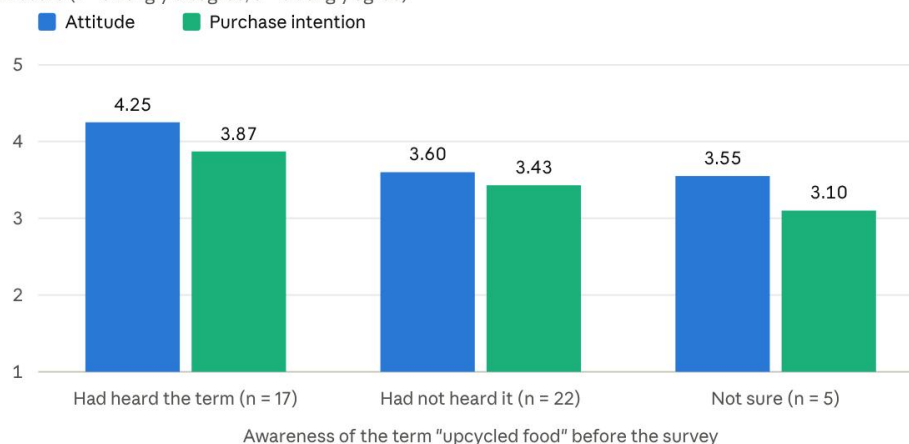


Fig.12. Attitude and Purchase Intention by Prior Awareness of Upcycled Food

Note. N = 44.

Alternative model. Because trust in startups correlated strongly with purchase intention, an alternative model (Model 2) added a direct path from trust to intention (Table 6 and Fig. 13). The direct path was positive but not significant ($\beta = 0.32$, $p = .129$), and the total effect of trust on intention was 0.34, 95% CI [-0.02, 0.60]. Subjective norm remained

the only significant predictor of intention ($\beta = 0.50$, $p < .001$), attitude remained non-significant, and the paths to attitude were essentially unchanged. Variance explained in purchase intention rose from 59% to 63%. The main conclusions therefore hold, and the role of trust as a direct driver of intention deserves testing in a larger sample.

Table 6: Comparison of the Hypothesised Model and the Alternative Model: Paths to Purchase Intention

Path	Model 1 β	Model 2 β	t	p	95% CI
Attitude → Purchase intention	0.13	0.02	0.13	.898	[-0.24, 0.38]
Subjective norm → Purchase intention	0.67	0.50	3.94	< .001	[0.26, 0.77]
Trust in startups → Purchase intention	-	0.32	1.52	.129	[-0.17, 0.67]
R^2 (purchase intention)	.59	.63			
Adjusted R^2	.57	.60			

Note. N = 44. Model 1 = hypothesised model (Table 5). Model 2 adds a direct path from trust in startups to purchase intention. The t , p and CI values refer to Model 2 and are based on 5,000 bootstrap subsamples.

With a direct trust path added, subjective norm still drives intention

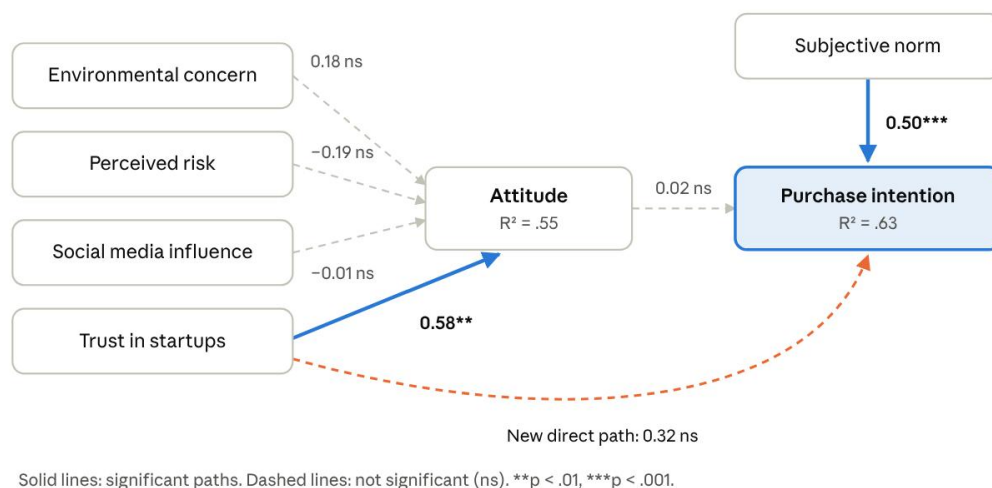


Fig.13. Alternative Structural Model With a Direct Path From Trust to Purchase Intention

Note. Values on the paths are standardised coefficients (β). R^2 = variance explained; ns = not significant.

p < .01. *p < .001.

5.5 Summary

H2 and H5 were supported, and H1, H3, H4 and H6 were not. With a sample of 44, only large effects can be detected, so the non-significant paths should not be read as evidence of no effect.

6. Discussion

6.1 Main findings

This study set out to explain what drives Generation Z's intention to buy upcycled food. Two findings stand out. Purchase intention was driven by subjective norm and not by attitude, and attitude itself was shaped by trust in startups and not by environmental concern, perceived risk or social media.

Subjective norm drives intention (H2 supported).

Respondents intended to buy upcycled food when they believed friends, family and peers would approve. This matches Qi et al. (2025), who found subjective norm to be the strongest predictor of food-waste avoidance among Chinese Gen Z, and Gan et al. (2026), who found a significant norm effect for upcycled food. It is also consistent with evidence that younger consumers are more easily influenced by peers when trying novel foods (Coderoni & Perito, 2020; Lu et al., 2024). For a product that half of the respondents had never heard of, social approval appears to act as a signal that the product is acceptable.

Attitude does not translate into intention (H1 not supported). Attitudes toward upcycled food were favourable ($M = 3.85$), yet attitude did not significantly predict intention once subjective norm

was in the model. This pattern echoes the attitude-intention gap documented for sustainable food (Vermeir & Verbeke, 2006) and for upcycled food specifically (Zaman et al., 2026). Price is one likely reason: 77% of respondents would not pay more for an upcycled product, in line with evidence that Gen Z's willingness to pay for green products is limited (Gomes et al., 2023). Low awareness is another, since a positive opinion formed during a survey may be too new to guide behaviour.

Trust in startups shapes attitude (H5 supported).

Trust was the only significant antecedent of attitude, with a large effect. Because most upcycled products come from young brands, consumers must rely on the company's claims about ingredients and safety. This supports earlier findings that transparency improves consumer response to upcycled products (Peschel & Aschemann-Witzel, 2020) and that information about circular-economy benefits raises perceived value among young consumers (Cela et al., 2024). In the alternative model, the direct path from trust to intention was positive but not significant, so trust may also act on intention directly, which a larger sample could test. In open-ended answers, respondents most often named affordable price, taste and food-safety certification as what would encourage them to buy.

Environmental concern, risk and social media (H3, H4 and H6 not supported).

Environmental concern was high ($M = 3.96$) but did not significantly shape attitude, unlike in the Italian sample of Zaman et al. (2026), where it was the strongest driver. Perceived risk was low ($M = 2.73$) and its effect was negative as expected but not significant, which is consistent with younger consumers being less neophobic (Coderoni & Perito, 2021). Social media

was the main information source for 86% of respondents, yet self-reported social media influence had no effect on attitude. Social media may raise awareness without persuading, or its influence may operate through peer norms (Xie & Madni, 2023), which the model captures separately. Given the small sample, these three paths may also simply be too weak to detect here. Awareness may matter more than any of them: respondents who already knew the term “upcycled food” held significantly more favourable attitudes (Fig. 12).

6.2 Theoretical implications

The study adds to the limited evidence on upcycled food from India and from Generation Z. It suggests that for an unfamiliar product category, the normative component of the Theory of Planned Behaviour may matter more than the attitudinal one, and that trust in the seller deserves a place among the antecedents of attitude when the sellers are startups. It also shows that high environmental concern does not automatically produce favourable evaluations of a specific sustainable product.

6.3 Practical implications

- **Build trust first.** Startups should invest in food-safety certification, clear labelling and transparency about where ingredients come from and how they are processed.
- **Use social proof.** Referral offers, campus ambassadors, group trials and visible peer adoption are likely to work better than messages aimed at individual attitudes.
- **Price at parity.** With three in four respondents unwilling to pay a premium, upcycled products need to match the price of regular alternatives, at least at entry.
- **Explain the concept.** Half of the respondents did not know the term “upcycled food”, so packaging and campaigns should say plainly what it means.
- **Do not rely on environmental messaging alone.** Concern about food waste was high but did not shape attitudes, so taste, quality and safety should lead the message.

6.4 Limitations and future research

The findings are preliminary and have several limitations. First, the sample of 44 is small, so only large effects could be detected and the non-significant paths are inconclusive. Second, the sample was a convenience sample dominated by male students from North India, which limits generalisation to Indian Gen Z as a whole. Third, perceived behavioural control was excluded because its items were revised during data collection, so the full Theory of Planned Behaviour was not tested. Fourth, eight straight-lining responses were removed without a formal attention check. Fifth, discriminant validity between subjective norm and trust was

marginal, and two full collinearity VIFs exceeded 3.3, so some common method variance is possible. Finally, the study measured intention and not actual purchase.

Future research should test the model on a larger and more balanced sample of at least 200 respondents, include perceived behavioural control with validated items, compare students with working respondents and men with women, and track actual purchases of upcycled products.

7. Conclusion

Upcycled food offers a practical way to reduce food waste, and its growth depends on young consumers. In this preliminary study of 44 Indian Gen Z respondents, intention to buy upcycled food depended mainly on the approval of friends and family, and attitudes depended mainly on trust in the startups that make these products. Favourable attitudes and high environmental concern were not enough on their own, and most respondents were unwilling to pay a premium. For zero-waste food startups, the path to this generation runs through credibility, social proof and fair pricing. A larger study is needed to confirm these patterns.

Reference

1. Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
2. Aschemann-Witzel, J., Asioli, D., Banovic, M., Perito, M. A., Peschel, A. O., & Stancu, V. (2023). Defining upcycled food: The dual role of upcycling in reducing food loss and waste. *Trends in Food Science & Technology*, 132, 132–137. <https://doi.org/10.1016/j.tifs.2023.01.001>
3. Bangar, S. P., Chaudhary, V., Kajla, P., Balakrishnan, G., & Phimolsiripol, Y. (2024). Strategies for upcycling food waste in the food production and supply chain. *Trends in Food Science & Technology*, 143, Article 104314. <https://doi.org/10.1016/j.tifs.2023.104314>
4. Berkeley Business Review. (2025, June 13). Waste not, want not: A circular food economy. <https://businessreview.studentorg.berkeley.edu/waste-not-want-not-a-circular-food-economy/>
5. Cattaneo, C., Lavelli, V., Proserpio, C., Laureati, M., & Pagliarini, E. (2019). Consumers' attitude towards food by-

- products: The influence of food technology neophobia, education and information. *International Journal of Food Science & Technology*, 54(3), 679–687. <https://doi.org/10.1111/ijfs.13978>
6. Cela, N., Giorgione, V., Fassio, F., & Torri, L. (2024). Impact of circular economy information on sensory acceptability, purchase intention and perceived value of upcycled foods by young consumers. *Food Research International*, 175, Article 113765. <https://doi.org/10.1016/j.foodres.2023.113765>
 7. Chen, H. S., & Chao, C. T. (2025). Solutions to food waste: Investigating Taiwanese consumer attitudes and behavioral drivers toward upcycled food. *British Food Journal*, 127, 971–989. <https://doi.org/10.1108/BFJ-07-2024-0680>
 8. Chiaraluce, G., Bentivoglio, D., Del Conte, A., Lucas, M. R., & Finco, A. (2024). The second life of food by-products: Consumers' intention to purchase and willingness to pay for an upcycled pizza. *Cleaner and Responsible Consumption*, 14, Article 100198. <https://doi.org/10.1016/j.clrc.2024.100198>
 9. Coderoni, S., & 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*, 252, Article 119870. <https://doi.org/10.1016/j.jclepro.2019.119870>
 10. Coderoni, S., & 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*, 126, 283–290. <https://doi.org/10.1016/j.wasman.2021.03.018>
 11. D'Souza, C., Mancuso Tradenta, J. C., Marimuthu, M., Fleming-Muñoz, D., & O'Keefe, S. (2025). The upcycled appetite: Exploring intentions behind choosing food waste-based functional products and food neophobia. *British Food Journal*, 127, 760–780. <https://doi.org/10.1108/BFJ-04-2025-0517>
 12. Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39–50. <https://doi.org/10.1177/002224378101800104>
 13. Gan, W., Gao, S., Song, C., & Liu, Y. (2026). Investigating the mechanisms influencing consumers' purchase intention toward upcycled foods: An integration of the value–attitude–behavior framework and the theory of planned behavior. *Frontiers in Sustainable Food Systems*, 10, Article 1825648. <https://doi.org/10.3389/fsufs.2026.1825648>
 14. Gatto, A., & Chepeliev, M. (2024). Global food loss and waste estimates show increasing nutritional and environmental pressures. *Nature Food*, 5, 136–147. <https://doi.org/10.1038/s43016-023-00915-6>
 15. Gomes, S., Lopes, J. M., & Nogueira, S. (2023). Willingness to pay more for green products: A critical challenge for Gen Z. *Journal of Cleaner Production*, 390, Article 136092. <https://doi.org/10.1016/j.jclepro.2023.136092>
 16. Grasso, S., & Asioli, D. (2020). Consumer preferences for upcycled ingredients: A case study with biscuits. *Food Quality and Preference*, 84, Article 103951. <https://doi.org/10.1016/j.foodqual.2020.103951>
 17. Grasso, S., Fu, R., Goodman-Smith, F., Lalor, F., & Crofton, E. (2023). Consumer attitudes to upcycled foods in US and China. *Journal of Cleaner Production*, 388, Article 135919. <https://doi.org/10.1016/j.jclepro.2023.135919>
 18. Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, 31(1), 2–24. <https://doi.org/10.1108/EBR-11-2018-0203>
 19. Hellali, W., & Korai, B. (2023). Understanding consumer's acceptability of the technology behind upcycled foods: An application of the technology acceptance model. *Food Quality and Preference*, 110, Article 104943. <https://doi.org/10.1016/j.foodqual.2023.104943>
 20. Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43(1),

- 115–135.
<https://doi.org/10.1007/s11747-014-0403-8>
21. Institute of Food Technologists. (2026, April 7). Building circularity into the supply chain. Food Technology. <https://www.ift.org/food-technology-magazine/building-circularity-into-the-supply-chain>
 22. Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of e-Collaboration*, 11(4), 1–10. <https://doi.org/10.4018/ijec.2015100101>
 23. Kock, N., & Hadaya, P. (2018). Minimum sample size estimation in PLS-SEM: The inverse square root and gamma-exponential methods. *Information Systems Journal*, 28(1), 227–261. <https://doi.org/10.1111/isj.12131>
 24. Lu, P., Parrella, J. A., Xu, Z., & Kogut, A. (2024). A scoping review of the literature examining consumer acceptance of upcycled foods. *Food Quality and Preference*, 114, Article 105098. <https://doi.org/10.1016/j.foodqual.2023.105098>
 25. Paul, J., Modi, A., & Patel, J. (2016). Predicting green product consumption using theory of planned behavior and reasoned action. *Journal of Retailing and Consumer Services*, 29, 123–134. <https://doi.org/10.1016/j.jretconser.2015.11.006>
 26. Perito, M. A., Coderoni, S., & Russo, C. (2020). Consumer attitudes towards local and organic food with upcycled ingredients: An Italian case study for olive leaves. *Foods*, 9(9), Article 1325. <https://doi.org/10.3390/foods9091325>
 27. Peschel, A. O., & Aschemann-Witzel, J. (2020). Sell more for less or less for more? The role of transparency in consumer response to upcycled food products. *Journal of Cleaner Production*, 273, Article 122884. <https://doi.org/10.1016/j.jclepro.2020.122884>
 28. Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879–903. <https://doi.org/10.1037/0021-9010.88.5.879>
 29. Qi, X., Li, M., Chen, J., Zhan, G., & Niu, L. (2025). What drives Generation Z to avoid food waste in China? An empirical investigation. *Foods*, 14(2), Article 323. <https://doi.org/10.3390/foods14020323>
 30. Randall, T., Cousins, A. L., Neilson, L., Price, M., Hardman, C. A., & Wilkinson, L. L. (2024). Sustainable food consumption across Western and non-Western cultures: A scoping review considering the theory of planned behaviour. *Food Quality and Preference*, 114, Article 105086. <https://doi.org/10.1016/j.foodqual.2023.105086>
 31. Robichaud, Z., & Yu, H. (2022). Do young consumers care about ethical consumption? Modelling Gen Z's purchase intention towards fair trade coffee. *British Food Journal*, 124, 2740–2760. <https://doi.org/10.1108/BFJ-05-2021-0536>
 32. Salková, D., Maierová, O., Stanislavská, L. K., & Pilar, L. (2023). The relationship between “zero waste” and food: Insights from social media trends. *Foods*, 12(17), Article 3280. <https://doi.org/10.3390/foods12173280>
 33. Singh, A., & Verma, P. (2017). Factors influencing Indian consumers' actual buying behaviour towards organic food products. *Journal of Cleaner Production*, 167, 473–483. <https://doi.org/10.1016/j.jclepro.2017.08.106>
 34. Tamasiga, P., Miri, T., Onyeaka, H., & Hart, A. (2022). Food waste and circular economy: Challenges and opportunities. *Sustainability*, 14(16), Article 9896. <https://doi.org/10.3390/su14169896>
 35. United Nations Environment Programme. (2024). Food waste index report 2024. Think eat save: Tracking progress to halve global food waste. <https://www.unep.org/resources/publication/food-waste-index-report-2024>
 36. Upcycled Food Definition Task Force. (2020). Defining upcycled foods: A definition and standards for use across industry, government, and academia. Harvard Law School Food Law and Policy Clinic. https://chlp.org/wp-content/uploads/2013/12/Upcycled-Food_Definition.pdf
 37. Van Opstal, W., & Borms, L. (2023). Startups and circular economy strategies: Profile differences, barriers and enablers. *Journal of Cleaner Production*, 396, Article 136510. <https://doi.org/10.1016/j.jclepro.2023.136510>

- 6510
38. Vermeir, I., & Verbeke, W. (2006). Sustainable food consumption: Exploring the consumer "attitude-behavioral intention" gap. *Journal of Agricultural and Environmental Ethics*, 19(2), 169–194. <https://doi.org/10.1007/s10806-005-5485-3>
39. Wu, Y., Yang, S., & Liu, D. (2023). The effect of social media influencer marketing on sustainable food purchase: Perspectives from multi-group SEM and ANN analysis. *Journal of Cleaner Production*, 416, Article 137890. <https://doi.org/10.1016/j.jclepro.2023.137890>
40. Xie, S., & Madni, G. R. (2023). Impact of social media on young generation's green consumption behavior through subjective norms and perceived green value. *Sustainability*, 15(4), Article 3739. <https://doi.org/10.3390/su15043739>
41. Yadav, R., & Pathak, G. S. (2016). Young consumers' intention towards buying green products in a developing nation: Extending the theory of planned behavior. *Journal of Cleaner Production*, 135, 732–739. <https://doi.org/10.1016/j.jclepro.2016.06.120>
42. Zaman, Q. U., Cei, L., Rossetto, L., Thiene, M., & Bedin, B. (2026). Analysing the drivers of consumers' attitudes and intention to buy upcycled food products: An application extending the theory of planned behaviour. *British Food Journal*, 128(13), 249–262. <https://doi.org/10.1108/BFJ-09-2025-1167>