Environment, Development and Sustainability
https://doi.org/10.1007/s10668-024-04466-z

Extending the theory of planned behaviour to predict sustainable food consumption

Bhavana Arya[1] · **Shiromi Chaturvedi**[1] · **Narender Singh Bhati**[1]

Received: 29 December 2023 / Accepted: 30 December 2023

Abstract
Promoting sustainable food consumption (SFC) involves prioritizing long-term health for individuals, communities, and the environment. This means considering social and economic impacts to create a healthier food system for future generations. Using the theory of planned behaviour as a foundation, we extend it to encompass biospheric values (BV), egoistic values (EGV), hedonic values (HV), environmental concern (EC), and environmental identity (ID) via attitudes (ATT), subjective norms (SN) and perceived behavioural control (PBC). This research is crucial for understanding the factors shaping food consumption behaviour and providing insights for targeted interventions and sustainable food policies. The study collected data from 309 respondents from universities to test fifteen hypotheses related to sustainable food consumption behaviour. Purposive and snowball sampling method was used. Descriptive and inferential tests were run using SPSS v25. Data analysis involved hypotheses testing via structural equation modelling. The findings revealed that ATT, SN, and PBC played significant roles in shaping SFC behaviour. PBC was impacted by BV, EGV, HV, EC, and ID. ATT were influenced by EGV, HV, EC, and ID, with no notable impact from BV. SN were influenced by ID but not by EC. The study highlights that ATT, SN, and PBC play a pivotal role in shaping SFC among young Indians. This understanding can guide policymakers, researchers, and practitioners in crafting targeted interventions to promote sustainable food habits among youth, contributing to a more sustainable food system. Additionally, integrating a diverse set of values and concerns into behavioural theories is essential for a nuanced understanding and effective influence on sustainable behaviour.

Keywords Sustainability · Biospheric values · Hedonic values · Egoistic values · Environmental concern · Structural equation modelling

✉ Shiromi Chaturvedi
shiromichaturvedi@gmail.com

[1] Manipal University Jaipur, Jaipur, Rajasthan, India

Published online: 30 January 2024

1 Introduction

Environmental problems are anthropogenic as there is no denying that human effects on the environment are intensifying and have led to mass depletion and degradation (Steg & Vlek, 2009). While humans have always modified the natural environment to survive and thrive, overconsumption of resources, especially the current food system (Ammann et al., 2023), without thinking about their renewal has led to many environmental problems. The rise in global levels of consumption is not only seen as responsible for a host of environmental issues like climate change (Amberg & Fogarassy, 2019), rising levels of pollution (Patel et al., 2017) and loss of biodiversity (The Global Risks Report, 2021; Lepczyk et al., 2017), but they're additionally endangering people's quality of everyday life (Grabs et al., 2016). Governments throughout the world are under growing pressure to establish legislation controlling emissions and implementing environmental measures as greenhouse gas (GHG) emissions continue to rise (Abbasi & Erdebilli, 2023). Hence, understanding why people have different attitudes and behaviours towards the environment, and finding ways to persuade them to be more eco-friendly, are key goals in environmental research.

The ongoing environmental crisis has captured worldwide focus, and the concept of sustainable consumption is gaining more and more traction (Taufique & Vathianathan 2018). With the rise in environmental problems, recent years have also witnessed an increase in environmental consciousness among individuals (Fogarassy et al., 2018). Facing environmental issues like air pollution, water scarcity, and food safety highlights the negative impact of excessive consumption on the environment. Making sustainable choices is a key solution (Dabija et al., 2018).

The sustainability conversation emphasizes the need for a better understanding of consumer lifestyles and sustainable consumption. Research should promote the same. Many consumers now prioritize environmental protection in their purchases, contributing to the rise of sustainable choices (Awan et al., 2020). Studies have indicated that the average household's carbon footprint in particular, i.e. the amount of greenhouse gas emissions due to food consumption directly or indirectly, is between 10 and 30% approximately (Yadav & Pathak, 2017). According to the Sustainable Development Goals (SDG) "food security" as well as "sustainable agriculture" are two of the top concerns for the global sustainability agenda (Gürsoy, 2022; United Nations, 2019). Thus, it is imperative to study food consumption to attempt to mitigate environmental problems through individual food choices.

Food is an important aspect of our lifestyle; hence, food consumption patterns have a significant bearing on the environment. Since food consumption is responsible for 60% of greenhouse gas emissions, research on sustainable food consumption, or SFC, is only getting started (Ivanova et al., 2016). Food must "meet specific criteria, such as providing secure, healthy, and nutrient-rich diets for everyone", assert Gorgitano and Sodano (2014); agriculture "must be also able to support farmers, processors, and merchants, as well as guarantee animal welfare, environmental preservation, biodiversity preservation, conservation of energy, and waste minimization". Sustainable food is produced with the least amount of carbon emissions and natural resources (Vermeir & Verbeke, 2006), while including an increase in plant-based diets (Rosenlöw & Hansson, 2020; Wyker & Davison, 2010), insect-based diets (Menozzi et al., 2017) and reducing consumption of meat (Bryant et al., 2019).

Globally, dairy product and beef production contribute to 20% and 41% of emissions within this sector, while buffalo milk and meat follow with 8% of emissions (Gerber et al., 2013). Agriculture, as indicated by research on Greenhouse Gas Emissions from the Food

System (de Boer et al., 2013), is a substantial contributor, accounting for up to 30% of total global greenhouse gas emissions. Methane and nitrous oxide, released directly from farms, make up 10–12% of this total (Chen, 2019). With more than half of edible food thrown away without being eaten, food waste makes up more landfill space in the US than any other sort of garbage. Besides food waste, unsustainable food consumption patterns result from poorly thought-out food purchases and excessive meal preparation (Graham-Rowe et al., 2014; Moeti, 2023). Additional findings from these studies have demonstrated that consumer food purchase habits are the main cause of food deterioration (Gunders & Bloom, 2017).

Food preferences, choices, and habits play an important part in human civilizations beyond their basic function as a means of survival and are impacted by a number of elements, including availability, affordability, flavour, and convenience (Chen, 2019). Attention has turned to investigating sustainable practices in the food production chain and ways to integrate environmental awareness into the chain of supply for food in the past few years (Deprá et al., 2022). Food-related decisions are highly susceptible to contextual factors, and sustainability concerns must compete with factors such as benefit uncertainty (Fennell & Bowyer, 2020), unfavourable attitudes towards new dietary choices (Chan et al., 2014), and food habits (Flaherty et al., 2018). Thus, it is not unexpected that there is a significant attitude-action gap in SFC (Aschemann-Witzel & Zielke, 2017). Hence, it is imperative to investigate the factors responsible for shaping individuals' intentions and decision-making concerning food consumption.

With consumer culture at an all-time high and India's economy expanding, there is an increasing need for both indigenous and imported items. According to the Third Advance Estimates for 2019–20, the nation's total food grain production was predicted to reach a record 295.67 million tonnes. To fulfil the demands of the expanding population, there has also been a significant increase in the production of rice, wheat, and nutritive/coarse cereals. According to Grossi et al. (2019), cattle emissions account for 14.5% of all anthropogenic greenhouse gas emissions, suggesting that this industry plays a major role in climate change. No studies have studied SFC practices in the Indian setting thus far. Since food choices are closely related to culture and availability of food, the behaviour cannot be generalized across cultures. Consequently, the current study uses an expanded form of the theory of planned behaviour (TPB) to examine the determinants driving SFC behaviour among adult Indians.

Several theories have already been extended to explain sustainability-related behaviours. The attitudes-facilitators-infrastructure (AFI) framework is a helpful conceptual model of transformation presented by Akenji (2014). According to AFI, transformation towards sustainability depends upon favourable attitudes among all stakeholders (formed by values and knowledge), and facilitators to help attitudes become actions and sustainable infrastructure. A further noteworthy illustration of a framework for comprehending the value-belief-norm (VBN) model (Stern et al., 1999). Consumer behaviour is explained by VBN as a result of norms, values, and beliefs in combination with the norm activation model (NAM), explaining why environmentally oriented behaviour occurs (Schwartz, 1990).

The TPB developed by Ajzen and Fishbein (1975) has been extensively employed for investigating behavioural intention and decision-making in behavioural science and psychological research. The TPB is gaining popularity in environmental research, showing its ability to predict and influence individual behaviour (Ding et al., 2018) while also enhancing social and environmental sustainability (Li et al., 2019; Steg & Vlek, 2009). Recent research, like D'Souza (2022) examining game meat as a sustainable alternative to conventional meats and Begum et al. (2022) studying factors affecting how marine fishermen

adapt to climate change, has used TPB in sustainable food studies. The TPB stands out as a highly influential theory in social psychology, offering predictive capabilities to understand factors influencing individual decision-making (Yuzhanin & Fisher, 2016). In the field of environmental behaviour, TPB has thus become crucial for predicting and encouraging various pro-environmental actions and is thus being used in the current research (Klöckner, 2013; Li et al., 2019).

2 Research gap

Despite prior research expanding TPB applications in analysing intent and use of eco-friendly items, the literature lacks a detailed exploration of how cognitive factors like EC, BV, EGV and ID influence the use of sustainable food products. Ajzen (2020) suggests TPB can include new predictors, improving prediction. Studies by Perugini and Bagozzi (2001) and Yadav and Pathak (2016) extended TPB in Italy and India, exploring different factors. According to Dunn et al. (2011), the theory's predictive power diminishes, especially in the context of intricate behaviours, like making dietary choices (Paul et al., 2016). Thus, by adding more variables, researchers have expanded TPB's predictive potential. Contini et al. (2020) studied a multi-component TPB model to confirm how control variables like cooking skills, product accessibility, finances, time constraints, and the desire for healthy eating influence SFC. According to Nguyen et al. (2019), there is a strong link between intention and ATT, SN, and PBC. The concept also considers cultural, financial, and information technology support as moderators.

The current research utilizes TPB as the base model (Fig. 1) as the theory provides a methodical approach to conceptualize the determinants of behaviour (Cekmez et al., 2015). The model was expanded by adding biospheric values (BV), hedonistic values (HV), egoistic values (EGV), environmental concern (EC) and environmental self-identity (ID) to it. This was done since the existing research demonstrates that EC strongly predicts pro-environmental conduct (Dunlap & Jones, 2002) and that adding EC to TPB enhances its

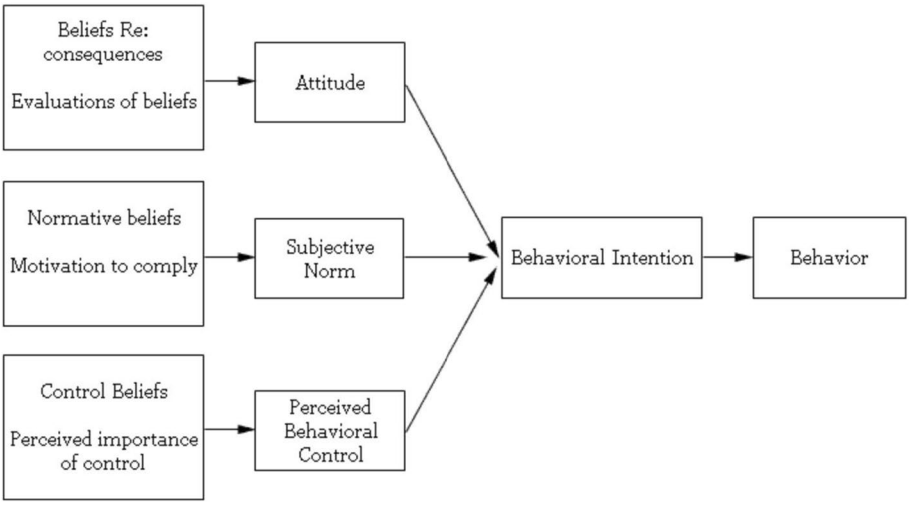

Fig. 1 TPB (Dillon & Morris, 1996)

predictive power (Donald et al., 2014). Current literature also suggests that values have a significant influence on our decision-making capacity (Kollmuss & Agyeman, 2002) by shaping our ATT and encouraging us to act in ways that are consistent with them (Schwartz & Bilsky, 1987). Thus, this justifies the addition of the three types of values to the existing model. Lastly, ideas from social identity theory were responsible for the addition of environmental self-identification (Tajfel & Turner, 1982). Social identity profoundly influences behaviour as individuals adopt group norms, shaping perspectives and actions (Conner & Armitage, 1998; Terry et al., 2008). Additionally, studies reveal that, in addition to TPB characteristics, the norms of relevant communities also strongly influence a variety of environmentally friendly actions such as recycling (Terry & Hogg, 1996) and water conservation (Menozzi & Mora, 2012) which are not included in the TPB framework. Building on past research, this study extends the TPB with values, environmental concern (EC), and identity (ID) to predict SFC behaviour. This extension enriches our understanding of the intricate interplay between various behavioural determinants. This study further underscores the importance of integrating EC into behavioural models, acknowledging its influence on pro-environmental actions. The incorporation of ID, in line with social identity theory, highlights the role of group norms. It enhances TPB's predictive capacity, enabling a more inclusive assessment of the factors influencing SFC among individuals.

3 Theoretical background and hypotheses development

The present study employs TPB as the foundational model, expanding it with the incorporation of EC, BV, EGV, HV, and ID. Figure 2 depicts the schematic representation of this conceptual framework.

3.1 TPB

Ajzen created and initially used TPB, which suggests that individual actions stem from behavioural intentions categorized as attitude (ATT), subjective norms (SN), and perceived behavioural control (PBC). TPB holds that the intention of someone is largely determined by their

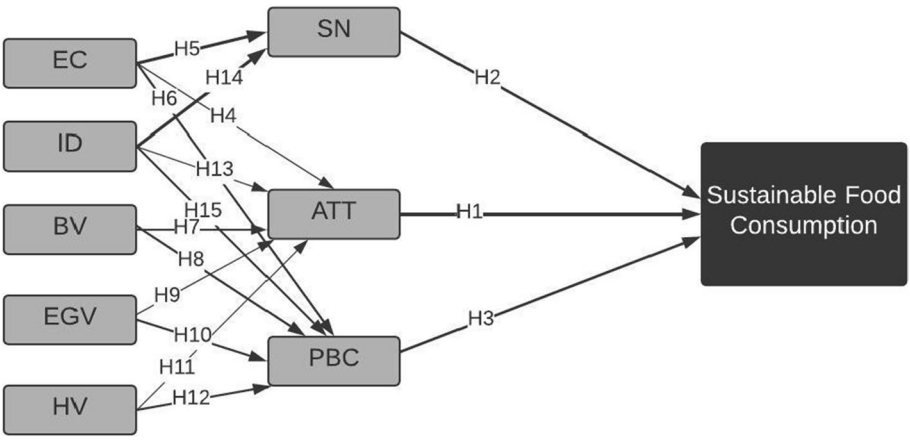

Fig. 2 TPB expansion: conceptual model

ATT and that an individual's desire to participate in behaviour impacts how probable it is that it will occur. Important attitudes impacting intentions within the TPB include the perceived attractiveness of the outcome (personal desirability), the reference group's acceptance of the findings, and the behaviour's feasibility (PBC) (Ajzen, 1991; Jäkel, 2020).

TPB has been widely used and extended in studies to understand various voluntary actions (for reviews, see, e.g. Conner & Armitage, 1998; Cook et al., 2002). TPB investigates how consumers' willingness to purchase green products is influenced by ATT, SN, and PBC (Hsu et al., 2017; Kim et al., 2013; Sun & Willson, 2008). Due to its flexibility, TPB (and its various extended versions) are useful in examining consumer intentions in diverse settings, such as purchasing green products (Chen & Deng, 2016), to use public transport (Chiou et al., 2013), to avoid food waste (Mak et al., 2018), and to study the future of SFC in a country like China (Chu et al., 2023). Thus, the current study focuses on studying TPB about sustainable food consumption and proposes the following hypotheses:

Hypothesis 1 (H1) ATT have a positive influence on SFC.

Hypothesis 2 (H2) SN have a positive influence on SFC.

Hypothesis 3 (H3). PBC has a positive influence on SFC.

Previous research opens further new avenues for research into sustainable consumption. The current study expands TPB by introducing new constructs (refer to Fig. 2). These additions consider influences on intention and subsequent SFC behaviour.

3.2 Environmental concern (EC)

According to Crosby et al. (1981), environmental concern is a "strong attitude to conserve the environment" and is linked to environmentally friendly behaviour (Lin & Huang, 2012). In predicting eco-friendly purchase intent, EC is a key cognitive factor (Jaiswal & Kant, 2018). According to Grunert and Juhl (1995), people with environment-friendly ATT are more likely to buy organic foods since there is a strong association between their purchasing habits and their environmental opinions (Vermeir & Verbeke, 2006). A study by Tanner and Kast (2003), elucidates that spending more on environmentally friendly items is more common among customers who appreciate the environment. A study by Borusiaket al. (2021) also found that EC has a positive impact on ATT, SN, and PBC over reducing bottled water consumption. Thus, the following research hypotheses are proposed for EC:

Hypothesis 4 (H4) EC has a positive influence on ATT towards SFC.

Hypothesis 5 (H5) EC has a positive influence on SN towards SFC.

Hypothesis 6 (H6) EC has a positive influence on PBC towards SFC.

3.3 Values

Various environmental ideas and behaviours are significantly influenced by personal values. Burgess (1992) states that consumer decision-making processes, such as the selection

of brands and sustainable products, may be significantly influenced by values. Steg and DeGroot (2012) have worked extensively on explaining the impact of values on pro-environmental behaviour. Numerous research studies (Finegan, 1994; Fritzsche, 1995; Thogersen, 2001) have further connected ethical or sustainable behaviour to personal beliefs. Environmental views and actions are said to be influenced by four human values: biospheric values (BV) which can be understood as a general sense of care for the environment, altruistic values (AV) that imply concern for others, egoistic values (EGV) that are understood as concern for one's resources, and lastly hedonistic values (HV), i.e. concern for pleasure and comfort. For this study, the focus is on biospheric, egoistic and hedonistic values.

3.3.1 Biospheric values (BV)

Research indicates a clear connection between pro-environmental activity and BV. Studies have shown a substantial and constant correlation between BV and environmental choices, intents, and behaviour. Higher BV is linked to more pro-environmental intentions and choices in addition to environmentally friendly attitudes and actions (Steg & De Groot, 2012). A study by McGuicken and Palomo-Velez (2021) investigated whether individuals are more inclined to consume sustainable food products predicated on their BV. The findings showed that people who strongly endorsed BV had a more favourable opinion of sustainable food products. It has been demonstrated that BV are associated with a number of pro-environmental choices and behaviours, such as consuming sustainably grown food. (Thøgersen & Ölander, 2002). Thus, the following hypotheses were formulated, for this research concerning BV:

Hypothesis 7 (H7) BV have a positive influence on ATT towards SFC.

Hypothesis 8 (H8) BV have a positive influence on PBC towards SFC.

3.3.2 Egoistic values (EGV)

Values, as previously discussed, direct attention and impact how individuals assess the repercussions of decisions, which in turn shapes their preferences and decisions. EGV emphasize power or accomplishment, as well as the costs and advantages a decision has on someone's resources. Thus, people view individual costs and advantages of alternatives to be more significant the more firmly they support egoistic beliefs, i.e. are high on EGV. It is noteworthy that values affect how people evaluate the repercussions of their actions as well as the outcomes they are likely to take into account when making judgements. Those firmly supporting BV, for instance, are more conscious of and worried about environmental issues brought on by their activity, whereas those who strongly support EGV are the exact opposite (Nordlund & Garvill, 2002; Steg 2015; Steg et al. 2015; Stern, 1995). Therefore, the following hypotheses are proposed for EGV:

Hypothesis 9 (H9) EGV have a negative influence on ATT towards SFC.

Hypothesis 10 (H10) EGV have a negative influence on PBC towards SFC.

3.3.3 Hedonic values (HV)

HV emphasize getting pleasure, experiencing good things, and exerting as little effort as possible. Since they are typically perceived as being laborious (such as using public transit instead of a car), uncomfortable (such as turning down the heat), or expensive (Venhoeven et al., 2013), many environmental activities are linked to egoistic and hedonic costs. Thus, those who passionately uphold egoistic or hedonistic ideals are often less likely to take action to protect the environment and have fewer strong pro-environmental convictions. According to a study in Pakistan (Mazhar et al., 2022), views on green products are significantly influenced by BV, EGV, and HV. Thus, the hypotheses stated below were formulated with HV for the current study:

Hypothesis 11 (H11) HV have a negative influence on ATT towards SFC.

Hypothesis 12 (H12) HV have a negative influence on PBC towards SFC.

3.3.4 Environmental self-identity (ID)

In related research (Whitmarsh & O'Neill, 2010), the role of self-identities in people's sustainable consumption practices has been investigated. According to the self-identity theory (Bem, 1967),

a person acts on his own and others' expectations of him." This is consistent with models of self-perception. A person's environmental choices, goals, and actions may be significantly influenced by his sense of self (Whitmarshand & O'Neill, 2010). Several research studies in Western countries have demonstrated that ID is crucial for predicting environmental preferences, intentions, and behaviour (Gaterslebenet al., 2014; Sparks & Shepherd, 1992). However, limited research in the Asian continent, especially India, focused on this theme so far. Therefore, this research has added ID to study its impact through the following hypotheses:

Hypothesis 13 (H13) ID has a positive influence on ATT towards SFC.

Hypothesis 14 (H14) ID has a positive influence on SN towards SFC.

Hypothesis 15 (H15) ID has a positive influence on PBC towards SFC.

4 Research methodology

The current study draws upon the positivism approach based on the hypothetical-deductive paradigm. Quantitative methods are used to test the proposed hypotheses and validate causal-explanatory paths (Park et al., 2020).

4.1 Sample and data collection

The present study attempted to identify the factors influencing SFC among young people in India. The study was done within the proposed research framework (Fig. 3). The target population of the current research were university students above the age of 18 years. The concept of sustainable food consumption is a complex concept and difficult to comprehend by younger individuals (Maichum et al., 2016). Hence, the ideal age of the participants was at least 18 years. University students were particularly chosen because students are expected to understand the health benefits of food, but they lack insights into the relationship between environmental issues and food choices (Menozzi & Mora, 2012). The questionnaire was a structured instrument and before finalizing the instrument a pre-test was conducted to ensure that the items were consistent and valid. Feedback was obtained from experts in the field. The items were modified based on the findings of the pre-test. For the pilot test, the finalized items were administered to 40 students to assess the reliability of the questionnaire. The value for each construct was greater than 0.70 (Hair et al., 2010), showing that the instrument has good internal consistency and can be used for data collection.

According to the specifications by Nunnally (1967), the minimum sample required is 10 times the total number of items used to measure the constructs. Accordingly, the sample required was 310, as the study involved 9 constructs measured by a total of 31 items. To ensure a minimum sample size of 310, the final questionnaire was personally distributed to 500 participants using a purposive and snowball sampling approach. Both sampling approaches worked well in choosing participants who met the study's goals (Sharma et al., 2022). The research was announced to the target population through various student groups and voluntary participation was sought. Subjects recruited through this method were then requested to provide links to more respondents. Before the participation, the respondents

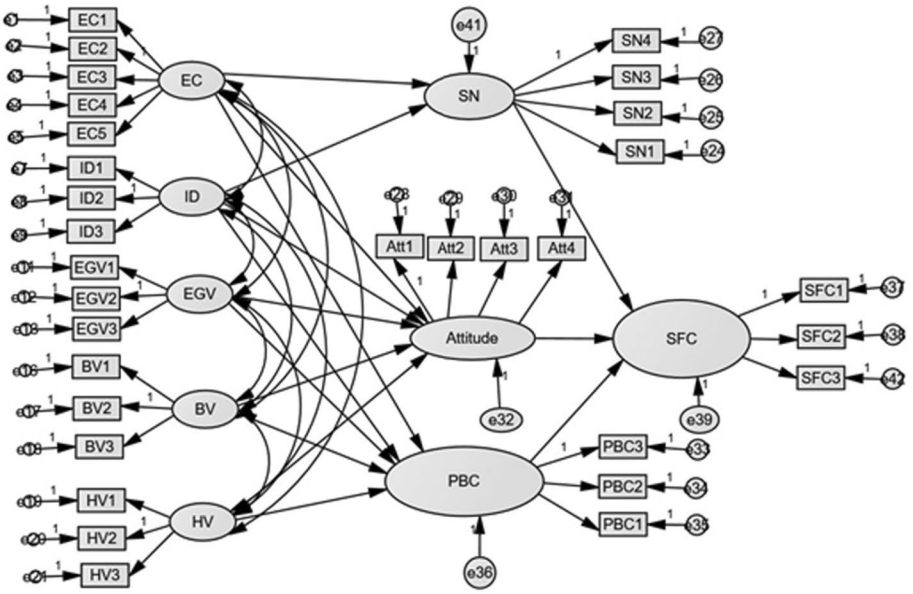

Fig. 3 SEM model

read the cover letter which informed them about the purpose of the research and provided consent to participate. Participation was voluntary and anonymous. Before the participants answered the questions, they were given the definition of sustainability ("development that meets the needs of the present without compromising the ability of future generations to meet their own needs" United Nations, 2019) and SFC (refer to Table 2). A total of 413 filled questionnaires were received between January and May 2022 by the researchers. After eliminating 46 responses due to invalid or missing data, the remaining 367 responses were checked for respondent alertness through a specific test item. 58 participants could not fulfil the criteria of attentiveness and failed to answer this item as instructed. The final sample ($n = 309$) comprised 41.74% females and 58.25% males (Table 1).

4.2 Survey instrument

The survey was completed through a structured questionnaire. The questionnaire had two sections. The first section collected information about demographics including sex, age, course, and education. The second section measured the nine constructs of the study. Five-point Likert scales were used to measure the constructs. Recommendations by Ajzen and Fishbein (1980) formed the basis of items measuring TPB constructs. The scales for ATT, SN, PBC, EC, ID and SFC were adapted from relevant research and existing literature (Arya & Chaturvedi, 2020). Measures of value were also drawn from past research. Values were measured in three dimensions: EGV and BV (Stern et al., 1999) as well as HV (Steg et al., (2014a, 2014b). All the items were adapted to suit the purpose of the current research (Table 2).

4.3 Data analysis techniques

The current research is reflective as constructs are causally related to the indicators. Data analysis for the current study utilized multivariate techniques. To check if sustainable food consumption could be predicted by the proposed extended version of TPB, a two-step analysis (Anderson & Gerbing, 1988) was done. Confirmatory factor analysis (CFA) was done in step 1 to determine the factor structure and the adequacy of the questionnaire to measure the constructs. CFA aims to establish the reliability and validity of the constructs. Structural Equation Modelling (SEM) was used in step 2 to test the hypotheses. Figure 3 shows

Table 1 Respondents' demographic information ($N = 305$)

Variables	Category	Frequency	Percentage
Sex	Male	180	58.25
	Female	129	41.74
Age	18–25 years	104	33.66
	26–35 years	125	40.45
	36–45 years	80	25.89
Educational qualification	SSC or below	42	13.59
	Under graduation	174	56.31
	Post-graduation	93	30.10
Occupation	Student	112	36.25
	Service	78	25.24
	Self-employed	53	17.15
	Homemaker	66	21.36

Table 2 Operational definitions and selected questionnaire items

Constructs	Operational Definition	Items selected	References
SFC	The use of food products "that respond to basic needs and bring a better quality of life while minimizing the use of natural resources, toxic materials and emissions of waste and pollutants over the life cycle, so as not to jeopardize the needs of future generations	SFC1, SFC2, SFC 3	(Conner et al., 2002; Kassem & Lee, 2004)
ATT	Positive or negative predisposition towards sustainable food consumption	ATT1, ATT2, ATT3, ATT4	Vermeir and Verbeke (2008); Tanner and Kast (2003)
SN	Beliefs whether people who are important in one's life approve of sustainable food consumption behaviour	SN1, SN2, SN3, SN4	Persson (2013); Alam and Sayuti (2011); Paul et al. (2016)
PBC	Perception of the individual about the ease of consuming sustainable food	PBC1, PBC2, PBC 3	Shiu et al. (2011); Paul et al. (2016)
EC	Individual's concern about the environmental condition	EC1, EC2, EC3, EC4, EC5	Yadav and Pathak (2016)
ID	The extent to which an individual perceives self as an environmentally friendly person	ID1, ID2, ID3	Neves and Oliveira (2021); Cook et al. 2002; Sparks and Shepherd 1992
EGV	Concern for power and social status	EGV1, EGV2, EGV3	Stern et al. (1999)
HV	Concern for personal enjoyment and pleasure	HV1, HV2, HV3	Steg et al. (2014a, 2014b)
BV	Concern for nature	BV1, BV2, BV3	Stern et al. (1999)

the proposed measurement and structural model. SEM provides a comprehensive means for testing theoretical models (Bentler, 1983). Based on recommendations by Kline (2011), structural models were established using overall fit indices. The indices used were chi-square, GFI (Goodness of the fit index), CFI (comparative fit indices), TLI (Tucker–Lewis index) and RMSEA (Root-mean-square error of approximation) (Hair et al., 2014). SPSS 25 was used to do the descriptive analysis. AMOS 23 was used to conduct CFA and SEM.

5 Results and findings

5.1 Measurement model

Before testing, we ensure measurement quality through CFA, reliability, and validity analyses.

5.2 CFA

The study used CFA to assess the construct validity. CFA is done to assess the validity of factors by calculating the factor loadings of each item (Asamoah et al., 2020). CFA assumes normality of distribution and linearity among constructs. Skewness values were less than ± 2, and kurtosis values were less than ± 4. We calculated factor loadings for all items and discarded those with values below the threshold of 0.6 (Henseler et al., 2009). Consequently, three items (one from the PBC scale, one from the attitude scale and another one from the SFC scale) were deleted. For the remaining items, all factor loadings exceeded 0.6 (Table 3) indicating good factor structure.

5.3 Reliability analysis

Nine constructs were measured using 31 items in a range from 1 to 5. To examine the internal consistency and reliability of the constructs, Cronbach's Alpha values and composite reliability (CR) values were used. Cronbach's alpha and CR values were all above 0.7, meeting the recommended standards set by Hair et al. (2010) and Nunnally (1994). Cronbach values ranged from 0.712 to 0.891 (Table 3) and CR values ranged from 0.704 to 0.901(Table 3). Thus, it can be inferred that the constructs have internal consistency and that all the factors were sufficiently associated with their constructs (Fornell & Larcker, 1981).

5.4 Validity analysis

Convergent validity was assessed using three conditions as given by Hair et al. (2014). Firstly, all factor loading values are greater than 0.6. Secondly, the obtained values of AVE are higher than 0.5. Thirdly, AVE is less than CR for all the constructs. As shown in Table 3, all conditions were fulfilled. Additionally, construct reliability was tested using the CR values. All CR values are greater than the recommended 0.7 (Nunnally, 1994). The table also shows the mean and SD values of all the constructs.

Discriminant validity confirms that each construct is independent of other constructs and each item is connected adequately with a suitable construct (Messick, 1997). Discriminant

Table 3 Model estimates and reliability

Constructs	Items	Factor weight	Mean	SD	Cronbach's alpha	CR	AVE	MSV
SFC	SFC1	0.951	3.51	0.71	0.883	0.704	0.554	0.353
	SFC2	0.852						
	SFC3	0.671						
ATT	Att1	0.777	3.10	1.17	0.863	0.887	0.662	0.402
	Att2	0.820						
	Att3	0.830						
	Att4	0.830						
SN	SN1	0.681	3.43	0.85	0.712	0.800	0.501	0.353
	SN2	0.776						
	SN3	0.672						
	SN4	0.700						
PBC	PBC1	0.883	3.35	1.04	0.846	0.901	0.754	0.436
	PBC2	0.798						
	PBC3	0.917						
EC	EC1	0.729	2.74	1.03	0.805	0.846	0.524	0.402
	EC2	0.704						
	EC3	0.744						
	EC4	0.726						
	EC5	0.719						
ID	ID1	0.783	3.16	1.10	0.817	0.845	0.645	0.778
	ID2	0.842						
	ID3	0.761						
EGV	EGV1	0.739	2.39	1.02	0.795	0.846	0.647	0.253
	EGV2	0.846						
	EGV3	0.821						
HV	HV1	0.687	3.21	0.91	0.822	0.782	0.545	0.778
	HV2	0.773						
	HV3	0.740						
BV	BV1	0.808	3.25	1.00	0.860	0.880	0.711	0.436
	BV2	0.902						
	BV3	0.817						

validity was assessed using criteria from Fornell and Larcker (1981). All factor loadings (0.672–0.917) and AVE values for constructs (ranging from 0.501 to 0.754) met the specified standards (were > 0.5; surpassed maximum shared variance, and the square root of AVE represented in bold surpassed inter-factor correlation between variables) as shown in Table 4.

5.5 Measurement model of the study

AMOS version 23 was used to assess the goodness of fit of the measurement model. The overall chi-square value was significant ($\chi^2 = 638.422$; df = 398; CMIN/df = 1.604 $p < 0.000$). CFI was recorded as 0.955, GFI was recorded as 0.955, and TLI was recorded

Table 4 Discriminant validity

	PBC	EC	ID	EGV	BV	HV	SN	Attitude	SFC
PBC	**0.868**								
EC	−0.314	**0.724**							
ID	0.019	0.600	**0.803**						
EGV	0.435	0.041	0.311	**0.805**					
BV	−0.047	0.572	0.621	0.386	**0.738**				
HV	0.660	−0.345	−0.064	0.503	−0.057	**0.843**			
SN	0.522	0.212	0.301	0.154	0.227	0.220	**0.708**		
Attitude	0.051	0.634	0.583	0.366	0.595	−0.146	0.434	**0.814**	
SFC	0.420	0.162	0.241	0.261	0.218	0.351	0.594	0.468	**0.744**

as 0.947. The model achieved a good fit as the values of CFI, GFI and TLI were above the recommended value of 0.9 (Anderson & Gerbing, 1988; Hair et al., 2010). RMSEA was obtained as 0.045, which is less than the recommended 0.7 and hence suggests a good model fit (Steiger, 1980). Table 5 shows the model fit indices of the measurement model. The measurement model output confirms the validity and appropriateness of the overall approach to measuring SFC behaviour.

5.6 Structural equation modelling and hypothesis testing

After establishing the reliability and validity of the scales and appropriateness of the measurement model, SEM was used to assess the proposed model to predict SFC behaviour among young people. AMOS version 23.0 was used to test hypotheses and evaluate the model fit, involving 15 paths to examine causal relationships among the 9 constructs. The fit indices for the structural model met acceptable standards (Table 5). The overall chi-square value was significant ($\chi^2 = 792.577$; d$f = 409$; CMIN/d$f = 1.938$ $p < 0.000$). CFI was recorded as 0.928, GFI was recorded as 0.929, and TLI was recorded as 0.918. All indicators show that the structural model fits well with the data. The RMSEA is 0.055, which is below the recommended 0.7, indicating a good fit (Steiger, 1980).

SEM was also used to test the hypotheses. The indices used were path coefficient (β) values, critical ratio (CR) and p values. Results are shown in Table 6. According to the structural path coefficients, H5 and H7 were not supported. All other hypotheses were supported by results. ATT, SN and PBC had a significant positive impact on SFC, indicating that changes in these variables significantly predicted attitude towards sustainable food consumption patterns.

Table 5 Model fit statistics measurement model fit output

Statistics	χ^2	DF	CMIN/DF	CFI	IFI	TLI	RMSEA
Measurement model	638.422	398	1.604	.955	.955	.947	.045
Structural model	792.577	409	1.938	.928	.929	.918	.055
Recommended value			≤3	>0.90	>0.90	>0.90	<0.07
References	(Hu & Bentler, 1999; Steiger, 2007; Tabachnick et al., 2007; Kline, 1998; Bentler & Bonett, 1980)						

Table 6 Hypotheses testing results

Hypothesis	Paths	SEM output			Results
		Standardized β	C.R. (t value)	P value	
H_1	ATT → SFC	.251	5.938	< 0.01	Supported
H_2	SN → SFC	.368	5.692	< 0.01	Supported
H_3	PBC → SFC	.232	5.642	< 0.01	Supported
H_4	EC → ATT	.468	4.958	< 0.01	Supported
H_5	EC → SN	− .030	.423	> 0.05	Not supported
H_6	EC → PBC	− .236	2.533	< 0.05	Supported
H_7	BV → ATT	− .272	1.247	> 0.05	Not supported
H_8	BV → PBC	− .706	2.637	< 0.01	Supported
H_9	HV → ATT	− .193	2.383	< 0.05	Supported
H_{10}	HV → PBC	.489	5.661	< 0.01	Supported
H_{11}	EGV → ATT	.431	4.836	< 0.01	Supported
H_{12}	EGV → PBC	.269	2.968	< 0.01	Supported
H_{13}	ID → ATT	.435	2.454	< 0.05	Supported
H_{14}	ID → SN	.253	4.019	< 0.01	Supported
H_{15}	ID → PBC	.666	3.043	< 0.05	Supported

6 Discussion

The study aimed to explore psychological predictors of SFC behaviour by expanding the TPB with added constructs like values (BV, EGV and HV), EC and ID to get a better understanding of the outcome, i.e. SFC. The results clarify how the mentioned factors influence an individual's SFC. SEM tested the research hypotheses to reveal that EC, ID, and BV positively influence SFC, while EGV and HV have a negative influence on SFC. Interestingly, BV were found to have no significant influence on ATT about SFC and EC was also found to have no significant influence on SN regarding SFC.

Numerous studies have employed the TPB to demonstrate that ATT, SN, and PBC are important variables that are linked to any pro-environmental behaviour (Ajzen, 1991; Ajzen & Fishbein, 1980; Stern, 2000) including some that specifically link the theory to SFC (Sparks & Shepherd, 1992; Vermeir & Verbeke, 2006). The current study supports previous studies and finds that ATT (H1), SN (H2) and PBC (H3) have a positive influence on SFC, and thus, these variables can be used to predict it. Persson (2013) claimed that people's attitudes affect how they perceive and believe about the food they eat, and that attitudes are a major factor in influencing SFC. Various research studies (Beck & Ajzen, 1991; Fishbein et al., 1980; Robinson & Smith, 2002) further make the case that a group's social views are major predictors of the food categories they choose. As different groups establish and strengthen their belief system, SN may vary among different age segments of society. The results of this study thus demonstrate that SN have a favourable link with the SFC. Previous studies have also shown that higher PBC raises the probability that an individual would engage in the target activity (Paul et al., 2016) which holds good for SFC. The current study also found support for the same that PBC increases the likelihood of a consumer engaging in more sustainable eating. When individuals perceive greater control over SFC in terms of ease of availability, or possession of required knowledge, they show a greater likelihood of engaging in the behaviour.

Furthermore, this study found the positive influence of EC on ATT (H4) and on PBC (H6) towards SFC. However, EC did not have a significant influence on SN about SFC (H5). This finding is consistent with previous research by Zhu et al. (2013) and Wongsaichia et al. (2022) who have had similar conclusions in their investigation of these variables. It also supports the main findings of a study by Pais et al. (2023) which shows that consumers are more likely to choose more environmentally sustainable food if they are informed and environmentally conscious. Policymakers should thus concentrate on educating the public on the nature of food and how it affects society, rather than just providing information.

Additionally, the study demonstrated that ID has a positive influence on ATT (H13), SN (H14), and PBC (H15) regarding SFC. Previous studies (Cook et al., 2002; Qasimet al., 2019) investigated whether ID might play a substantial mediating effect in the link between consumption ideals and people's behaviour while purchasing organic foods and found evidence for the same. The current study further validates their work that one's ID leads to more positive ATT, stronger social influence, and more PBC of SFC.

Moreover, the current study has also shown the impact of values on SFC. Firstly, BV were not found to have any significant influence on ATT towards SFC (H7), whereas EGV (H9) and HV (H11) significantly influenced SFC. This is inconsistent with the findings by De Groot and Steg (2007) which found that BV are typically more strongly associated with pro-environmental attitudes, norms, and behaviours. This can be justified based on a lack of knowledge about the environmental impact of food consumption patterns. However, all three types of values were found to influence PBC towards SFC. In this vein, BV (H8) were found to have a positive influence on PBC about SFC food consumption, whereas EGV (H10) and HV (H12) were found to have a negative influence. This supports past research by Stern et al. (1999) as well as Steg and De Groot (2012) who also found similar connections between these variables and other types of pro-environmental behaviour, which includes but is not limited to SFC. Research by Venhoeven et al. (2013) has also found that strong proponents of EGV or HV are often less likely to act sustainably and hold less ardent pro-environmental sentiments which are in line with the findings of the current research.

This study has found the positive influences of EC, ID, and BV on SFC, while EGV and HV have shown negative impacts. ATT, SN, and PBC also influenced SFC positively, aligning with prior TPB-based studies. EC positively affected ATT and PBC, but not SN. ID positively influenced ATT, SN, and PBC. While BV did not influence ATT, EGV and HV impacted SFC. BV, EGV, HV all impact PBC. Understanding values, EC, and ID predicts SFC through ATT, SN, and PBC. Insights for policymakers promoting sustainable eating align with past research confirming EC, ID, EGV, HV, and BV influence SFC through ATT, SN, and PBC.

7 Implications of the Study

7.1 Theoretical Implications of the Study

The researchers expanded the TPB to develop a more comprehensive model for understanding SFC in India. This involved integrating EC, ID, and various values (BV, EGV, HV) into the traditional TPB framework. The goal was to provide a nuanced and holistic understanding of factors influencing sustainable food consumption. This novel model goes

beyond the conventional TPB, recognizing the importance of additional psychological variables in shaping environmental behaviours.

This expansion facilitates a more robust exploration of the factors influencing sustainable food consumption, particularly in the unique socio-cultural and environmental context of India. The study has confirmed the relationship between EC and ATT as well as PBC regarding SFC but also identifies that EC does not impact SN regarding the same. This paves the way for further exploration and research. It has also been found that an important understudied factor that influences ATT, SN, and PBC about SFC is ID. It has further strengthened the positive and negative role of certain values in promoting or reducing SFC and how it can be understood in the light of this comprehensive framework.

7.2 Practical Implications of the Study

The study has the best implications for how interventions should be planned at an individual and group level to improve rates of SFC in the Indian context. It is important to assess levels of EC and then work towards enhancing the same through various mediums like advertising, subliminal cues, workshops, etc. This can be further strengthened by helping individuals build an ID from an early age through education and mentorship which will help them engage in more pro-environmental behaviour at large and specifically SFC. The packaging of green products and messaging around SFC needs to work towards all types of values – BV, EGV, and HV if we wish for more people to engage in the desired behaviour. Interestingly, even people high on EGV or HV can be primed to engage in SFC if only they can be shown the benefits in it for them both in the short term and the long run.

8 Study limitations and future researchs

In the Indian setting, this study is among the first of its sort. It still has some shortcomings, though, which open up new avenues for investigation. This study did not examine how user demographic factors like age, gender, and experience may influence the results. Future research can consider these factors as possible moderators to explore how they might affect the impact of the created framework. Another limitation is that it has studied only Indian university students so a broader and more diverse sample size may be beneficial in making the study more generalizable. Future studies may also examine other aspects of adopting SFC, including pricing and cost-effectiveness, availability, packaging, taste, and the influence of governmental subsidies on green food products, which were beyond the scope of the current study. To better comprehend the acceptance of SFC and its practical implementation in India and other contexts, future research should explore these concerns and build on the results of the current study.

Author contributions All authors contributed significantly to the preparation of the manuscript. BA contributed to Conceptualization, Methodology, Writing, Reviewing and Editing. SC contributed to Investigation, Writing, Reviewing, and Editing. NSB contributed to Data curation, Software, Validation.

Funding NA (This research received no specific grant from any funding agency in the public, commercial, or not-for-profit organization/s).

Material availability All material will be made available on request.

Declarations

Conflict of interest The authors declare no conflict of interest.

Ethical approval The research was conducted according to the ethical principles of Helsinki.

Consent to participate All participants provided consent to participate.

Consent for publication The authors provide consent to publish the paper as per the journal policies.

References

Abbasi, S., & Erdebilli, B. (2023). Green closed-loop supply chain networks' response to various carbon policies during COVID-19. *Sustainability, 15*(4), 3677.

Ajzen, I. (1991). The TPB. *Organizational Behavior and Human Decision Processes, 50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Ajzen, I. (2020). The theory of planned behavior: Frequently asked questions. *Human Behavior and Emerging Technologies, 2*(4), 314–324. https://doi.org/10.1002/hbe2.195

Ajzen, I., & Fishbein, M. (1975). A Bayesian analysis of attribution processes. *Psychological Bulletin, 82*(2), 261. https://doi.org/10.1037/h0076477

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall.

Akenji, L. (2014). Consumer scapegoatism and limits to green consumerism. *Journal of Cleaner Production, 63*, 13–23. https://doi.org/10.1016/j.jclepro.2013.05.022

Alam, S. S., & Sayuti, N. M. (2011). Applying the theory of planned behavior (TPB) in halal food purchasing. *International Journal of Commerce and Management, 21*(1), 8–20. https://doi.org/10.1108/10569211111111676

Amberg, N., & Fogarassy, C. (2019). Green consumer behavior in the cosmetics market. *Resources, 8*(3), 137. https://doi.org/10.3390/resources8030137

Ammann, J., Arbenz, A., Mack, G., Nemecek, T., & El Benni, N. (2023). A review on policy instruments for sustainable food consumption. *Sustainable Production and Consumption*. https://doi.org/10.1016/j.spc.2023.01.012

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin, 103*(3), 411. https://doi.org/10.1037/0033-2909.103.3.411

Arya, B., & Chaturvedi, S. (2020). Extending the theory of planned behaviour to explain energy saving behaviour. *Rigas Tehniskas Universitates Zinatniskie Raksti, 24*(1), 516–528. https://doi.org/10.2478/rtuect-2020-0032

Asamoah, J. K. K., Owusu, M. A., Jin, Z., Oduro, F. T., Abidemi, A., & Gyasi, E. O. (2020). Global stability and cost-effectiveness analysis of COVID-19 considering the impact of the environment: Using data from Ghana. *Chaos, Solitons & Fractals, 140*, 110103. https://doi.org/10.1016/j.chaos.2020.110103

Aschemann-Witzel, J., & Zielke, S. (2017). Can't buy me green? A review of consumer perceptions of and behavior toward the price of organic food. *Journal of Consumer Affairs, 51*(1), 211–251. https://doi.org/10.1111/joca.12092

Awan, A. B., Khan, M. N., Zubair, M., & Bellos, E. (2020). Commercial parabolic trough CSP plants: Research trends and technological advancements. *Solar Energy, 211*, 1422–1458. https://doi.org/10.1016/j.solener.2020.09.072

Beck, L., & Ajzen, I. (1991). Predicting dishonest actions using the theory of planned behavior. *Journal of Research in Personality, 25*(3), 285–301. https://doi.org/10.1016/0092-6566(91)90021-H

Begum, M., Masud, M. M., Alam, L., Mokhtar, M. B., & Amir, A. A. (2022). The adaptation behaviour of marine fishermen towards climate change and food security: An application of the theory of planned behaviour and health belief model. *Sustainability*, *14*(21), 14001. https://doi.org/10.3390/su142114001.

Bem, D. J. (1967). Self-perception: An alternative interpretation of cognitive dissonance phenomena. *Psychological Review, 74*(3), 183. https://doi.org/10.1037/h0024835

Bentler, P. M. (1983). Some contributions to efficient statistics in structural models: Specification and estimation of moment structures. *Psychometrika, 48*(4), 493–517. https://doi.org/10.1007/BF02293875

Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological bulletin, 88*(3), 588. https://doi.org/10.1037/0033-2909.88.3.588

Borusiak, B., Szymkowiak, A., Pierański, B., & Szalonka, K. (2021). The impact of environmental concern on intention to reduce consumption of single-use bottled water. *Energies, 14*(7), 1985. https://doi.org/10.3390/en14071985

Bryant, C., Szejda, K., Parekh, N., Deshpande, V., & Tse, B. (2019). A survey of consumer perceptions of plant-based and clean meat in the USA, India, and China. *Frontiers in Sustainable Food Systems*. https://doi.org/10.3389/fsufs.2019.00011

Burgess, S. M. (1992). Personal values and consumer research: An historical perspective. *Research in Marketing, 11*(1), 35–79.

Cekmez, Y., Öcal, D., Korkmaz, V., Sertoğlu, E., Ucar, Y., & Küçüközkan, T. (2015). The diagnostic role of vitamin D and cathelicidin levels in pelvic inflammatory disease. *Clinical Laboratory, 61*(12), 1871–1875. https://doi.org/10.7754/Clin.Lab.2015.150228

Chan, A. W., Song, F., Vickers, A., Jefferson, T., Dickersin, K., Gøtzsche, P. C., & Van Der Worp, H. B. (2014). Increasing value and reducing waste: addressing inaccessible research. *The Lancet, 383*(9913), 257–266. https://doi.org/10.1016/S0140-6736(13)62296-5

Chen, H. S. (2019). Environmental concerns and food consumption: What drives consumers' actions to reduce food waste? *Journal of International Food & Agribusiness Marketing, 31*(3), 273–292. https://doi.org/10.1080/08974438.2018.1520179

Chen, K., & Deng, T. (2016). Research on the green purchase intentions from the perspective of product knowledge. *Sustainability, 8*(9), 943. https://doi.org/10.3390/su8090943

Chu, M., Anders, S., Deng, Q., Contador, C. A., Cisternas, F., Caine, C., & Lam, H. M. (2023). The future of sustainable food consumption in China. *Food and Energy Security, 12*(2), e405. https://doi.org/10.1002/fes3.405

Chiou, Y. C., Lan, L. W., & Chang, K. L. (2013). Sustainable consumption, production and infrastructure construction for operating and planning intercity passenger transport systems. *Journal of Cleaner Production, 40*, 13–21. https://doi.org/10.1016/j.jclepro.2010.09.004

Conner, M., & Armitage, C. J. (1998). Extending the theory of planned behavior: A review and avenues for further research. *Journal of Applied Social Psychology, 28*(15), 1429–1464. https://doi.org/10.1111/j.1559-1816.1998.tb01685.x

Conner, M., Norman, P., & Bell, R. (2002). The theory of planned behavior and healthy eating. *Health psychology, 21*(2), 194. https://doi.org/10.1037/0278-6133.21.2.194

Contini, C., Boncinelli, F., Marone, E., Scozzafava, G., & Casini, L. (2020). Drivers of plant-based convenience foods consumption: Results of a multicomponent extension of the theory of planned behaviour. *Food Quality and Preference, 84*, 103931. https://doi.org/10.1016/j.foodqual.2020.103931

Cook, A. J., Kerr, G. N., & Moore, K. (2002). Attitudes and intentions towards purchasing GM Food. *Journal of Economic Psychology, 23*(5), 557–572. https://doi.org/10.1016/S0167-4870(02)00117-4

Crosby, L. A., Gill, J. D., & Taylor, J. R. (1981). Consumer/voter behavior in the passage of the Michigan container law. *Journal of Marketing, 45*(2), 19–32. https://doi.org/10.1177/002224298104500203

D'Souza, C. (2022). Game meats: Consumption values, theory of planned behaviour, and the moderating role of food neophobia/neophiliac behaviour. *Journal of Retailing and Consumer Services, 66*, 102953. https://doi.org/10.1016/j.jretconser.2022.102953

Dabija, D. C., Bejan, B. M., & Grant, D. B. (2018). The impact of consumer green behaviour on green loyalty among retail formats. *Moravian Geographical Reports*. https://doi.org/10.2478/mgr-2018-0014

de Boer, J., Schösler, H., & Boersema, J. J. (2013). Climate change and meat eating: An inconvenient couple? *Journal of Environmental Psychology, 33*, 1–8. https://doi.org/10.1016/j.jenvp.2012.09.001

De Groot, J., & Steg, L. (2007). General beliefs and the theory of planned behavior: The role of environmental concerns in the TPB. *Journal of Applied Social Psychology, 37*(8), 1817–1836. https://doi.org/10.1111/j.1559-1816.2007.00239.x

Deprá, M. C., Dias, R. R., Zepka, L. Q., & Jacob-Lopes, E. (2022). Building cleaner production: How to anchor sustainability in the food production chain? *Environmental Advances, 9*, 100295. https://doi.org/10.1016/j.envadv.2022.100295

Dillon, A., & Morris, M. G. (1996). User acceptance of new information technology: theories and models.

Ding, Z., Jiang, X., Liu, Z., Long, R., Xu, Z., & Cao, Q. (2018). Factors affecting low-carbon consumption behavior of urban residents: A comprehensive review. *Resources, Conservation and Recycling, 132*, 3–15. https://doi.org/10.1016/j.resconrec.2018.01.013

Donald, I. J., Cooper, S. R., & Conchie, S. M. (2014). An extended theory of planned behavior model of the psychological factors affecting commuters' transport mode use. *Journal of Environmental Psychology, 40*, 39–48. https://doi.org/10.1016/j.jenvp.2014.03.003

Dunlap, R. E., & Jones, R. E. (2002). Environmental concern: Conceptual and measurement issues. In R. E. Dunlap & W. Michelson (Eds.), *Handbook of environmental sociology* (pp. 482–524). Greenwood Press.

Dunn, K. I., Mohr, P., Wilson, C. J., & Wittert, G. A. (2011). Determinants of fast-food consumption. An application of the theory of planned behaviour. *Appetite, 57*(2), 349–357. https://doi.org/10.1016/j.appet.2011.06.004

Fennell, D. A., & Bowyer, E. (2020). Tourism and sustainable transformation: A discussion and application to tourism food consumption. *Tourism Recreation Research, 45*(1), 119–131. https://doi.org/10.1080/02508281.2019.1694757

Finegan, J. (1994). The impact of personal values on judgments of ethical behaviour in the workplace. *Journal of Business Ethics, 13*(9), 747–755. https://doi.org/10.1007/BF00881335

Fishbein, M., Jaccard, J., Davidson, A. R., Ajzen, I., & Loken, B. (1980). *Predicting and understanding family planning behaviors*. Prentice Hall.

Flaherty, K. M., Hughes, A. M., Teague, R., Simon, J. B., Andrews, S. M., & Wilner, D. J. (2018). Turbulence in the TW Hya disk. *The Astrophysical Journal, 856*(2), 117. https://doi.org/10.3847/1538-4357/aab615

Fogarassy, C., Nguyen, H. H., Oláh, J., & Popp, J. (2018). Transition management applications to accelerate sustainable food consumption–comparative analysis between Switzerland and Hungary. *Journal of International Studies*. https://doi.org/10.14254/2071-8330.2018/11-3/3

Fornell, C., & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. *Journal of Marketing Research*. https://doi.org/10.2307/3150980

Fritzsche, D. J. (1995). Personal values: potential keys to ethical decision making. *Journal of Business Ethics, 14*(11), 909–922. https://doi.org/10.1007/BF00882069

Gatersleben, B., Murtagh, N., & Abrahamse, W. (2014). Values, identity and pro-environmental behaviour. *Contemporary Social Science, 9*(4), 374–392. https://doi.org/10.1080/21582041.2012.682086

Gerber PJ, Steinfeld H, Henderson B, Mottet A, Opio C, Dijkman J, ... Tempio G (2013). Tackling climate change through livestock: a global assessment of emissions and mitigation opportunities. Food and Agriculture Organization of the United Nations (FAO).

Gorgitano, M. T., & Sodano, V. (2014). Sustainable food consumption: Concept and policies. *Calitatea, 15*(S1), 207.

Grabs, J., Langen, N., Maschkowski, G., & Schäpke, N. (2016). Understanding role models for change: A multilevel analysis of success factors of grassroots initiatives for sustainable consumption. *Journal of Cleaner Production, 134*, 98–111. https://doi.org/10.1016/j.jclepro.2015.10.061

Graham-Rowe, E., Jessop, D. C., & Sparks, P. (2014). Identifying motivations and barriers to minimising household food waste. *Resources, Conservation and Recycling, 84*, 15–23. https://doi.org/10.1016/j.resconrec.2013.12.005

Grossi, G., Goglio, P., Vitali, A., & Williams, A. G. (2019). Livestock and climate change: Impact of livestock on climate and mitigation strategies. *Animal Frontiers, 9*(1), 69–76. https://doi.org/10.1093/af/vfy034

Grunert, S. C., & Juhl, H. J. (1995). Values, environmental attitudes, and buying of organic foods. *Journal of Economic Psychology, 16*(1), 39–62. https://doi.org/10.1016/0167-4870(94)00034-8

Gunders D, Bloom J (2017). Wasted: How America is losing up to 40 percent of its food from farm to fork to landfill.

Gürsoy, S. İ. (2022). Food policy. *Applied food science* (pp. 85–98). Wageningen Academic Publishers. https://doi.org/10.3920/978-90-8686-933-6_5

Hair, J. F., Gabriel, M., & Patel, V. (2014). AMOS covariance-based structural equation modeling (CB-SEM): Guidelines on its application as a marketing research tool. *Brazilian Journal of Marketing*. https://doi.org/10.5585/remark.v13i2.2718

Hair, J. F., Ortinau, D. J., & Harrison, D. E. (2010). *Essentials of marketing research*. New York, NY: McGraw-Hill/Irwin.

Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). *The use of partial least squares path modeling in international marketing*. Emerald Group Publishing Limited. https://doi.org/10.1108/S1474-7979(2009)0000020014

Hsu, C. L., Chang, C. Y., & Yansritakul, C. (2017). Exploring purchase intention of green skincare products using the theory of planned behavior: Testing the moderating effects of country of origin and price sensitivity. *Journal of Retailing and Consumer Services, 34*, 145–152. https://doi.org/10.1016/j.jretconser.2016.10.006

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Ivanova, D., Stadler, K., Steen-Olsen, K., Wood, R., Vita, G., Tukker, A., & Hertwich, E. G. (2016). Environmental impact assessment of household consumption. *Journal of Industrial Ecology, 20*(3), 526–536. https://doi.org/10.1111/jiec.12371

Jaiswal, D., & Kant, R. (2018). Green purchasing behaviour: A conceptual framework and empirical investigation of Indian consumers. *Journal of Retailing and Consumer Services, 41*, 60–69. https://doi.org/10.1016/j.jretconser.2017.11.008

Jäkel, L. J. (2020). How does influencer marketing impact brands in the sportswear industry?: exploring the effects of brand coolness, brand attitude and purchase intentions (Doctoral dissertation).

Kassem, N. O., & Lee, J. W. (2004). Understanding soft drink consumption among male adolescents using the theory of planned behavior. *Journal of Behavioral Medicine, 27*(3), 273–296. https://doi.org/10.1023/B:JOBM.0000028499.29501.8f

Kim, Y. J., Njite, D., & Hancer, M. (2013). Anticipated emotion in consumers' intentions to select eco-friendly restaurants: Augmenting the theory of planned behavior. *International Journal of Hospitality Management, 34*, 255–262. https://doi.org/10.1016/j.ijhm.2013.04.004

Kline, R. B. (1998). *Structural equation modeling*. Guilford.

Kline, R. B. (2011). *Convergence of structural equation modeling and multilevel modeling*. SAGE Publications Ltd.

Klöckner, C. A. (2013). A comprehensive model of the psychology of environmental behaviour—A meta-analysis. *Global Environmental Change, 23*(5), 1028–1038. https://doi.org/10.1016/j.gloenvcha.2013.05.014

Kollmuss, A., & Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research, 8*(3), 239–260. https://doi.org/10.1080/13504620220145401

Lepczyk, C. A., Aronson, M. F. J., Evans, K. L., Goddard, M. A., Lerman, S. B., & MacIvor, J. S. (2017). Biodiversity in the city: fundamental questions for understanding the ecology of urban green spaces for biodiversity conservation. *BioScience, 67*(9), 799–807. https://doi.org/10.1093/biosci/bix079

Li, D., Zhao, L., Ma, S., Shao, S., & Zhang, L. (2019). What influences an individual's pro-environmental behavior? A literature review. *Resources, Conservation and Recycling, 146*, 28–34. https://doi.org/10.1016/j.resconrec.2019.03.024

Lin, P. C., & Huang, Y. H. (2012). The influence factors on choice behavior regarding green products based on the theory of consumption values. *Journal of Cleaner Production, 22*(1), 11–18. https://doi.org/10.1016/j.jclepro.2011.10.002

Maichum, K., Parichatnon, S., & Peng, K. C. (2016). Application of the extended theory of planned behavior model to investigate purchase intention of green products among Thai consumers. *Sustainability, 8*(10), 1077. https://doi.org/10.3390/su8101077

Mak, T. M., Iris, K. M., Tsang, D. C., Hsu, S. C., & Poon, C. S. (2018). Promoting food waste recycling in the commercial and industrial sector by extending the Theory of Planned Behaviour: A Hong Kong case study. *Journal of Cleaner Production, 204*, 1034–1043. https://doi.org/10.1016/j.jclepro.2018.09.049

Mazhar, W., Jalees, T., Asim, M., Alam, S. H., & Zaman, S. I. (2022). Psychological consumer behavior and sustainable green food purchase. *Asia Pacific Journal of Marketing and Logistics*. https://doi.org/10.1108/APJML-05-2021-0317

McGuicken, T., & Palomo-Vélez, G. (2021). What do carbon labels signal? The role of biospheric values on perceptions of "green" food consumers. *Journal of Food Products Marketing, 27*(7), 340–364. https://doi.org/10.1080/10454446.2021.2021119

Menozzi, D., & Mora, C. (2012). Fruit consumption determinants among young adults in Italy: A case study. *LWT-Food Science and Technology, 49*(2), 298–304. https://doi.org/10.1016/j.lwt.2012.03.028

Menozzi, D., Sogari, G., Veneziani, M., Simoni, E., & Mora, C. (2017). Eating novel foods: An application of the theory of planned behaviour to predict the consumption of an insect-based product. *Food Quality and Preference, 59*, 27–34. https://doi.org/10.1016/j.foodqual.2017.02.001

Messick, B. (1997). Genealogies of reading and the scholarly cultures of Islam. *Cultures of scholarship* (pp. 387–412). University of Michigan Press.

Moeti, I. (2023). Sustainability and consumer education on food sustainability. PhD diss., London South Bank University. https://doi.org/10.18744/lsbu.936y5

Neves, J., & Oliveira, T. (2021). Understanding energy-efficient heating appliance behavior change: The moderating impact of the green self-identity. *Energy, 225*, 120169. https://doi.org/10.1016/j.energy.2021.120169

Nguyen, N., Nguyen, H. V., Nguyen, P. T., Tran, V. T., Nguyen, H. N., Nguyen, T. M. N., Cao, T. K., & Nguyen, T. H. (2019). Some key factors affecting consumers' intentions to purchase functional foods: A case study of functional yogurts in Vietnam. *Foods, 9*(1), 24. https://doi.org/10.3390/foods9010024

Nordlund, A. M., & Garvill, J. (2002). Value structures behind proenvironmental behavior. *Environment and Behavior, 34*(6), 740–756. https://doi.org/10.1177/0013916022372 44
Nunnally JC (1967). Psychometric theory.
Nunnally, J. C. (1994). The assessment of reliability. *Psychometric Theory, 3*(1), 248.
Pais, D. F., Marques, A. C., & Fuinhas, J. A. (2023). How to Promote Healthier and More Sustainable Food Choices: The Case of Portugal. *Sustainability*, *15*(4), 3868. https://doi.org/10.3390/su15043868.
Park, S. W., Cornforth, D. M., Dushoff, J., & Weitz, J. S. (2020). The time scale of asymptomatic transmission affects estimates of epidemic potential in the COVID-19 outbreak. *Epidemics, 31*, 100392. https://doi.org/10.1016/j.epidem.2020.100392
Patel, M. R., Calhoon, J. H., Dehmer, G. J., Grantham, J. A., Maddox, T. M., Maron, D. J., & Smith, P. K. (2017). ACC/AATS/AHA/ASE/ASNC/SCAI/SCCT/STS 2017 appropriate use criteria for coronary revascularization in patients with stable ischemic heart disease: A report of the American college of cardiology appropriate use criteria task force, American association for thoracic surgery, American heart association, American society of echocardiography, American society of nuclear cardiology, society for cardiovascular angiography and interventions, society of cardiovascular computed tomography, and society of thoracic …. *Journal of the American College of Cardiology, 69*(17), 2212–2241. https://doi.org/10.1016/j.jacc.2017.02.001
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
Persson, A. (2013). Determinants of sustainable food consumption-Moving consumers down the path of sustainability by understanding their behavior.
Perugini, M., & Bagozzi, R. P. (2001). The role of desires and anticipated emotions in goal-directed behaviours: Broadening and deepening the theory of planned behaviour. *British Journal of Social Psychology, 40*(1), 79–98. https://doi.org/10.1348/014466601164704
Qasim, H., Yan, L., Guo, R., Saeed, A., & Ashraf, B. N. (2019). The defining role of environmental self-identity among consumption values and behavioral intention to consume organic food. *International Journal of Environmental Research and Public Health, 16*(7), 1106. https://doi.org/10.3390/ijerph16071106
Robinson, R., & Smith, C. (2002). Psychosocial and demographic variables associated with consumer intention to purchase sustainably produced foods as defined by the Midwest Food Alliance. *Journal of Nutrition Education and Behavior, 34*(6), 316–325. https://doi.org/10.1016/S1499-4046(06)60114-0
Rosenlöw E, Hansson T (2020). Going for the plant-based (legen) dairy alternative?: An exploratory study on consumer attitudes and purchase intentions towards plant-based dairy alternatives.
Schwartz, S. H. (1990). Individualism-collectivism: Critique and proposed refinements. *Journal of Cross-Cultural Psychology, 21*(2), 139–157. https://doi.org/10.1177/0022022190212001
Schwartz, S. H., & Bilsky, W. (1987). Toward a universal psychological structure of human values. *Journal of Personality and Social Psychology, 53*(3), 550. https://doi.org/10.1037/0022-3514.53.3.550
Sharma, M., Luthra, S., Joshi, S., & Kumar, A. (2022). Developing a framework for enhancing survivability of sustainable supply chains during and post-COVID-19 pandemic. *International Journal of Logistics Research and Applications, 25*(4–5), 433–453. https://doi.org/10.1080/13675567.2020.1810213
Shiu, Y. S., Chang, S. Y., Wu, H. C., Huang, S. C. H., & Chen, H. H. (2011). Physical layer security in wireless networks: A tutorial. *IEEE wireless Communications, 18*(2), 66–74. https://doi.org/10.1109/MWC.2011.5751298
Sparks, P., & Shepherd, R. (1992). Self-identity and the theory of planned behavior: Assesing the role of identification with" green consumerism". *Social psychology quarterly*. https://doi.org/10.2307/2786955
Steg, L. (2015). Environmental psychology and sustainable consumption. *Handbook of research on sustainable consumption* (pp. 70–83). Edward Elgar Publishing. https://doi.org/10.4337/9781783471270.00012
Steg, L., Bolderdijk, J. W., Keizer, K., & Perlaviciute, G. (2014). An integrated framework for encouraging pro-environmental behaviour: The role of values, situational factors and goals. *Journal of Environmental psychology, 38*, 104–115. https://doi.org/10.1016/j.jenvp.2014.01.002
Steg, L., Bolderdijk, J. W., Keizer, K., & Perlaviciute, G. (2014b). An integrated framework for encouraging pro-environmental behaviour: The role of values, situational factors and goals. *Journal of Environmental Psychology, 38*, 104–115. https://doi.org/10.1016/j.jenvp.2014.01.002
Steg, L., & De Groot, J. I. M. (2012). Environmental values. In S. Clayton (Ed.), *The handbook of environmental and conservation psychology* (p. 81e92). New York: Oxford University Press. https://doi.org/10.1093/oxfordhb/9780199733026.013.0005

Steg, L., Perlaviciute, G., & van der Werff, E. (2015). Understanding the human dimensions of a sustainable energy transition. *Frontier Psychology, 6*, 1–17. https://doi.org/10.3389/fpsyg.2015.00805

Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology, 29*(3), 309–317. https://doi.org/10.1016/j.jenvp.2008.10.004

Steiger, J. H. (1980). Tests for comparing elements of a correlation matrix. *Psychological Bulletin, 87*(2), 245. https://doi.org/10.1037/0033-2909.87.2.245

Steiger, J. H. (2007). Understanding the limitations of global fit assessment in structural equation modeling. *Personality and Individual differences, 42*(5), 893–898. https://doi.org/10.1016/j.paid.2006.09.017

Stern, B. B. (1995). Consumer myths: Frye's taxonomy and the structural analysis of consumption text. *Journal of Consumer Research, 22*(2), 165–185. https://doi.org/10.1086/209443

Stern, P. C. (2000). New environmental theories: Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues, 56*(3), 407–424. https://doi.org/10.1111/0022-4537.00175

Stern, P. C., Dietz, T., Abel, T., Guagnano, G. A., & Kalof, L. (1999). A value-belief-norm theory of support for social movements: The case of environmentalism. *Human ecology review, 6*, 81–97.

Sun, J., & Willson, V. L. (2008). Assessing general and specific attitudes in human learning behavior: An activity perspective and a multilevel modeling approach. *Educational and Psychological Measurement, 68*(2), 245–261. https://doi.org/10.1177/0013164407308510

Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2007). *Using multivariate statistics* (pp. 481–498). Boston, MA: Pearson.

Tajfel, H., & Turner, J. C. (1982). Social psychology of intergroup relations. *Annual Review of Psychology, 33*(1), 1–39. https://doi.org/10.1146/annurev.ps.33.020182.000245

Tanner, C., & Kast, S. W. (2003). Promoting sustainable consumption: determinants of green purchases by swiss consumer. *Psychology & Marketing, 20*(10), 883–902. https://doi.org/10.1002/mar.10101

Taufique, K. M. R., & Vaithianathan, S. (2018). A fresh look at understanding green consumer behavior among young urban indian consumers through the lens of theory of planned behavior. *Journal of Cleaner Production, 183*, 46–55. https://doi.org/10.1016/j.jclepro.2018.02.097

Terry, D. J., & Hogg, M. A. (1996). Group norms and the attitude-behavior relationship: A role for group identification. *Personality and Social Psychology Bulletin, 22*(8), 776–793. https://doi.org/10.1177/0146167296228002

Terry, M. A., Shamie, N., Chen, E. S., Hoar, K. L., & Friend, D. J. (2008). Endothelial keratoplasty: A simplified technique to minimize graft dislocation, iatrogenic graft failure, and pupillary block. *Ophthalmology, 115*(7), 1179–1186. https://doi.org/10.1016/j.ophtha.2007.09.005

Thogersen, J. (2001). Consumer values, behaviour and sustainable development. *Asia Pacific Advances in Consumer Research, 4*, 207–209.

Thøgersen, J., & Ölander, F. (2002). Human values and the emergence of a sustainable consumption pattern: A panel study. *Journal of Economic Psychology, 23*(5), 605–630. https://doi.org/10.1016/S0167-4870(02)00120-4

United Nations. (2019). Sustainable development knowledge platform. https://sustainabledevelopment.un.org/sdg2

Venhoeven, L. A., Bolderdijk, J. W., & Steg, L. (2013). Explaining the paradox: How pro-environmental behaviour can both thwart and foster well-being. *Sustainability, 5*(4), 1372–1386. https://doi.org/10.3390/su5041372

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

Vermeir, I., & Verbeke, W. (2008). Sustainable food consumption among young adults in Belgium: Theory of planned behaviour and the role of confidence and values. *Ecological economics, 64*(3), 542–553. https://doi.org/10.1016/j.ecolecon.2007.03.007

Whitmarsh, L., & O'Neill, S. (2010). Green identity, green living? The role of pro-environmental self-identity in determining consistency across diverse pro-environmental behaviours. *Journal of Environmental Psychology, 30*(3), 305–314. https://doi.org/10.1016/j.jenvp.2010.01.003

Wongsaichia, S., Naruetharadhol, P., Schrank, J., Phoomsom, P., Sirisoonthonkul, K., Paiyasen, V., & Ketkaew, C. (2022). Influences of green eating behaviors underlying the extended theory of planned behavior: A study of market segmentation and purchase intention. *Sustainability, 14*(13), 8050. https://doi.org/10.3390/su14138050

Wyker, B. A., & Davison, K. K. (2010). Behavioral change theories can inform the prediction of young adults' adoption of a plant-based diet. *Journal of Nutrition Education and Behavior, 42*(3), 168–177. https://doi.org/10.1016/j.jneb.2009.03.124

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

Yadav, R., & Pathak, G. S. (2017). Determinants of consumers' green purchase behavior in a developing nation: Applying and extending the theory of planned behavior. *Ecological Economics, 134*, 114–122. https://doi.org/10.1016/j.ecolecon.2016.12.019

Yuzhanin, S., & Fisher, D. (2016). The efficacy of the theory of planned behavior for predicting intentions to choose a travel destination: A review. *Tourism Review, 71*(2), 135–147. https://doi.org/10.1108/tr-11-2015-0055

Zhu, Q., Li, Y., Geng, Y., & Qi, Y. (2013). Green food consumption intention, behaviors and influencing factors among Chinese consumers. *Food Quality and Preference, 28*(1), 279–286. https://doi.org/10.1016/j.foodqual.2012.10.005