sustainability

MDPI

Article

Examining the Relationship between Consumers' Food-Related Actions, Wider Pro-Environmental Behaviours, and Food Waste Frequency: A Case Study of the More Conscious Consumer

Stephanie Marwood [1,*], Noreen Byrne [1], Olive McCarthy [1], Ciara Heavin [2] and Peter Barlow [3]

[1] Department of Food Business and Development, Centre for Co-Operative Studies, University College Cork, T12 CY82 Cork, Ireland
[2] Department of Business Information Systems, University College Cork, T12 CY82 Cork, Ireland
[3] Moray House School of Education and Sport, University of Edinburgh, Edinburgh EH8 9YL, UK
* Correspondence: 114369356@umail.ucc.ie

Abstract: The implications of food waste extend to the environment, society, and the economy. In the Global North, consumers' food waste contributes significantly to the current global levels, with action and practice largely driving this contribution. The resulting policies largely centre around raising awareness amongst consumers. However, awareness is not always found to lead to action, resulting in what is termed the 'value-action gap'. Thus, the focus of this study is on consumers who have demonstrated awareness and knowledge of food waste issues in their willingness to take part in a home food growing campaign. This sample allows us to examine how consumers can be moved beyond awareness and encouraged towards action. This study investigates the actions and practices of consumers that contribute to the likelihood of wasting food while also exploring the relationship between wider pro-environmental behaviour and food waste in the context of social practice theory. Quantitative analysis of survey data (n = 1106) shows that growing food and composting decrease the likelihood of wasting food, supporting a shift in mindset surrounding how food is viewed and reducing the disconnect between consumers and food that is prevalent in modern society. Overall engagement in wider pro-environmental behaviours was found to decrease an individual's likelihood of wasting food. A layered policy approach with a practices perspective is suggested, with recommendations proposed for interventions and initiatives at individual, community, and broader societal levels.

Keywords: consumer food waste; food-related actions; wider environmental behaviours; pro-environmental behaviours

Citation: Marwood, S.; Byrne, N.; McCarthy, O.; Heavin, C.; Barlow, P. Examining the Relationship between Consumers' Food-Related Actions, Wider Pro-Environmental Behaviours, and Food Waste Frequency: A Case Study of the More Conscious Consumer. *Sustainability* **2023**, *15*, 2650. https://doi.org/10.3390/su15032650

Academic Editor: Matteo Vittuari

Received: 4 October 2022
Revised: 18 January 2023
Accepted: 26 January 2023
Published: 1 February 2023

1. Introduction

Food waste, in the context of a growing global population and an already pressurised natural environment, is a multi-faceted issue, bringing with it environmental, economic, and societal implications. The magnitude of the problem at hand is contextualised by the estimation that 17% of all food produced may be wasted [1]. Food production is one of the biggest strains on our planet, producing significant levels of greenhouse gas emissions, polluting the air, soil, and waterways and contributing to land-use change, biodiversity loss, and species extinction [2–5]. While economic losses are faced through the inefficient use of resources, the societal and ethical implications of rising hunger levels are also evident. Estimates of global hunger levels report that between 720 and 811 million people faced hunger in 2020, an increase of 161 million since 2019 [6]. The paradox between malnutrition, global hunger, and food insecurity on the one hand and food waste levels on the other highlights the shortcomings of the current global food system and the need to re-evaluate the current norms.

The global food waste crisis and the associated implications has resulted in international policies aimed at reducing current levels. In 2015, the United Nations (UN) announced its Sustainable Development Goals (SDGs), of which SDG 12.3 aims to "halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses" by 2030 [7]. The European Commission (EC) in 2015 echoed this goal in its Circular Economy plan, setting the EU-wide target to reduce food waste by 30% by 2025 and 50% by 2030 [8]. With such policies in place, there is a growing need to explore mechanisms to help reach these targets throughout the entire food supply chain.

This study focuses on consumer food waste. In the Global North, a large proportion of food waste occurs at the consumer level, with estimates that 61% of global food waste is derived from households [1]. In the EU, an estimated 53% of food waste is attributed to households per annum, with an associated cost of 98 billion Euros [9]. Central to the issue of consumer food waste is a complex array of actions and practices [5]. Understanding how such actions and practices factor into food waste is valuable in the development of our knowledge, creation of public campaigns and facilitation of policy development, compliance, and revision. With the issue of consumer food waste gaining momentum, there has been a rise in campaigns and initiatives to reduce levels. Much of these measures have centred around raising consumer awareness and education [10–12]. However, awareness does not always equate to action [13–15]. With awareness of the issue of food waste increasing, it is essential to consider how we move beyond awareness and towards action. The literature recognises this lack of follow through, describing it as an example of a 'value-action gap' [14,16]. We take this gap as the starting point for our research. To examine this, we assess a cohort that has already demonstrated a level of awareness and knowledge through their willingness to participate in a food growing campaign.

In addition, food waste frequencies may be influenced by individuals' wider pro-environmental behaviour through an effect known as 'behavioural spillover'. We draw on social practice theory as a lens through which to explore this interaction, a viewpoint that has remained less explored in previous food waste literature and discussions of pro-environmental behaviour spillover [17,18]. This study aims to explore the influence of consumers' food-related actions on food waste frequencies while also analysing how wider pro-environmental behaviour factors into food waste frequencies. The research questions examined are:

1. What is the relationship between food-related actions and frequency of food waste?
2. What is the relationship between wider pro-environmental behaviour, food waste, and food-related actions?

2. Background

With consumer food waste in sharp focus amongst policy makers, there has been a subsequent rise in research in the areas of food waste and its behavioural predictors. Emerging research explores socio-demographic influences on food waste [19–22], food-related actions that impact food waste levels [5,23] and quantitative estimates of food waste levels [2].

Academic analysis, however, has yet to come to a consensus on an appropriate definition of food waste. In the context of this study, the definition provided by the FAO ([24], pg. 9) is adopted: "food waste refers to food appropriate for human consumption being discarded, whether or not after it is kept beyond its expiry date or left to spoil". In this study, this term exclusively refers to consumer food waste that occurs within the home. Similarly, previously published literature uses a range of terms when discussing consumers' actions, behaviour, and habits surrounding food and food waste. In the context of this study, the term 'food-related action(s)' will be used, with examples of such actions detailed in Section 2.1.

2.1. The Role of the Consumer in Reducing Food Waste

Consumer food waste is rooted in multiple, interlinking consumer actions, behaviour, and habits that ultimately impact the likelihood or amount of food waste being generated [5]. Understanding these factors and being able to influence action towards more sustainable choices is deemed a critical tactic in the efforts to reduce global food waste [5,25,26].

The key areas of food-related actions that have been heavily linked as predictors of food waste are planning and shopping [3,16,22,23]. Planning behaviour includes making lists, checking inventories, and planning meals. Literature suggests that individuals who make shopping lists are regularly found to be more likely to have reduced levels of food waste. For example, Jörissen et al. found that using a shopping list lowered the amount of food discarded per capita by 20–25% [23]. Both Jörissen et al. and Quested et al. showed that planning meals in advance significantly reduces levels of food waste [5,23].

Shopping refers to several actions in itself, including the location of shops and purchasing habits. The purchasing of promotional offers is a shopping behaviour which highlights a point of contention between studies [16,27]. While multiple studies show that the reduced purchasing of promotional offers, in turn, reduces food waste [3,28], some studies find the opposite effect [22,23]. Studies concluding the latter speculate that, when these promotional deals are availed of due to frugality or money shortages, a higher value is placed on the food, and therefore, less is wasted [22,23]. Similar conclusions have been drawn when discussing the impact of where food is purchased or sourced. When purchased from alternative food networks or home grown, food waste is less when compared to that bought exclusively in large supermarkets [17,23,29]. An explanation for this outcome is offered by Jörissen et al., who hypothesised that those who source their food from alternative food networks or grow their own place a higher value on food and are more aware of the complexities and challenges of food production [23]. The practice of home food growing is thought to encourage more involvement with food and, in turn, reduce the disconnect between consumers and food that is evident in modern society [30].

Composting is a food-related action that has not garnered as much academic exploration in terms of its impact on food waste. Composting has been linked to practices such as home food growing and gardening, with those who grow their own being more likely to compost [17,31]. Composting holds great potential as a policy tool to reduce consumer food waste as it can change how people view food waste, shifting it from that of waste to a resource [17,32].

Several demographic attributes have been found to impact food waste generation, although the strength and predictive power of these influences remains a relatively grey area [16]. While studies have shown a correlation between food waste and factors such as age, gender, household size, and educational level, the direction and strength of such relationships varies across studies [16,21]. Contradictory evidence as to the impact of age on food waste highlights the uncertainty of these impacts: older ages have frequently been associated with lower levels of food waste [21,33,34]. However, Jörissen et al., in a comparative quantitative case study of two locations, found that older consumers (>60 years old) wasted more than their younger counterparts [23]. Moreover, age, gender, and employment status, and household size show a 'modest' predictive power of food waste and food-related actions, having been found to account for only 7.3% of variance in a case study of Denmark [21]. Meanwhile, only age and employment status were found to be associated with food waste in a case study of Spain, explaining 8.1% of variances [21]. Across studies, household size has been found to be a key component of demographics that can be used to predict food waste, with larger households consistently found to waste more food [19,22,33].

2.2. The Influence of Pro-Environmental Behaviour

Pro-environmental behaviour is classed by Kollmuss and Agyeman as behaviour that "consciously seek[s] to minimize the negative impact of one's actions on the natural and built world" ([35], p. 240). Research has shown that, through engaging with one

pro-environmental action, further environmentally friendly action can be promoted within a range of behavioural domains [36–38]. When an initial pro-environmental action is completed, it increases the likelihood of subsequent action being taken [39]. This effect, often referred to as 'behavioural spillover', is complex both in terms of understanding the underlying mechanisms which influence it, and in how it can be measured [37]. Research has examined this effect in several ways. Sintov et al., for example, studied the effect a specific action, namely composting, had on wider consumption behaviour [37]. Results found that those who began composting later displayed an increased occurrence of water and energy saving behaviour [37]. Nash et al. explored the role of previous environmental engagement in mediating the observed effects, finding that those who are more environmentally engaged are more likely to exhibit this effect [40]. In a study exploring the effect of educating users on either the monetary or climate savings of reduced electricity use, Steinhorst et al. found that environmental appeals were more successful in promoting increased intention for wider environmental behaviour [41].

Much of the literature on pro-environmental behaviour and spillover effects focuses on the psychosocial mechanisms that underpin this relationship, drawing on psychological theories such as cognitive dissonance theory [36,42–44], theory of planned behaviour [45], and self-perception theory [36,42–44]. Such theories focus on the individual, with beliefs, attitudes and values used as predictors of behaviour [46]. There is, however, an emerging alternative in exploring pro-environmental behaviour that places focus on the role of action and practice, discussed primarily through social practice theory [17,46]. Social practice theory places the practice and action themselves as the unit of analysis rather than the individuals who carry them out [17,46]. This theory emphasises that, through engaging with action and practice, individuals come to understand the world, and the act of 'doing' is conducive to behavioural change [46]. In using this theory to explore a spillover of pro-environmental behaviour, we look to the discussions of Nash et al. [18]. Nash et al. propose that individuals who engage in environmental practice and action carry specific competencies (skills, techniques), materials (technology, infrastructure) or meanings (understanding, ideas) across different practices, which may lend to this spillover of subsequent practice and action [18]. It is in the context of this theory that we explore the relationship between wider pro-environmental behaviour and food waste.

3. Materials and Methods

3.1. Research Context

The contextual setting of the study is the Republic of Ireland. In terms of food waste, the Environmental Protection Agency (EPA) of Ireland estimates that 1.2 million tonnes of food are wasted per year, 255,000 tonnes of which are from households, with the average Irish family wasting 150 kg of food each year, costing approximately 700 Euros [8,47]. The time period of March to July 2021, in which the data were collected, is of note in the context of this study. In March 2021, movement within Ireland remained heavily restricted, with a 5 km radius limit from homes in force due to the COVID pandemic. This backdrop may shape the findings of this study as the impact of COVID on food behaviour has become well documented within literature, influencing both planning and shopping behaviour [30,48]. This time period noted a trend in increased home food growing as people were openly seeking new hobbies and tasks [49,50]. The findings of this study may therefore exhibit a 'best case scenario' observed during this time.

3.2. Sample Description and Survey Design

This study received approval from the relevant University ethics committee (Log 2021-056). The survey data were gathered from self-selecting participants in an educational and participatory campaign related to growing one's own food, conducted by not-for-profit social enterprise, GIY (Grow it Yourself). The aim of this public campaign, entitled 'Grow it Forward', was to provide participants with seeds and growing guides while also encouraging seed sharing to increase social connection. Participants were self-selecting

both in terms of their decision to take part in the campaign and to complete the survey. Two surveys were distributed: an initial registration survey (T1) at the outset of the campaign in March 2021 and a follow-up survey (T2) at the end of the campaign in July 2021. As there was a short time period (3 months) between the two surveys, it was decided to amalgamate the data into one data set. The survey instrument from which the data is sourced is detailed in Section 3.3.

Survey data were collected via Qualtrics [51], with survey development being guided by previous studies [33,37,52–54]. The survey had three sections, the first of which sought to garner participants' demographic information. The second section related to participants' self-reported food waste frequencies over the past month, as well as a range of food-related actions known to impact levels of food waste amongst consumers. Lastly, individuals' wider pro-environmental behaviour was explored. The variables included are explained in further detail in Section 3.3.

3.3. Variables

3.3.1. Food Waste Frequency

Food waste frequency is the dependent variable for the analysis. This variable was created based on a survey question in T2 which asked how often an individual produced food waste in the past month. The available responses to this question were 'Never', 'Rarely', 'Sometimes', 'Often', or 'Most Mealtimes'. During analysis, these responses were collapsed into 'Never/Rarely', 'Sometimes', or 'Frequently' to create larger categories and strengthen the power of analysis.

3.3.2. Wider Pro-Environmental Behaviour

The wider pro-environmental behaviour variable was created based on survey data (T2) asking a number of questions related to an individual's wider environmental behaviour. These included questions on whether an individual would turn lights off when they left a room, cycle or walk instead of drive, turn off the tap when brushing their teeth, unplug devices, take shorter showers, improve their recycling habits, bring reusable bags for shopping, and reduce reliance on single-use plastics.

We sought to use the above variables to derive an understanding of the general environmental behaviour of participants. To develop this variable, a polychoric principal components analysis (PCA) was used. This method captures the maximum variation between the variables in question. The variables were first standardised. The Pearson correlation coefficient between each of the variables was calculated and a covariance matrix was created which detailed the level of correlation between each variable in a matrix format. The eigenvalue of each eigenvector within the matrix was then calculated. The eigenvector with the largest eigenvalue was multiplied by the original standardised data to indicate the scores of the principal components. This yielded a single variable which captured the greatest possible variation within these highly correlated variables. This variable was labelled as 'Environmental Behaviour'.

In order to categorise this variable into three distinct categories, the data were examined at the tertile level which allowed individuals to be categorised based on their wider environmental behaviour. The PCA scores were then broken down into tertiles to make the variable structure comparable with other variables in the dataset. The resulting categories were 'good', 'neutral', and 'poor' environmental behaviour. Table A1 (see Appendix A) describes the results of the principal components analysis (PCA), which indicates the level of correlation of each of the variables with the first principal component derived from the analysis. The eigenvalue for the first eigenvector was 2.83. This suggests that the variance captured by the analysis would be the equivalent information of 2.83 variables from the original underlying data.

3.3.3. Demographic Factors

We sought to address and consider the role of demographic factors to inform the analysis of the behavioural variables of interest. These wider covariates included gender, age, household size, type of residence (rural, urban, suburban), and level of education (up to secondary-level, post-secondary-level, and third-level qualification).

3.3.4. Food-Related Action Variables

A range of food-related action variables were assessed. The variables are summarised by name, description, and scale in Table 1 below.

Table 1. Breakdown of Food-related Action Variables.

Variable	Source of Data	Description	Scale	Note
Growing experience	Survey T1	Level of experience growing food at the outset of the campaign	5-point Likert scale (No experience—Extremely experienced)	Collapsed into 3 categories * (a lot of experience, a moderate amount of experience or little or no growing experience)
Stage of Growing Achieved	Survey T2	Stage of growing achieved with the seeds provided by the campaign	4-point Likert scale ('Sowed'—'Sowed, seedling, harvest and eaten'	
Seasonality	Survey T1	Consideration of the seasonality of produce when purchasing fruit and vegetables	5-point Likert scale (Never—Always)	Collapsed into 3 categories * (Never, rarely, sometimes)
Composting	Survey T2	Individuals were asked whether they composted	3-point Likert scale (Yes, no, sometimes)	
Planning Shopping	Survey T2	Plan shopping ahead of time, including making lists, taking inventories or planning meals in advance	5-point Likert scale (strongly disagree to strongly agree)	Collapsed into 3 categories * (disagree, neutral, agree)
Buying More with Offers	Survey T2	Purchase more food than needed when promotional offers such as 'Buy One Get One Free' were available	5-point Likert scale (strongly disagree to strongly agree)	Collapsed into 3 categories * (disagree, neutral, agree)
Diet	Survey T1	Individuals were asked to characterise their diet	7-point Likert scale (Eat everything (red meat, poultry, fish)—vegan and other)	Collapsed into 3 categories * (eat everything, reduced meat intake, vegan/vegetarian)
Economic Worry of Food Waste	Survey T1	Feel there was good economic reasoning to reduce their food waste	5-point Likert scale (strongly disagree to strongly agree)	Collapsed into 3 categories * (disagree, neutral, agree)
Environmental Awareness of Food Waste	Survey T1	Feel there was good environmental reasoning to reduce their food waste	5-point Likert scale (strongly disagree to strongly agree)	Collapsed into 3 categories * (disagree, neutral, agree)
Perceived Avoidability of Food Waste	Survey T1	Consider food waste to be avoidable	5-point Likert scale (strongly disagree to strongly agree)	Collapsed into 3 categories * (disagree, neutral, agree)
Social Connection	Survey T2	Feeling of social connection at the time of the survey	5-point Likert scale (strongly disagree to strongly agree)	Collapsed into 3 categories * (disagree, neutral, agree)

* These categories were collapsed down to 3 categories to provide larger categories and strengthen the power of the analysis.

3.4. Model

To understand the effect of food-related actions on an individual's likelihood of wasting food, an ordered logistic regression was employed. This method determines the effect of these other factors on an individual's probability of reaching the next threshold level of food waste. This model was deemed suitable as it provides a method to estimate a model based on a categorical dependent variable with multiple ordered categories. The functional form of the model is described by the equation below.

$$\ln\left(\frac{p_n}{1-p_n}\right) = \beta_0 + \beta_D X_D + \beta_S X_S + \beta_G X_G + \beta_B X_B \quad (1)$$

$$\ln\left(\frac{p_m}{1-p_n-p_m}\right) = \beta_0 + \beta_D X_D + \beta_S X_S + \beta_G X_G + \beta_B X_B \quad (2)$$

While Equation (1) derives the likelihood that an individual will enter the second category (wastes food sometimes), Equation (2) models the likelihood that an individual will be in the third category (wastes food frequently).

In Equation (1), p_n represents the probability of an individual reporting that they have 'some' food waste. Similarly, p_m in Equation (2) represents the probability of an individual reporting that they have 'a lot' of food waste. The equations determine the log of the odds of this occurring, which is a linear function of $\beta_{0,}$ the intercept value. The independent variables X_D take account of variation in demographic variables, X_S which takes account of variation in the spillover activities, X_G which takes account of variation in the growth variable and X_B which takes account of variation in the behavioural variable. The effect associated with the variation in behavioural variables is determined by the estimated β_D which is the effect associated with the matrix of demographic variables described in this study. Similarly, β_S is the coefficient associated with spillover activities, β_G is the coefficient associated with growth and β_B the coefficient associated with behaviour. Based on these βs, it is possible to calculate odds ratios that indicate the relative chance of an individual falling into a particular category given the value of a dependent variable. The base value of the odds ratio, which is 1, is assigned to the base category of each variable.

To provide further context to the effects associated with the different variables used in the equations, three distinct models were investigated. The first model analysed the effect of the spillover variable in the context of only demographic variables such as age and gender. The second model added the effects associated with participants engaging in growing their own food as this was a key area of interest within the survey. The third model included all the variables detailed in Tables 1 and 2 and was considered relevant by the research team.

Table 2. Sample Summary Statistics.

	Variable	Categories	Frequencies	Percentage (%)
Food Waste	Food Waste Frequency	Never/Rarely	539	48.73%
		Sometimes	422	38.16%
		Always	145	13.11%
Pro-Environmental Behaviour	Environmental Behaviour Variables (PCA tertiles)	Tertile 1: Most environmentally friendly	372	33.63%
		Tertile 2: Neutral	371	33.54%
		Tertile 3: Least environmentally friendly	363	32.82%
Demographics	Gender	Female	933	84.36%
		Male	173	15.64%
	Age Range	25–44	475	42.95%
		45–64	544	49.19%
		65+	87	7.87%
	Household Composition	1	87	7.87%
		2	299	27.03%
		3	214	19.35%
		4	283	25.59%
		More than 4	223	20.16%
	Residence Type	Rural	512	46.29%
		Suburban	371	33.54%
		Urban	223	20.16%
	Education	Up to Secondary Level	112	10.13%
		Post-Secondary Level	159	14.38%
		Third level qualification	835	75.50%
Food-related Actions	Growing Experience	No experience	152	13.74%
		Moderate experience	354	32.01%
		A lot of experience	635	57.41%
	Stage of Growing Achieved	Sowed	31	2.80%
		Sowed and seedling	231	20.89%
		Sowed, seedling and harvested	138	12.48%
		Sowed, seedling, harvest and eaten	706	63.83%
	Considering Seasonality when Purchasing Fruit and Vegetables	Never/ Rarely	239	21.61%
		Sometimes	475	42.95%
		Often/ Regularly	392	35.44%
	Composting	No	119	10.76%
		Sometimes	72	6.51%
		Yes	915	82.73%
	Economic Attitude Towards Food Waste	Disagree	37	3.35%
		Neutral	182	16.46%
		Agree	887	80.20%

Table 2. *Cont.*

Variable	Categories	Frequencies	Percentage (%)
Environmental Attitude Towards Food Waste	Disagree	37	3.35%
	Neutral	88	7.96%
	Agree	981	88.70%
Perceived Avoidability of Food Waste	Disagree	149	13.47%
	Neutral	179	16.18%
	Agree	782	70.71%
Planning Shopping	Disagree	116	10.49%
	Neutral	149	13.47%
	Agree	841	76.04%
Buying More with Promotional Offers	Disagree	406	36.71%
	Neutral	239	21.61%
	Agree	461	41.68%
Diet	Eat everything	801	72.42%
	Reduced meat consumption	197	17.81%
	Vegan/Vegetarian	66	5.97%
	Other	42	3.80%
Social Connection	Disagree	87	7.87%
	Neutral	274	24.77%
	Agree	745	67.36%
Number of Observations		1106	100.00

Based on the effect of these variables on the log of the odds of an individual reporting that they waste food, odds ratios are calculated. These indicate the likelihood of an individual reporting that they waste food relative to 1, where 1 is having no effect.

4. Results

4.1. Descriptive Statistics

Summary statistics for the sample are presented in Table 2.

4.2. Robustness Checks

To assess the validity of our model, post-estimation checks were carried out (See Appendix C). To test for goodness of fit, the likelihood-ratio test (p > chi2 = 0.000) and the pseudo R^2 (0.162) were considered. These test statistics indicated that the model explained some of the variation in food waste frequency. Similarly, the Hosmer Lemeshow test and the Limitz test were used to assess goodness of fit (see Table A3). These tests failed to reject their null hypotheses which indicated that the model had an appropriate fit.

To determine whether the model violated the parallel lines assumption, a Brant test was carried out (see Table A4). It indicated that the model, as a whole, did not violate this assumption. However, it did indicate that a small minority of control variables (namely gender, social connection, and diet) violated the assumption. To account for these violations, a generalised ordered logistic regression model was implemented. The generalised ordered logistic regression model (see Appendix E, Table A8) indicated that these had no effects on the significance of these, or other variables. Given this result, it was not felt necessary to relax the parallel lines assumption for this analysis. Finally, a logistic regression was performed, the results of which are in line with the model used (see Appendix F, Table A9).

4.3. Food-Related Actions

The role of food-related actions in an individual's likelihood of wasting food was examined, and results displayed in Table 3, with key variables further illustrated in Figure 1. Our analysis concluded that those who had little to no growing experience were found to be significantly more likely to waste food more regularly than those who had a lot of growing experience (Odds Ratio (OR) 1.54) (Table 3). In a similar vein, those who did not engage in composting were 1.592 times as likely to waste food more regularly than those who did. Those who perceived food waste to be avoidable were 0.301 times less likely to waste food and those who agreed that they planned their shop in advance were 0.322 times less likely to waste food (Table 3). However, those who bought more when items were on offer were 1.60 times as likely to waste food more regularly. In examining the role of demographic characteristics on the likelihood of individuals wasting food, we found

individuals aged between 45 and 64 to be 0.62 times less likely to waste food more regularly than those aged 25 to 44 (Table 3). Meanwhile, those in larger households were significantly more likely to waste food more frequently. Those in a household of a greater size than 4 were 2.93 times as likely to report wasting food more regularly than those residing in a household alone (Table 3).

Table 3. Results of ordered logistic regression on how often an individual wastes food in a month.

Food Waste Frequency (PCA Analysis)	Reference Category	Basic	Growth	Full Model
Model		**1**	**2**	**3**
Tertiles: Neutral PCA.	Tertiles: Poor PCA.	0.652 ** (0.094)	0.667 ** (0.097)	0.844 (0.132)
Tertiles: Good PCA.	Tertiles: Poor PCA.	0.321 *** (0.049)	0.34 *** (0.053)	0.419 *** (0.071)
Age: 45–64	Age: 25–44	0.515 *** (0.065)	0.54 *** (0.069)	0.62 *** (0.085)
Age: 65+	Age: 25–44	0.43 ** (0.116)	0.481 ** (0.132)	0.866 (0.159)
Male	Female	0.775 (0.134)	0.836 (0.147)	0.662 (0.189)
Household: 2 people	Household: 1 person	1.04 (0.269)	1.035 (0.269)	1.136 (0.308)
Household: 3 people	Household: 1 person	2.139 ** (0.564)	2.122 ** (0.562)	2.261 ** (0.628)
Household: 4 people	Household: 1 person	2.778 *** (0.713)	2.75 *** (0.709)	2.674 *** (0.721)
Household: More than 4	Household: 1 person	2.942 *** (0.780)	2.946 *** (0.784)	2.934 *** (0.820)
Residence: Suburban	Residence: Rural	1.596 *** (0.219)	1.529 ** (0.212)	1.638 *** (0.240)
Residence: Urban	Residence: Rural	1.288 (0.209)	1.223 (0.200)	1.31 (0.224)
Education: Post-Secondary	Education: Up to Secondary Level	1.301 (0.329)	1.317 (0.334)	1.361 (0.367)
Education: 3rd level degree	Education: Up to Secondary Level	1.358 (0.283)	1.361 (0.285)	1.518 (0.336)
Growing Experience: A moderate amount	Growing Experience: A great deal/A lot		1.289 (0.273)	1.269 (0.281)
Growing Experience: A little/none	Growing Experience: A great deal/A lot		1.721 ** (0.348)	1.54 * (0.329)
Stage of Growing: sowed and seedling	Stage of Growing: sowed		0.965 (0.372)	0.867 (0.353)
Stage of Growing: sowed, seedling and harvest	Stage of Growing: sowed		0.815 (0.327)	0.871 (0.368)
Stage of Growing: sowed, seedling, harvest and ate	Stage of Growing: sowed		0.866 (0.322)	0.906 (0.355)
Seasonality: Rarely	Seasonality: Never/Rarely			0.935 (0.155)
Seasonality: Often/Regularly	Seasonality: Never/Rarely			1.129 (0.206)
Composting: No	Composting: Yes			1.592 * (0.329)
Composting: Sometimes	Composting: Yes			1.682 * (0.419)
Economic attitude: Neutral	Economic attitude: Strongly disagree/Disagree			1.482 (0.569)
Economic attitude: Agree/Strongly agree	Economic attitude: Strongly disagree/Disagree			1.449 (0.531)
Environment attitude: Neutral	Environment attitude: Strongly disagree/disagree			1.744 (0.724)
Environment attitude: Agree/Strongly Agree	Environment attitude: Strongly disagree/disagree			1.515 (0.560)
Avoidable attitude: Neutral	Avoidable attitude: Strongly disagree/disagree			1.051 (0.233)

Table 3. *Cont.*

Food Waste Frequency (PCA Analysis)	Reference Category	Basic	Growth	Full Model
Model		**1**	**2**	**3**
Avoidable attitude: Agree/Strongly Agree	Avoidable attitude: Strongly disagree/disagree			0.301 *** (0.057)
Plan shop: Neutral	Plan shop: Strongly disagree/Disagree			0.62 (0.154)
Plan shop: Agree/Strongly Agree	Plan shop: Strongly disagree/Disagree			0.322 *** (0.067)
Buy more when offers: Neutral	Buy more when offers: Strongly Disagree/Disagree			1 (0.176)
Buy more when offers: Agree/Strongly agree	Buy more when offers: Strongly Disagree/Disagree			1.600 ** (0.238)
Feeling of social connection increased: Neutral	Feeling of social connection increased: Strongly disagree/ Disagree			0.68 (0.157)
Feeling of social connection increased: Agree/Strongly Agree	Feeling of social connection increased: Strongly disagree/ Disagree			0.633 * (0.146)
Social Connection: Fair	Social Connection: Very poor/Poor			1.282 (0.342)
Social Connection: Good/Excellent	Social Connection: Very poor/Poor			1.121 (0.276)
Diet: Limited meat	Diet: Eat most meat			0.722 (0.126)
Diet: Vegan/Vegetarian	Diet: Eat most meat			0.737 (0.203)
Diet: Other	Diet: Eat most meat			0.98 (0.337)
N		1106	1106	1106
Log likelihood		−1000.84	−995.44	−913.24

$p < 0.05$ *, $p < 0.01$ **, $p < 0.001$ ***, Standard errors in parentheses. Analysis carried out using Stata v16.1. Model 1, referred to as the 'Basic Model', includes PCA tertiles and demographic variables (including age, gender, household size, residential area, and education). Model 2, referred to as the 'Growth Model', includes variables from Model 1 as well as the growth variables: growing experience and stage of growing achieved within the campaign. Model 3, referred to as the 'Full Model', includes variables from Models 1 and 2 as well as the remaining food-related action variables: considering seasonality, composting, economic attitude, environmental attitude, avoidable attitude, planning shopping, buying more with promotional offers, diet, and social connection. All variables listed are outlined in further detail in Section 3.

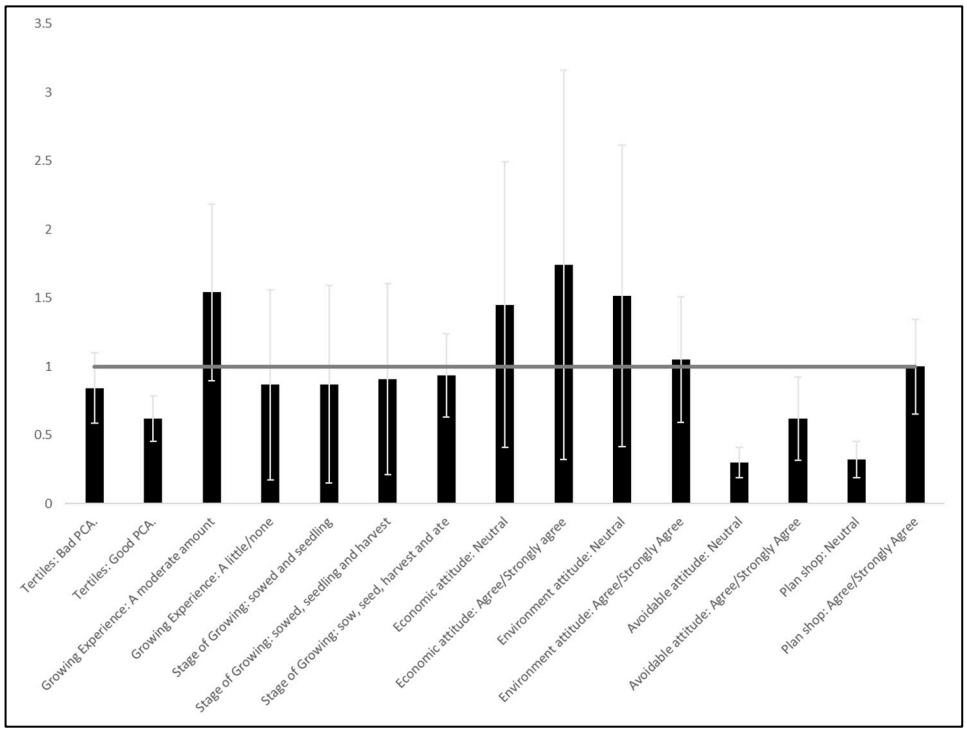

Figure 1. Diagram of regression results for key variables, illustrating odds ratios (bars) and confidence intervals (whiskers).

The marginal effects of these variables of interest are displayed in Tables 4–6. Tables that display the marginal effects of all variables on the likelihood of being in any category of food waste frequency can be found in Appendix D (Tables A5–A7).

Table 4. Marginal effects associated with variables of interest for the 'Never/ Rarely' category of food waste.

Food Waste Frequency	Reference Category	Marginal Effects of Full Model
Marginal Effect on Likelihood of Being in the 'Never/Rarely' Category		
Tertiles: Neutral PCA.	Tertiles: Poor PCA.	0.033 (0.030)
Tertiles: Good PCA.	Tertiles: Poor PCA.	0.169 *** (0.033)
Growing Experience: A moderate amount	Growing Experience: A great deal/A lot	−0.046 (0.042)
Growing Experience: A little/none	Growing Experience: A great deal/A lot	−0.083 * (0.041)
Stage of Growing: sowed and seedling	Stage of Growing: sowed	0.027 (0.077)
Stage of Growing: sowed, seedling and harvest	Stage of Growing: sowed	0.026 (0.080)
Stage of Growing: sowed, seedling, harvest and ate	Stage of Growing: sowed	0.019 (0.075)
Economic attitude: Neutral	Economic attitude: Strongly disagree/Disagree	−0.074 (0.072)
Economic attitude: Agree/Strongly agree	Economic attitude: Strongly disagree/Disagree	−0.074 (0.072)
Environment attitude: Neutral	Environment attitude: Strongly disagree/disagree	−0.07 (0.069)
Environment attitude: Agree/Strongly Agree	Environment attitude: Strongly disagree/disagree	−0.079 (0.069)
Avoidable attitude: Neutral	Avoidable attitude: Strongly disagree/disagree	−0.009 (0.040)
Avoidable attitude: Agree/Strongly Agree	Avoidable attitude: Strongly disagree/disagree	0.239 *** (0.036)
Plan shop: Neutral	Plan shop: Strongly disagree/Disagree	0.088 (0.045)
Plan shop: Agree/Strongly Agree	Plan shop: Strongly disagree/Disagree	0.217 *** (0.037)
N		1106

p <0.05 *, p < 0.001 ***, Standard errors in parentheses. Analysis carried out using Stata v16.1. This analysis includes variables from the Full Model, as detailed in Table 3. Variables included are: PCA tertiles, demographic variables (age, gender, household size, residential area, and education), growth variables (growing experience and growing stage achieved within the campaign), and food-related actions (considering seasonality, composting, economic attitude, environmental attitude, avoidable attitude, planning shopping, buying more with promotional offers, diet and social connection). All variables are outlined in further detail in Section 3.

Table 5. Marginal effects associated with variables of interest for the 'Sometimes' category of food waste.

Food Waste Frequency	Reference Category	Marginal Effects of Full Model
Marginal Effect on Likelihood of Being in the 'Sometimes' Category		
Tertiles: Neutral PCA.	Tertiles: Poor PCA.	−0.015 (0.014)
Tertiles: Good PCA.	Tertiles: Poor PCA.	0.169 *** (0.033)
Growing Experience: A moderate amount	Growing Experience: A great deal/A lot	0.026 (0.025)
Growing Experience: A little/none	Growing Experience: A great deal/A lot	0.045 (0.024)
Stage of Growing: sowed and seedling	Stage of Growing: sowed	−0.013 (0.037)
Stage of Growing: sowed, seedling and harvest	Stage of Growing: sowed	−0.013 (0.038)
Stage of Growing: sowed, seedling, harvest and ate	Stage of Growing: sowed	−0.009 (0.035)

Table 5. *Cont.*

Food Waste Frequency	Reference Category	Marginal Effects of Full Model
Economic attitude: Neutral	Economic attitude: Strongly disagree/Disagree	0.04 (0.041)
Economic attitude: Agree/Strongly agree	Economic attitude: Strongly disagree/Disagree	0.038 (0.040)
Environment attitude: Neutral	Environment attitude: Strongly disagree/disagree	0.056 (0.044)
Environment attitude: Agree/Strongly Agree	Environment attitude: Strongly disagree/disagree	0.043 (0.041)
Avoidable attitude: Neutral	Avoidable attitude: Strongly disagree/disagree	0.002 (0.008)
Avoidable attitude: Agree/Strongly Agree	Avoidable attitude: Strongly disagree/disagree	−0.111 *** (0.015)
Plan shop: Neutral	Plan shop: Strongly disagree/Disagree	−0.024 (0.013)
Plan shop: Agree/Strongly Agree	Plan shop: Strongly disagree/Disagree	−0.087 *** (0.012)
N		1106

$p < 0.001$ ***, Standard errors in parentheses. Analysis carried out using Stata v16.1. This analysis includes variables from the Full Model, as detailed in Table 3. Variables included are: PCA tertiles, demographic variables (age, gender, household size, residential area, and education), growth variables (growing experience and growing stage achieved within the campaign), and food-related actions (considering seasonality, composting, economic attitude, environmental attitude, avoidable attitude, planning shopping, buying more with promotional offers, diet and social connection). All variables are outlined in further detail in Section 3.

Table 6. Marginal effects associated with variables of interest for the 'Frequent' category of food waste.

Food Waste Frequency	Reference Category	Marginal Effects of Full Model
Marginal Effect on Likelihood of Being in the 'Frequent' Category		
Tertiles: Neutral PCA.	Tertiles: Poor PCA.	−0.018 (0.017)
Tertiles: Good PCA.	Tertiles: Poor PCA.	−0.077 *** (0.015)
Growing Experience: A moderate amount	Growing Experience: A great deal/A lot	0.02 (0.018)
Growing Experience: A little/none	Growing Experience: A great deal/A lot	0.039 (0.018)
Stage of Growing: sowed and seedling	Stage of Growing: sowed	−0.014 (0.041)
Stage of Growing: sowed, seedling and harvest	Stage of Growing: sowed	−0.013 (0.042)
Stage of Growing: sowed, seedling, harvest and ate	Stage of Growing: sowed	−0.01 (0.039)
Economic attitude: Neutral	Economic attitude: Strongly disagree/Disagree	0.034 (0.031)
Economic attitude: Agree/Strongly agree	Economic attitude: Strongly disagree/Disagree	0.032 (0.029)
Environment attitude: Neutral	Environment attitude: Strongly disagree/disagree	0.049 (0.034)
Environment attitude: Agree/Strongly Agree	Environment attitude: Strongly disagree/disagree	0.035 (0.028)
Avoidable attitude: Neutral	Avoidable attitude: Strongly disagree/disagree	0.007 (0.032)
Avoidable attitude: Agree/Strongly Agree	Avoidable attitude: Strongly disagree/disagree	−0.128 *** (0.025)
Plan shop: Neutral	Plan shop: Strongly disagree/Disagree	−0.064 (0.034)
Plan shop: Agree/Strongly Agree	Plan shop: Strongly disagree/Disagree	−0.13 *** (0.029)
N		1106

$p < 0.001$ ***, Standard errors in parentheses. Analysis carried out using Stata v16.1. This analysis includes variables from the Full Model, as detailed in Table 3. Variables included are: PCA tertiles, demographic variables (age, gender, household size, residential area, and education), growth variables (growing experience and growing stage achieved within the campaign), and food-related actions (considering seasonality, composting, economic attitude, environmental attitude, avoidable attitude, planning shopping, buying more with promotional offers, diet and social connection). All variables are outlined in further detail in Section 3.

4.4. Wider Pro-Environmental Behaviour

Wider pro-environmental behaviour and how it relates to food waste frequency was explored. As illustrated in Table 3, overall, those who display good environmental behaviour are less likely to frequently waste food. Those in the highest tertile of good environmental behaviour are 0.419 times as likely to waste food more frequently.

The role that food-related actions play in determining wider pro-environmental behaviour and overall environmental friendliness was explored, with results displayed in Table A2 (See Appendix B). The results showed that those who regularly shopped with seasonality of produce in mind and those who planned their shopping were twice as likely to exhibit environmentally friendly behaviour than those who do not (OR 2.651 and 1.956 respectively). Additionally, Table A2 identifies demographic factors that were found to be important in understanding whether an individual was likely to display good wider environmental behaviour. Age was shown to be significant in determining an individual's wider pro-environmental behaviour. Those aged 65 and over were 0.53 times as likely to be in a more environmentally friendly tertile compared to those aged 25–44. This suggests that younger people are more likely to act in an environmentally friendly fashion.

5. Discussion

The aim of this study was to examine the food-related actions that contribute to food waste amongst participating consumers, as well as explore the correlation between food-related actions and wider pro-environmental behaviour. Our findings demonstrate that, even amongst a cohort that the authors assume to be more environmentally aware and engaged based on their willingness to participate, underlying issues regarding food-related actions emerge. It is within this context that we examine and discuss our findings.

5.1. The Sample

Summary statistics of the sample, as detailed in Table 2, show findings of note. It is seen that almost half (48.73%) of the sample reported that they never or rarely waste food, while 'sometimes' and 'always' account for 38.16% and 13.11% of responses, respectively. However, it is important to note that self-reported food waste is commonly found to be underestimated by consumers [55].

It is seen that the sample largely comprises females (84.36%) compared to males (15.64%). As participants were self-selecting, we propose two explanations for this. First, we look to the highly cited work of Smith, who found a significant gender bias towards females in online survey response behaviour [56]. Smith uses social exchange theory to explain this finding, stating that the imbalance shows differences in the way genders make decisions and value actions online [56]. Second, we point to the gender dynamics surrounding food-related actions. The practice and action surrounding food and food waste are largely carried out by women, giving weight to the reasonable assumption that women may be more aware of and interested in the subject matter of the survey [57,58].

Lastly, the sample is also seen to largely comprise individuals with third level qualifications (75.50%). While this is likely a result of the self-selecting nature of survey participation, some studies suggest that higher educational levels are associated with increased environmental concern [59] and increased concern for food waste [60] and thus, may be more interested in the subject matter of the survey.

5.2. Factors Associated with Food Waste

Food-related action was found to be associated with food waste frequency. A key finding is the impact of growing experience on food waste: those who had little or no experience growing their own food were significantly more likely to waste food than those with higher levels of experience. These findings echo those of Ganglbauer et al. and Keegan and Breadsell [14,17]. The time and energy dedicated to growing food is thought to promote a deeper appreciation as growing one's own food requires a physical engagement with food production not present on supermarket shelves [14,17]. In a similar vein, those

who do not compost were found to be more likely to waste food more frequently than those who do. Composting prompts reflection on the circularity of the food system [14], with the action of composting changing the nature of food waste to that of a useful and valuable resource [17].

Those who planned their shopping were less likely to waste food than those who did not. Our findings also suggest that individuals who purchase more items due to promotional offers (e.g., 'Buy One Get One Free') are more likely to waste food than those who do not. As found by Mondéjar-Jiménez et al., promotional offers promote surplus purchasing, directly impacting food waste levels [28]. It can be argued, however, that the impact of promotional offers on food waste may vary amongst individuals depending on their socio-economic circumstances, although such relationships were not explored within this study.

While economic awareness and environmental concerns for food waste held no predictive power over the frequency of food waste, perceiving food waste to be avoidable was found to be associated with a decreased likelihood of wasting food. This result points to several possible conclusions. It suggests that these individuals may possess skills that make reducing food waste easier, such as cooking with leftovers [61]. This result suggests that actions perceived as easy are more likely to be implemented and sustained by individuals. This, in turn, opens an opportunity to encourage further environmental action, as action considered by the consumer to be 'easy' increases the likelihood of further environmental action [62].

Lastly, the analysis shows that certain demographic attributes were found to be useful predictors of food waste. Individuals in the age range 45–64 were less likely to waste food than those aged 25–44, similar to the findings of Jörissen et al. [23]. Studies have come to differing conclusions regarding the impact of age, with many finding that those aged 65 and older are less likely to waste food [5,27,34]. This is theorised to be connected to a post-Second World War upbringing in which food security was uncertain, rationing was the norm [5,27], and skills to utilise leftovers were more developed [34]. This study found that household size significantly increases the likelihood of food waste, with households of more than four people being more likely to waste food. These findings support those of numerous previous studies [19,22,33]. Individuals living in suburban areas were found to be less likely to waste food, although this significance is moderate, and a limitation is highlighted in the complications which arise in interpreting this result. Specifically, individuals may have differing opinions on how to define a 'suburban' area, and no definition was provided within the survey.

5.3. Wider Pro-Environmental Behaviour

Engaging in wider pro-environmental behaviour was found to decrease an individual's likelihood of wasting food. Those in the highest tertile of environmental behaviour are less likely to waste food than those in the lower two tertiles. However, this study reveals an apparent gap in environmental action amongst consumers with the nuances observed within this result. The results suggest that being vigilant in one area of pro-environmental behaviour does not consistently equate to being vigilant in others. This was particularly apparent when considering home food growing and composting. We identified both home food growing and composting as important actions in reducing food waste, however they were not found to translate into whether or not an individual is likely to act in a positive pro-environmental manner in a wider sense. This raises a number of questions including, what drives and motivates action and what motivates a choice to act in one area of environmental protection and not another?

We postulate that several factors contribute to answering this question. First, a noted complexity within food-related action that may contribute, is the temporal disconnect between the action and the result. As stated by Quested et al., by the time food waste has been generated, the opportunity to take action to prevent or reduce food waste is hours, if not days, in the past [5]. This leads to a conceptual disconnect between the action

relevant to food waste and the outcome [5]. Amongst both food-related actions and wider environmental behaviour, a range of factors can help in explaining this gap. Availability and access to appropriate resources that can promote and foster environmental action are one such factor, including for example, required infrastructure (e.g., available recycling services, access to public transport) [35]. Personal circumstances, such as available financial resources, are another, having been identified as a barrier to environmental action, with greener purchasing options often being less affordable [63]. Finally, education is found to play a large part in explaining the gap, often in terms of individuals lacking 'procedural knowledge' which includes practical education about how individual action can be taken, such as how to efficiently plan shopping trips or how to begin composting [63].

In a broader sense, food-related action found to be important in understanding whether an individual was likely to show positive wider pro-environmental behaviour wase identified within our analysis. Planning food shops was found to be linked to wider pro-environmental behaviour, with those who planned their shopping twice as likely to display good environmental behaviour. While growing and composting are found to be important indicators of an individual's likelihood to waste food, they are not found to be associated with good wider pro-environmental behaviour. However, considering seasonality when purchasing fruit and vegetables is. Those who consider the seasonality of the produce they are purchasing are found to be twice as likely to display good environmental behaviour.

The analysis concluded that age was an important factor in understanding whether an individual showed positive wider pro-environmental behaviour. Results suggest that individuals aged 65 years and over are less likely to be in a more environmentally friendly tertile. Such a finding provides an interesting point of discussion in terms of the relationship between age and wider pro-environmental behaviour and attitude and is not unlike that of other studies. In a meta-analysis review, Wiernik et al. found environmental attitude to be negatively related to age, suggesting that, on average, younger people have a somewhat more positive environmental attitude [64]. Similarly, Lorenzini et al. found younger generations to be, on average, more likely to be favourable to the environment than older generations [65].

5.4. Policy Implications

Ireland's current food waste policy is largely dictated by wider EU policies. 'Ireland's National Food Waste Prevention Roadmap', developed as part of Ireland's National Waste Policy 2020–2025, sets out a plan for the reduction of national food waste levels [66]. The authors argue that there is limited attention attributed to consumers' household food waste, given the known national statistics [47]. Moreover, the main focus of consumer food waste prevention is awareness and education, delivered primarily through the 'Stop Food Waste' initiative managed by the EPA. Given our findings (Figure 2), we conclude there is a justifiable need for the integration of a more layered policy approach to appropriately address and mobilise consumers with varying levels of awareness and engagement. This study has examined a cohort of consumers that the authors can reasonably assume to be environmentally aware and engaged, based on their willingness to participate in a food growing campaign. Our novel contributions show that, even amongst this group, there are still underlying issues regarding food-related action. For a cohort that is already demonstrating awareness and engagement, but which lacks in action, we propose ingraining a practices perspective into policy, focusing on practices and actions to positively influence changes in mindsets.

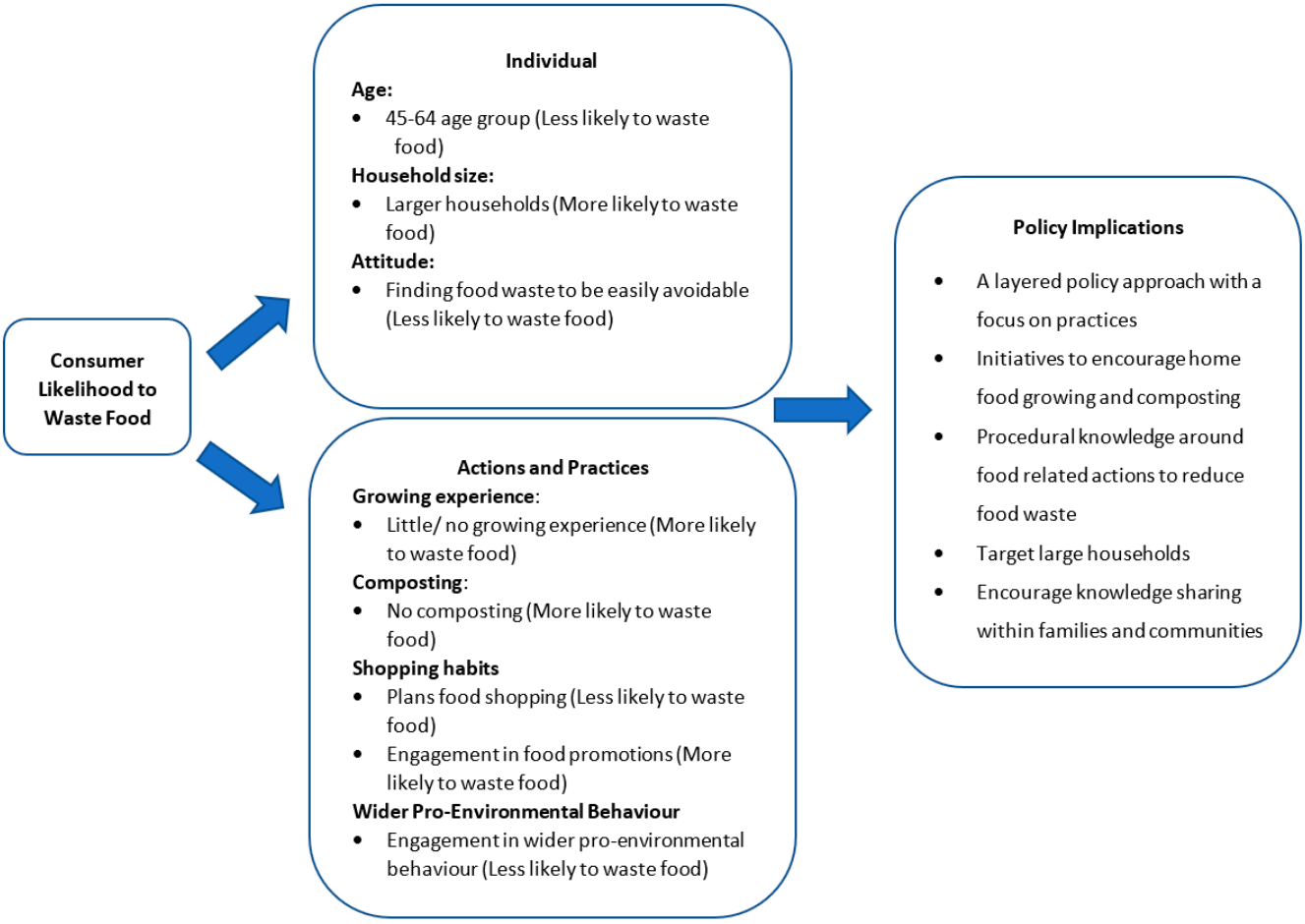

Figure 2. Summary of Key Findings and Resultant Policy Implications.

In designing such a policy approach, we set out the following recommendations: At an individual level, home food growing and composting were found to be associated with lower levels of food waste and are therefore suggested as areas of focus of future policies and initiatives. While home food growing offers a leverage point for a behavioural shift in consumers, composting presents an area of opportunity to educate individuals on the circularity of the food system. There is scope for further initiatives at a community level and within local contexts, such as establishing allotments in suburban and urban areas to include those of varying socio-economic circumstances and who may have limited access to growing space. These findings, and proposed areas of focus for policy, support a movement from a disconnected system to an interconnected one. At present, there is an emphasis on a fragmented view of food waste, with focus placed on isolated tasks rather than 'whole system thinking' [67]. In promoting and encouraging home food growing and composting, there is opportunity for a shift, not just in behaviour but also in mindset, through an increased appreciation of the interconnected nature of the food system.

On a broader level, our findings show support for educational interventions focusing on the procedural knowledge around food-related action and practice. Increasing consumers' skills and proficiencies to avoid food waste, as well as their knowledge on the ease with which they can avoid food waste, may be beneficial to national food waste levels. As larger households were found to be associated with higher levels of food waste, our findings also indicate that specific and targeted education and support for such households are needed. Older participants were found to have lower levels of food waste, and thus, a future campaign area could encourage intergenerational knowledge sharing within families and communities. As the above initiatives are in danger of only reaching those who are already environmentally inclined, wider scale public communication campaigns should

also be considered. Information on the nature and volume of food waste, including the economic cost and environmental impact, should be shared on a national scale on the radio, on television, and in schools and supermarkets.

5.5. Limitations

This research has some limitations. Participants were self-selecting, both in terms of their willingness to take part in the campaign and their involvement in the survey. This willingness is taken to demonstrate a level of knowledge and awareness surrounding the issue of food waste, making our sample a case study of the more conscious consumer. Additionally, we note the temporal context of COVID which aided in facilitating access to this consumer cohort as it led to a noted increase in consumers growing their own food [49,50]. The findings may therefore present a best-case scenario in terms of food waste behaviour. Methodological limitations include the use of self-reported food waste frequencies (commonly found to be underestimated [55], and the exclusion of certain variables (such as income levels and employment status). Finally, analysis suggested that a lack of an accompanying definition regarding the word 'suburban' may have created uncertainty among respondents which complicated our interpretation of findings regarding this variable.

5.6. Future Research

While this study has noted limitations, it also provides scope for future research. As this research relied on self-reported food waste frequencies, an opportunity for future research lies in replicating the study with an additional measure for food waste frequency to limit possible under-estimations. Further, the inclusion of additional demographic variables such as household income and employment status may provide additional insights into this cohort in terms of their food-related actions and their wider environmental behaviour. Further opportunity lies in broadening the range of food-related practices that are included in analysis, for example, a more in-depth analysis of shopping habits. Lastly, the study presents the lessons learnt within the context of Ireland. However, there is scope to replicate the study in other regions. The replicability will rely on taking a similar approach in participant selection, in selecting a cohort that has demonstrated a level of awareness and engagement in terms of tackling food waste. This would allow researchers from other regions and countries to identify a sample of people who have moved beyond awareness and need to be mobilised towards action. Opportunities arising from the replication of this study include the incorporation of additional demographic and food practice variables to deepen our understanding, as well as comparison across various countries.

6. Conclusions

The study presents an investigation of food-related action that contributes to food waste amongst participating consumers. While our results emphasise food-related action that contributes to an increased likelihood of wasting food, we also shed light on areas that hold potential to decrease consumer food waste. The actions of growing food and composting were found to decrease the likelihood of wasting food, supporting a shift in mindset surrounding how food is viewed and reducing the disconnect often perpetuated by supermarkets. Alongside this, we have explored the correlation between food-related actions and wider pro-environmental behaviour. We found that, overall, engaging in wider pro-environmental behaviour decreases an individuals' likelihood of wasting food. In assessing this interaction, nuances were observed in terms of what motivates environmental action in certain areas and not others. We propose a temporal disconnect between food-related actions and food waste, education and access to resources as means to explain this finding. Theoretically, this study adds to the discussion of social practice theory in informing the spillover of wider pro-environmental behaviour. Moreover, our findings support a layered policy approach, informed by social practice theory, focusing on prac-

tices and actions on individual, community, and societal levels to reduce consumer food waste levels.

Author Contributions: Conceptualization, S.M., N.B. O.M. and C.H.; methodology, S.M. and P.B.; investigation, S.M.; formal analysis, P.B.; validation, P.B.; data curation, S.M. and P.B.; writing—original draft preparation, S.M.; writing—review and editing, N.B. O.M. and C.H.; visualization, P.B.; supervision, N.B. O.M. and C.H. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding, and the APC was funded by the authors' research funds.

Institutional Review Board Statement: This study was conducted with ethical approval from the Social Research Ethics Committee (SREC) of University College Cork.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Restrictions apply to the availability of the data. Data were obtained in collaboration with non-academic research partner GIY and are available from the corresponding author with the permission of GIY.

Acknowledgments: The authors would like to extend their thanks to social enterprise GIY for their support in this research. The access provided by GIY was paramount in the completion of this study.

Conflicts of Interest: Social enterprise GIY played a support role, facilitating access to survey participants, however no financial funding was obtained. They played no part in the analyses, the interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

Appendix A

Table A1. Covariance matrix of eigenvalues for the principal component/factor analysis.

Variable	Category	Comp1	Comp2	Comp3
Turning lights off	Strongly Disagree	−1.156589	0.995677	0.665199
	Disagree	−0.83515	0.718959	0.480327
	Neutral	−0.47127	0.405704	0.271046
	Agree	−0.171714	0.147824	0.098759
	Strongly Agree	0.277944	−0.239275	−0.159856
Turn off tap when brushing teeth	Strongly Disagree	−0.759257	0.74899	0.606431
	Disagree	−0.500313	0.493548	0.399608
	Neutral	−0.316563	0.312282	0.252844
	Agree	−0.128904	0.127161	0.102958
	Strongly Agree	0.274028	−0.270323	−0.218871
Unplug devices	Strongly Disagree	−0.803506	0.84746	−0.267329
	Disagree	−0.419925	0.442897	−0.139711
	Neutral	−0.1554	0.163901	−0.051702
	Agree	0.057745	−0.060904	0.019212
	Strongly Agree	0.418842	−0.441754	0.13935
Shorter showers	Strongly Disagree	−0.79011	0.422441	−0.590644
	Disagree	−0.421805	0.225522	−0.315319
	Neutral	−0.130078	0.069548	−0.09724
	Agree	0.133231	−0.071233	0.099596
	Strongly Agree	0.490129	−0.262052	0.366394
Walk instead of drive	Strongly Disagree	−0.450637	−0.318363	−1.346433
	Disagree	−0.188817	−0.133394	−0.564156
	Neutral	0.002605	0.00184	0.007783
	Agree	0.158811	0.112196	0.474501
	Strongly Agree	0.381475	0.269502	1.139788
Improve recycling behaviours	Strongly Disagree	−1.031736	−1.11156	−0.085054
	Disagree	−0.759894	−0.818686	−0.062644
	Neutral	−0.416413	−0.44863	−0.034328
	Agree	−0.098761	−0.106402	−0.008142
	Strongly Agree	0.322259	0.347192	0.026566

Table A1. *Cont.*

Variable	Category	Comp1	Comp2	Comp3
Bring bags shopping	Strongly Disagree	−0.996086	−1.482217	1.224691
	Disagree	−0.878543	−1.307309	1.080172
	Neutral	−0.673256	−1.001834	0.827771
	Agree	−0.401468	−0.597401	0.493606
	Strongly Agree	0.11345	0.168818	−0.139487
Reuse plastics	Strongly Disagree	−1.005331	−1.012827	0.23989
	Disagree	−0.681388	−0.686469	0.162591
	Neutral	−0.354319	−0.356961	0.084547
	Agree	−0.043848	−0.044175	0.010463
	Strongly Agree	0.362226	0.364927	−0.086433

Appendix B

Table A2. Table displaying regression of general environmental behaviour.

Variable	Reference Category	Basic	Growth	Full Model
Dependant Variable: Tertile: Environmental Behaviour		**(1)**	**(2)**	**(3)**
Age: 45–64	Age: 25–44	0.962	0.911	0.804
		(0.114)	(0.110)	(0.103)
Age: 65+	Age: 25–44	0.905	0.788	0.530 *
		(0.210)	(0.187)	(0.132)
Male	Female	0.72	0.684	0.6
		(0.112)	(0.107)	(0.148)
Household: 2 people	Household: 1 person	1.115	1.142	0.725
		(0.255)	(0.263)	(0.119)
Household: 3 people	Household: 1 person	1.026	1.064	1.239
		(0.245)	(0.257)	(0.294)
Household: 4 people	Household: 1 person	1.084	1.126	1.133
		(0.252)	(0.264)	(0.282)
Household: More than 4	Household: 1 person	1.02	1.047	1.191
		(0.243)	(0.251)	(0.289)
Residence: Suburban	Residence: Rural	1.583	1.643	1.56 ***
		(0.200)	(0.210)	(0.208)
Residence: Urban	Residence: Rural	1.249	1.34	1.218
		(0.188)	(0.203)	(0.193)
Education: Post-Secondary	Education: Up to Secondary Level	0.614 *	0.598 *	0.524 **
		(0.142)	(0.139)	(0.127)
Education: 3rd level degree	Education: Up to Secondary Level	0.763	0.742	0.628
		(0.145)	(0.142)	(0.125)
Growing Experience: A lot	Growing Experience: A great deal/A lot		0.761 **	0.905
			(0.142)	(0.176)
Growing Experience: A moderate amount	Growing Experience: A great deal/A lot		0.585	0.77
			(0.105)	(0.145)
Stage of Growing: sowed and seedling	Stage of Growing: sowed		1.205	1.458
			(0.440)	(0.576)
Stage of Growing: sowed, seedling and harvest	Stage of Growing: sowed		1.663	1.825
			(0.631)	(0.748)
Stage of Growing: sowed, seedling, harvest and ate	Stage of Growing: sowed		1.818	1.854
			(0.639)	(0.706)
Seasonality: Sometimes	Seasonality: Never/Rarely			1.686 ***
				(0.267)
Seasonality: Often/Regularly	Seasonality: Never/Rarely			2.651 ***
				(0.456)
Composting: No	Composting: Yes			0.537 **
				(0.107)
Composting: Sometimes	Composting: Yes			0.938
				(0.225)
Economic attitude: Neutral	Economic attitude: Strongly disagree/Disagree			0.838
				(0.304)
Economic attitude: Agree/Strongly agree	Economic attitude: Strongly disagree/Disagree			1.104
				(0.378)
Environment attitude: Neutral	Environment attitude: Strongly disagree/disagree			1.299
				(0.522)
Environment attitude: Agree/Strongly Agree	Environment attitude: Strongly disagree/disagree			2.427 *
				(0.850)

Table A2. *Cont.*

Variable	Reference Category	Basic	Growth	Full Model
Dependant Variable: Tertile: Environmental Behaviour		**(1)**	**(2)**	**(3)**
Avoidable attitude: Neutral	Avoidable attitude: Strongly disagree/disagree			1.701 * (0.374)
Avoidable attitude: Agree/Strongly Agree	Avoidable attitude: Strongly disagree/disagree			1.192 (0.214)
Plan shop: Neutral	Plan shop: Strongly disagree/Disagree			1.094 (0.272)
Plan shop: Agree/Strongly Agree	Plan shop: Strongly disagree/Disagree			1.956 *** (0.392)
Buy more when offers: Neutral	Buy more when offers: Strongly Disagree/Disagree			0.884 (0.139)
Buy more when offers: Agree/Strongly agree	Buy more when offers: Strongly Disagree/Disagree			0.682 (0.093)
Feeling of social connection increased: Neutral	Feeling of social connection increased: Strongly disagree/ Disagree			1.001 (0.228)
Feeling of social connection increased: Agree/Strongly Agree	Feeling of social connection increased: Strongly disagree/ Disagree			1.229 (0.278)
Social Connection: Fair	Social Connection: Very poor/Poor			1.029 (0.249)
Social Connection: Good/Excellent	Social Connection: Very poor/Poor			0.98 (0.219)
Diet: Limited meat	Diet: Eat most meat			0.957 (0.150)
Diet: Vegan/Vegetarian	Diet: Eat most meat			1.514 (0.375)
Diet: Other	Diet: Eat most meat			0.783 (0.239)
N		1106	1106	1106
Log likelihood		−1203.96	−1192.25	−1119.13

$p < 0.05$ *, $p < 0.01$ **, $p < 0.001$ ***, Standard errors in parentheses. Analysis carried out using Stata v16.1.

Appendix C

Table A3. Goodness of fit tests for the ordinal regression.

	Number of Groups	Test Statistic	*p*-Value
Ordinal HL	10	14.351	0.6421
Lipsitz	10	6.099	0.7299
HL = Hosmer Lemeshow			

Table A4. Brant test for validity of the parallel lines assumption.

	Chi^2 Test Statistic	$p >$ chi^2	Degrees of Freedom
All variables	49.48	0.121	39

Appendix D

Table A5. Marginal effects on being in the 'Never/ Rarely' category of food waste frequency.

Food Waste Frequency	Reference Category	Marginal Effects of Full Model
Marginal Effect on Likelihood of Being in the Never/Rarely Category		
Tertiles: Neutral PCA.	Tertiles: Poor PCA.	0.033 (0.030)
Tertiles: Good PCA.	Tertiles: Poor PCA.	0.169 *** (0.033)
Age: 45–64	Age: 25–44	0.093 *** (0.027)
Age: 65+	Age: 25–44	0.08 (0.056)

Table A5. *Cont.*

Food Waste Frequency	Reference Category	Marginal Effects of Full Model
Male	Female	0.027 (0.035)
Household: 2 people	Household: 1 person	−0.024 (0.051)
Household: 3 people	Household: 1 person	−0.16 ** (0.053)
Household: 4 people	Household: 1 person	−0.194 *** (0.051)
Household: More than 4	Household: 1 person	−0.212 *** (0.053)
Residence: Suburban	Residence: Rural	−0.094 *** (0.028)
Residence: Urban	Residence: Rural	−0.052 (0.033)
Education: Post-Secondary	Education: Up to Secondary Level	−0.059 (0.051)
Education: 3rd level degree	Education: Up to Secondary Level	−0.08 (0.042)
Growing Experience: A moderate amount	Growing Experience: A great deal/A lot	−0.046 (0.042)
Growing Experience: A little/none	Growing Experience: A great deal/A lot	−0.083 * (0.041)
Stage of Growing: sowed and seedling	Stage of Growing: sowed	0.027 (0.077)
Stage of Growing: sowed, seedling and harvest	Stage of Growing: sowed	0.026 (0.080)
Stage of Growing: sowed, seedling, harvest and ate	Stage of Growing: sowed	0.019 (0.075)
Seasonality: Rarely	Seasonality: Never/Rarely	0.013 (0.031)
Seasonality: Often/Regularly	Seasonality: Never/Rarely	−0.023 (0.034)
Composting: No	Composting: Yes	−0.089 * (0.039)
Composting: Sometimes	Composting: Yes	−0.099 * (0.047)
Economic attitude: Neutral	Economic attitude: Strongly disagree/Disagree	−0.074 (0.072)
Economic attitude: Agree/Strongly agree	Economic attitude: Strongly disagree/Disagree	−0.074 (0.072)
Environment attitude: Neutral	Environment attitude: Strongly disagree/disagree	−0.07 (0.069)
Environment attitude: Agree/Strongly Agree	Environment attitude: Strongly disagree/disagree	−0.079 (0.069)
Avoidable attitude: Neutral	Avoidable attitude: Strongly disagree/disagree	−0.009 (0.040)
Avoidable attitude: Agree/Strongly Agree	Avoidable attitude: Strongly disagree/disagree	0.239 *** (0.036)
Plan shop: Neutral	Plan shop: Strongly disagree/Disagree	0.088 (0.045)
Plan shop: Agree/Strongly Agree	Plan shop: Strongly disagree/Disagree	0.217 *** (0.037)
Buy more when offers: Neutral	Buy more when offers: Strongly Disagree/Disagree	0 (0.034)
Buy more when offers: Agree/Strongly agree	Buy more when offers: Strongly Disagree/Disagree	−0.091 (0.029)
Feeling of social connection increased: Neutral	Feeling of social connection increased: Strongly disagree/Disagree	0.073 (0.044)
Feeling of social connection increased: Agree/Strongly Agree	Feeling of social connection increased: Strongly disagree/Disagree	0.087 * (0.043)
Social Connection: Fair	Social Connection: Very poor/Poor	−0.047 (0.051)
Social Connection: Good/Excellent	Social Connection: Very poor/Poor	−0.022 (0.047)
Diet: Limited meat	Diet: Eat most meat	0.062 (0.033)
Diet: Vegan/Vegetarian	Diet: Eat most meat	0.058 (0.052)
Diet: Other	Diet: Eat most meat	0.004 (0.066)
N		1106

$p < 0.05$ *, $p < 0.01$ **, $p < 0.001$ ***, Standard errors in parentheses. Analysis carried out using Stata v16.1.

Table A6. Marginal effect of being in the 'sometimes' category of food waste frequency.

Food Waste Frequency	Reference Category	Marginal Effects of Full Model
Marginal Effect on Likelihood of Being in the Sometimes Category		
Tertiles: Neutral PCA.	Tertiles: Poor PCA.	−0.015 (0.014)
Tertiles: Good PCA.	Tertiles: Poor PCA.	−0.092 *** (0.019)
Age: 45–64	Age: 25–44	−0.048 *** (0.014)
Age: 65+	Age: 25–44	−0.04 (0.031)
Male	Female	−0.014 (0.017)
Household: 2 people	Household: 1 person	0.016 (0.035)
Household: 3 people	Household: 1 person	0.096 ** (0.034)
Household: 4 people	Household: 1 person	0.111 *** (0.033)
Household: More than 4	Household: 1 person	0.119 *** (0.034)
Residence: Suburban	Residence: Rural	0.047 *** (0.014)
Residence: Urban	Residence: Rural	0.027 (0.017)
Education: Post-Secondary	Education: Up to Secondary Level	0.033 (0.029)
Education: 3rd level degree	Education: Up to Secondary Level	0.043 (0.025)
Growing Experience: A moderate amount	Growing Experience: A great deal/A lot	0.026 (0.025)
Growing Experience: A little/none	Growing Experience: A great deal/A lot	0.045 (0.024)
Stage of Growing: sowed and seedling	Stage of Growing: sowed	−0.013 (0.037)
Stage of Growing: sowed, seedling and harvest	Stage of Growing: sowed	−0.013 (0.038)
Stage of Growing: sowed, seedling, harvest and ate	Stage of Growing: sowed	−0.009 (0.035)
Seasonality: Rarely	Seasonality: Never/Rarely	−0.006 (0.016)
Seasonality: Often/Regularly	Seasonality: Never/Rarely	0.011 (0.017)
Composting: No	Composting: Yes	0.041 * (0.016)
Composting: Sometimes	Composting: Yes	0.045 * (0.018)
Economic attitude: Neutral	Economic attitude: Strongly disagree/Disagree	0.04 (0.041)
Economic attitude: Agree/Strongly agree	Economic attitude: Strongly disagree/Disagree	0.038 (0.040)
Environment attitude: Neutral	Environment attitude: Strongly disagree/disagree	0.056 (0.044)
Environment attitude: Agree/Strongly Agree	Environment attitude: Strongly disagree/disagree	0.043 (0.041)
Avoidable attitude: Neutral	Avoidable attitude: Strongly disagree/disagree	0.002 (0.008)
Avoidable attitude: Agree/Strongly Agree	Avoidable attitude: Strongly disagree/disagree	−0.111 *** (0.015)
Plan shop: Neutral	Plan shop: Strongly disagree/Disagree	−0.024 (0.013)
Plan shop: Agree/Strongly Agree	Plan shop: Strongly disagree/Disagree	−0.087 *** (0.012)
Buy more when offers: Neutral	Buy more when offers: Strongly Disagree/Disagree	0 (0.019)
Buy more when offers: Agree/Strongly agree	Buy more when offers: Strongly Disagree/Disagree	0.046 ** (0.015)
Feeling of social connection increased: Neutral	Feeling of social connection increased: Strongly disagree/ Disagree	−0.033 (0.018)

Table A6. *Cont.*

Food Waste Frequency	Reference Category	Marginal Effects of Full Model
Feeling of social connection increased: Agree/Strongly Agree	Feeling of social connection increased: Strongly disagree/ Disagree	−0.04 * (0.018)
Social Connection: Fair	Social Connection: Very poor/Poor	0.024 (0.027)
Social Connection: Good/Excellent	Social Connection: Very poor/Poor	0.011 (0.025)
Diet: Limited meat	Diet: Eat most meat	−0.033 (0.018)
Diet: Vegan/Vegetarian	Diet: Eat most meat	−0.031 (0.029)
Diet: Other	Diet: Eat most meat	−0.002 (0.032)
N		1106

$p < 0.05$ *, $p < 0.01$ **, $p < 0.001$ ***, Standard errors in parentheses. Analysis carried out using Stata v16.1.

Table A7. Marginal effects on being in the 'Frequent' category of food waste frequency.

Food Waste Frequency	Reference Category	Marginal Effects of Full Model
Marginal Effect on Likelihood of Being in the Frequent Category		
Tertiles: Neutral PCA.	Tertiles: Poor PCA.	−0.018 (0.017)
Tertiles: Good PCA.	Tertiles: Poor PCA.	−0.077 *** (0.015)
Age: 45–64	Age: 25–44	−0.046 *** (0.013)
Age: 65+	Age: 25–44	−0.04 (0.025)
Male	Female	−0.014 (0.017)
Household: 2 people	Household: 1 person	0.008 (0.017)
Household: 3 people	Household: 1 person	0.065 ** (0.020)
Household: 4 people	Household: 1 person	0.082 *** (0.020)
Household: More than 4	Household: 1 person	0.093 *** (0.022)
Residence: Suburban	Residence: Rural	0.047 *** (0.014)
Residence: Urban	Residence: Rural	0.024 (0.016)
Education: Post-Secondary	Education: Up to Secondary Level	0.026 (0.022)
Education: 3rd level degree	Education: Up to Secondary Level	0.036 (0.018)
Growing Experience: A moderate amount	Growing Experience: A great deal/A lot	0.02 (0.018)
Growing Experience: A little/none	Growing Experience: A great deal/A lot	0.039 * (0.018)
Stage of Growing: sowed and seedling	Stage of Growing: sowed	−0.014 (0.041)
Stage of Growing: sowed, seedling and harvest	Stage of Growing: sowed	−0.013 (0.042)
Stage of Growing: sowed, seedling, harvest and ate	Stage of Growing: sowed	−0.01 (0.039)
Seasonality: Rarely	Seasonality: Never/Rarely	−0.006 (0.015)
Seasonality: Often/Regularly	Seasonality: Never/Rarely	0.012 (0.018)
Composting: No	Composting: Yes	0.048 * (0.023)
Composting: Sometimes	Composting: Yes	0.054 (0.029)
Economic attitude: Neutral	Economic attitude: Strongly disagree/Disagree	0.034 (0.031)
Economic attitude: Agree/Strongly agree	Economic attitude: Strongly disagree/Disagree	0.032 (0.029)
Environment attitude: Neutral	Environment attitude: Strongly disagree/disagree	0.049 (0.034)
Environment attitude: Agree/Strongly Agree	Environment attitude: Strongly disagree/disagree	0.035 (0.028)
Avoidable attitude: Neutral	Avoidable attitude: Strongly disagree/disagree	0.007 (0.032)

Table A7. *Cont.*

Food Waste Frequency	Reference Category	Marginal Effects of Full Model
Avoidable attitude: Agree/Strongly Agree	Avoidable attitude: Strongly disagree/disagree	−0.128 *** (0.025)
Plan shop: Neutral	Plan shop: Strongly disagree/Disagree	−0.064 (0.034)
Plan shop: Agree/Strongly Agree	Plan shop: Strongly disagree/Disagree	−0.13 *** (0.029)
Buy more when offers: Neutral	Buy more when offers: Strongly Disagree/Disagree	0 (0.015)
Buy more when offers: Agree/Strongly agree	Buy more when offers: Strongly Disagree/Disagree	0.045 ** (0.014)
Feeling of social connection increased: Neutral	Feeling of social connection increased: Strongly disagree/ Disagree	−0.041 (0.026)
Feeling of social connection increased: Agree/Strongly Agree	Feeling of social connection increased: Strongly disagree/ Disagree	−0.047 (0.026)
Social Connection: Fair	Social Connection: Very poor/Poor	0.023 (0.024)
Social Connection: Good/Excellent	Social Connection: Very poor/Poor	0.01 (0.022)
Diet: Limited meat	Diet: Eat most meat	−0.029 (0.015)
Diet: Vegan/Vegetarian	Diet: Eat most meat	−0.028 (0.023)
Diet: Other	Diet: Eat most meat	−0.002 (0.034)
N		1106

$p < 0.05$ *, $p < 0.01$ **, $p < 0.001$ ***, Standard errors in parentheses. Analysis carried out using Stata v16.1.

Appendix E

Table A8. Generalised ordered logistic regression on frequency of food waste.

Food Waste Frequency	Reference Category	Odds Ratio of Full Model
Odds Ratio of Moving from Never/Rarely to Sometimes		
Tertiles: Neutral PCA.	Tertiles: Poor PCA.	0.848 (0.133)
Tertiles: Good PCA.	Tertiles: Poor PCA.	0.417 *** (0.071)
Age: 45–64	Age: 25–44	0.617 (0.085)
Age: 65+	Age: 25–44	0.678 *** (0.193)
Male	Female	0.708 (0.138)
Household: 2 people	Household: 1 person	1.115 (0.304)
Household: 3 people	Household: 1 person	2.171 ** (0.606)
Household: 4 people	Household: 1 person	2.625 *** (0.712)
Household: More than 4	Household: 1 person	2.932 *** (0.824)
Residence: Suburban	Residence: Rural	1.645 *** (0.242)
Residence: Urban	Residence: Rural	1.314 (0.225)
Education: Post-Secondary	Education: Up to Secondary Level	1.33 (0.358)
Education: 3rd level degree	Education: Up to Secondary Level	1.514 * (0.335)
Growing Experience: A moderate amount	Growing Experience: A great deal/A lot	1.271 (0.282)
Growing Experience: A little/none	Growing Experience: A great deal/A lot	1.526 * (0.327)
Stage of Growing: sowed and seedling	Stage of Growing: sowed	0.867 (0.355)
Stage of Growing: sowed, seedling and harvest	Stage of Growing: sowed	0.878 (0.374)
Stage of Growing: sowed, seedling, harvest and ate	Stage of Growing: sowed	0.909 (0.359)

Table A8. *Cont.*

Food Waste Frequency	Reference Category	Odds Ratio of Full Model
Seasonality: Rarely	Seasonality: Never/Rarely	0.939 (0.156)
Seasonality: Often/Regularly	Seasonality: Never/Rarely	1.121 (0.206)
Composting: No	Composting: Yes	1.602 * (0.334)
Composting: Sometimes	Composting: Yes	1.688 * (0.422)
Economic attitude: Neutral	Economic attitude: Strongly disagree/Disagree	1.575 (0.610)
Economic attitude: Agree/Strongly agree	Economic attitude: Strongly disagree/Disagree	1.519 (0.562)
Environment attitude: Neutral	Environment attitude: Strongly disagree/disagree	1.733 (0.725)
Environment attitude: Agree/Strongly Agree	Environment attitude: Strongly disagree/disagree	1.581 (0.591)
Avoidable attitude: Neutral	Avoidable attitude: Strongly disagree/disagree	1.041 (0.232)
Avoidable attitude: Agree/Strongly Agree	Avoidable attitude: Strongly disagree/disagree	0.3 *** (0.057)
Plan shop: Neutral	Plan shop: Strongly disagree/Disagree	0.612 (0.154)
Plan shop: Agree/Strongly Agree	Plan shop: Strongly disagree/Disagree	0.32 *** (0.067)
Buy more when offers: Neutral	Buy more when offers: Strongly Disagree/Disagree	0.993 (0.176)
Buy more when offers: Agree/Strongly agree	Buy more when offers: Strongly Disagree/Disagree	1.598 * (0.239)
Feeling of social connection increased: Neutral	Feeling of social connection increased: Strongly disagree/ Disagree	0.702 (0.164)
Feeling of social connection increased: Agree/Strongly Agree	Feeling of social connection increased: Strongly disagree/ Disagree	0.639 (0.148)
Social Connection: Fair	Social Connection: Very poor/Poor	1.103 (0.305)
Social Connection: Good/Excellent	Social Connection: Very poor/Poor	1.092 (0.272)
Diet: Limited meat	Diet: Eat most meat	0.718 −0.125
Diet: Vegan/Vegetarian	Diet: Eat most meat	0.73 (0.202)
Diet: Other	Diet: Eat most meat	0.617 (0.239)
Odds of moving from Sometimes to Frequently		
Tertiles: Neutral PCA.	Tertiles: Poor PCA.	0.848 (0.133)
Tertiles: Good PCA.	Tertiles: Poor PCA.	0.417 *** (0.071)
Age: 45–64	Age: 25–44	0.617 *** (0.085)
Age: 65+	Age: 25–44	0.678 (0.193)
Male	Female	1.579 (0.416)
Household: 2 people	Household: 1 person	1.115 (0.304)
Household: 3 people	Household: 1 person	2.171 ** (0.606)
Household: 4 people	Household: 1 person	2.625 *** (0.712)
Household: More than 4	Household: 1 person	2.932 *** (0.824)
Residence: Suburban	Residence: Rural	1.645 *** (0.242)
Residence: Urban	Residence: Rural	1.314 (0.225)
Education: Post-Secondary	Education: Up to Secondary Level	1.33 (0.358)
Education: 3rd level degree	Education: Up to Secondary Level	1.514 * (0.335)
Growing Experience: A moderate amount	Growing Experience: A great deal/A lot	1.271 (0.282)
Growing Experience: A little/none	Growing Experience: A great deal/A lot	1.526 * (0.327)
Stage of Growing: sowed and seedling	Stage of Growing: sowed	0.867 (0.355)
Stage of Growing: sowed, seedling and harvest	Stage of Growing: sowed	0.878 (0.374)
Stage of Growing: sowed, seedling, harvest and ate	Stage of Growing: sowed	0.909 (0.359)

Table A8. *Cont.*

Food Waste Frequency	Reference Category	Odds Ratio of Full Model
Seasonality: Rarely	Seasonality: Never/Rarely	0.939 (0.156)
Seasonality: Often/Regularly	Seasonality: Never/Rarely	1.121 (0.206)
Composting: No	Composting: Yes	1.602 * (0.334)
Composting: Sometimes	Composting: Yes	1.688 * (0.422)
Economic attitude: Neutral	Economic attitude: Strongly disagree/Disagree	1.575 (0.610)
Economic attitude: Agree/Strongly agree	Economic attitude: Strongly disagree/Disagree	1.519 (0.562)
Environment attitude: Neutral	Environment attitude: Strongly disagree/disagree	1.733 (0.725)
Environment attitude: Agree/Strongly Agree	Environment attitude: Strongly disagree/disagree	1.581 (0.591)
Avoidable attitude: Neutral	Avoidable attitude: Strongly disagree/disagree	1.041 (0.232)
Avoidable attitude: Agree/Strongly Agree	Avoidable attitude: Strongly disagree/disagree	0.3 *** (0.057)
Plan shop: Neutral	Plan shop: Strongly disagree/Disagree	0.612 (0.154)
Plan shop: Agree/Strongly Agree	Plan shop: Strongly disagree/Disagree	0.32 *** (0.067)
Buy more when offers: Neutral	Buy more when offers: Strongly Disagree/Disagree	0.993 (0.176)
Buy more when offers: Agree/Strongly agree	Buy more when offers: Strongly Disagree/Disagree	1.598 (0.239)
Feeling of social connection increased: Neutral	Feeling of social connection increased: Strongly disagree/ Disagree	0.702 (0.164)
Feeling of social connection increased: Agree/Strongly Agree	Feeling of social connection increased: Strongly disagree/ Disagree	0.639 (0.148)
Social Connection: Fair	Social Connection: Very poor/Poor	1.748 (0.542)
Social Connection: Good/Excellent	Social Connection: Very poor/Poor	1.092 (0.272)
Diet: Limited meat	Diet: Eat most meat	0.718 (0.125)
Diet: Vegan/Vegetarian	Diet: Eat most meat	0.73 (0.202)
Diet: Other	Diet: Eat most meat	2.116 (0.882)
N		1106

$p < 0.05$ *, $p < 0.01$ **, $p < 0.001$ ***, Standard errors in parentheses. Analysis carried out using Stata v16.1.

Appendix F

Table A9. Results of logistic regression on whether individuals were in the frequent category of food waste frequency.

Food Waste Frequency	Reference Category	Odds Ratio
Category		
Tertiles: Neutral PCA.	Tertiles: Poor PCA.	0.686 (0.167)
Tertiles: Good PCA.	Tertiles: Poor PCA.	0.366 *** (0.106)
Age: 45–64	Age: 25–44	0.618 * (0.137)
Age: 65+	Age: 25–44	0.861 (0.450)
Male	Female	1.573 (0.437)
Household: 2 people	Household: 1 person	2.290 (1.501)
Household: 3 people	Household: 1 person	3.031 (2.011)
Household: 4 people	Household: 1 person	4.545 * (2.915)

Table A9. *Cont.*

Food Waste Frequency	Reference Category	Odds Ratio
Category		
Household: More than 4	Household: 1 person	5.983 ** (3.889)
Residence: Suburban	Residence: Rural	1.472 (0.352)
Residence: Urban	Residence: Rural	1.459 (0.402)
Education: Post-Secondary	Education: Up to Secondary Level	2.918 (1.636)
Education: 3rd level degree	Education: Up to Secondary Level	3.312 * (1.675)
Growing Experience: A moderate amount	Growing Experience: A great deal/A lot	1.215 (0.484)
Growing Experience: A little/none	Growing Experience: A great deal/A lot	1.303 −0.493
Stage of Growing: sowed and seedling	Stage of Growing: sowed	0.770 −0.461
Stage of Growing: sowed, seedling and harvest	Stage of Growing: sowed	0.703 (0.455)
Stage of Growing: sowed, seedling, harvest and ate	Stage of Growing: sowed	0.795 (0.461)
Seasonality: Rarely	Seasonality: Never/Rarely	1.185 (0.306)
Seasonality: Often/Regularly	Seasonality: Never/Rarely	1.627 (0.475)
Composting: No	Composting: Yes	2.157 ** (0.623)
Composting: Sometimes	Composting: Yes	1.816 (0.679)
Economic attitude: Neutral	Economic attitude: Strongly disagree/Disagree	1.291 (0.709)
Economic attitude: Agree/Strongly agree	Economic attitude: Strongly disagree/Disagree	1.141 (0.606)
Environment attitude: Neutral	Environment attitude: Strongly disagree/disagree	1.513 (0.877)
Environment attitude: Agree/Strongly Agree	Environment attitude: Strongly disagree/disagree	1.405 (0.728)
Avoidable attitude: Neutral	Avoidable attitude: Strongly disagree/disagree	0.783 (0.234)
Avoidable attitude: Agree/Strongly Agree	Avoidable attitude: Strongly disagree/disagree	0.27 *** (0.070)
Plan shop: Neutral	Plan shop: Strongly disagree/Disagree	0.585 (0.201)
Plan shop: Agree/Strongly Agree	Plan shop: Strongly disagree/Disagree	0.337 *** (0.093)
Buy more when offers: Neutral	Buy more when offers: Strongly Disagree/Disagree	0.792 (0.259)
Buy more when offers: Agree/Strongly agree	Buy more when offers: Strongly Disagree/Disagree	1.824 * (0.447)
Feeling of social connection increased: Neutral	Feeling of social connection increased: Strongly disagree/ Disagree	0.631 (0.210)
Feeling of social connection increased: Agree/Strongly Agree	Feeling of social connection increased: Strongly disagree/ Disagree	0.534 (0.18)
Social Connection: Fair	Social Connection: Very poor/Poor	1.543 (0.645)
Social Connection: Good/Excellent	Social Connection: Very poor/Poor	0.917 (0.364)
Diet: Limited meat	Diet: Eat most meat	0.613 (0.202)
Diet: Vegan/Vegetarian	Diet: Eat most meat	0.824 (0.380)
Diet: Other	Diet: Eat most meat	2.254 (0.973)
N		1106

$p < 0.05$ *, $p < 0.01$ **, $p < 0.001$ ***, Standard errors in parentheses. Analysis carried out using Stata v16.1.

References

1. UNEP. *UNEP Food Waste Index Report 2021*; UNEP: Nairobi, Kenya, 2021.
2. Flanagan, A.; Priyadarshini, A. A Study of Consumer Behaviour towards Food-Waste in Ireland: Attitudes, Quantities and Global Warming Potentials. *J. Environ. Manag.* **2021**, *284*, 112046. [CrossRef] [PubMed]
3. Principato, L.; Mattia, G.; Di Leo, A.; Pratesi, C.A. The Household Wasteful Behaviour Framework: A Systematic Review of Consumer Food Waste. *Ind. Mark. Manag.* **2021**, *93*, 641–649. [CrossRef]
4. Scherhaufer, S.; Moates, G.; Hartikainen, H.; Waldron, K.; Obersteiner, G. Environmental Impacts of Food Waste in Europe. *Waste Manag.* **2018**, *77*, 98–113. [CrossRef] [PubMed]

5. Quested, T.E.; Marsh, E.; Stunell, D.; Parry, A.D. Spaghetti Soup: The Complex World of Food Waste Behaviours. *Resour. Conserv. Recycl.* **2013**, *79*, 43–51. [CrossRef]
6. FAO; IFAD; UNICEF; WFP; WHO. *The State of Food Security and Nutrition in the World 2021*; FAO: Rome, Italy; IFAD: Rome, Italy; UNICEF: New York, NY, USA; WFP: Rome, Italy; WHO: Geneva, Switzerland, 2021.
7. UN Sustainable Consumption and Production. Available online: https://www.un.org/sustainabledevelopment/sustainable-consumption-production/ (accessed on 30 September 2022).
8. Government of Ireland. *Waste Action Plan for a Circular Economy*; Government of Ireland: Dublin, Ireland, 2020.
9. Stenmarck, Â.; Jensen, C.; Quested, T.; Moates, G.; Buksti, M.; Cseh, B.; Juul, S.; Parry, A.; Politano, A.; Redlingshofer, B. *Estimates of European Food Waste Levels*; IVL Swedish Environmental Research Institute: Stockholm, Sweden, 2016.
10. Chinie, C.; Biclesanu, I.; Bellini, F. The Impact of Awareness Campaigns on Combating the Food Wasting Behavior of Consumers. *Sustainability* **2021**, *13*, 11423. [CrossRef]
11. Soma, T.; Li, B.; Maclaren, V. An Evaluation of a Consumer Food Waste Awareness Campaign Using the Motivation Opportunity Ability Framework. *Resour. Conserv. Recycl.* **2021**, *168*, 105313. [CrossRef]
12. Zamri, G.B.; Azizal, N.K.A.; Nakamura, S.; Okada, K.; Nordin, N.H.; Othman, N.; MDAkhir, F.N.; Sobian, A.; Kaida, N.; Hara, H. Delivery, Impact and Approach of Household Food Waste Reduction Campaigns. *J. Clean. Prod.* **2020**, *246*, 118969. [CrossRef]
13. Baker, D.; Fear, J.; Denniss, R. *What a Waste—An Analysis of Household Expenditure on Food*; The Australia Institute: Canberra, Australia, 2009.
14. Ganglbauer, E.; Fitzpatrick, G.; Comber, R. Negotiating Food Waste: Using a Practice Lens to Inform Design. *ACM Trans. Comput. Hum. Interact.* **2013**, *20*, 1–25. [CrossRef]
15. Shaw, P.; Smith, M.; Williams, I. On the Prevention of Avoidable Food Waste from Domestic Households. *Recycling* **2018**, *3*, 24. [CrossRef]
16. Schanes, K.; Dobernig, K.; Gözet, B. Food Waste Matters-A Systematic Review of Household Food Waste Practices and Their Policy Implications. *J. Clean. Prod.* **2018**, *182*, 978–991. [CrossRef]
17. Keegan, E.; Breadsell, J.K. Food Waste and Social Practices in Australian Households. *Sustainability* **2021**, *13*, 3377. [CrossRef]
18. Nash, N.; Whitmarsh, L.; Capstick, S.; Hargreaves, T.; Poortinga, W.; Thomas, G.; Sautkina, E.; Xenias, D. Climate-relevant Behavioral Spillover and the Potential Contribution of Social Practice Theory. *WIREs Clim. Change* **2017**, *8*, e481. [CrossRef]
19. Ananda, J.; Karunasena, G.G.; Mitsis, A.; Kansal, M.; Pearson, D. Analysing Behavioural and Socio-Demographic Factors and Practices Influencing Australian Household Food Waste. *J. Clean. Prod.* **2021**, *306*, 127280. [CrossRef]
20. Filimonau, V.; Mika, M.; Kubal-Czerwińska, M.; Zajadacz, A.; Durydiwka, M. Religious Values and Family Upbringing as Antecedents of Food Waste Avoidance. *Glob. Environ. Change* **2022**, *75*, 102547. [CrossRef]
21. Grasso, A.C.; Olthof, M.R.; Boevé, A.J.; van Dooren, C.; Lähteenmäki, L.; Brouwer, I.A. Socio-Demographic Predictors of Food Waste Behavior in Denmark and Spain. *Sustainability* **2019**, *11*, 3244. [CrossRef]
22. Koivupuro, H.-K.; Hartikainen, H.; Silvennoinen, K.; Katajajuuri, J.-M.; Heikintalo, N.; Reinikainen, A.; Jalkanen, L. Influence of Socio-Demographical, Behavioural and Attitudinal Factors on the Amount of Avoidable Food Waste Generated in Finnish Households. *Int. J. Consum. Stud.* **2012**, *36*, 183–191. [CrossRef]
23. Jörissen, J.; Priefer, C.; Bräutigam, K.-R. Food Waste Generation at Household Level: Results of a Survey among Employees of Two European Research Centers in Italy and Germany. *Sustainability* **2015**, *7*, 2695–2715. [CrossRef]
24. FAO. *Food Wastage Footprint: Impacts on Natural Resources: Summary Report*; FAO: Rome, Italy, 2013.
25. Boulet, M.; Hoek, A.C.; Raven, R. Towards a Multi-Level Framework of Household Food Waste and Consumer Behaviour: Untangling Spaghetti Soup. *Appetite* **2021**, *156*, 104856. [CrossRef]
26. Cerciello, M.; Agovino, M.; Garofalo, A. Estimating Urban Food Waste at the Local Level: Are Good Practices in Food Consumption Persistent? *Econ. Politica* **2019**, *36*, 863–886. [CrossRef]
27. Do Carmo Stangherlin, I.; De Barcellos, M.D. Drivers and Barriers to Food Waste Reduction. *Br. Food J.* **2018**, *120*, 2364–2387. [CrossRef]
28. Mondéjar-Jiménez, J.-A.; Ferrari, G.; Secondi, L.; Principato, L. From the Table to Waste: An Exploratory Study on Behaviour towards Food Waste of Spanish and Italian Youths. *J. Clean. Prod.* **2016**, *138*, 8–18. [CrossRef]
29. McCarthy, M.; O'Neill, C.; Hashem, S.; Moran, C. *An Exploration of the Dynamics between Household Food Sustainability Practices and Food Acquisition Routes*; SUSFOOD2: ERA-NET, PLATEFORMS—H20 EU Project 2018–2021; DAFM, Government of Ireland: Dublin, Ireland, 2021.
30. Roe, B.E.; Bender, K.; Qi, D. The Impact of COVID-19 on Consumer Food Waste. *Appl. Econ. Perspect. Policy* **2021**, *43*, 401–411. [CrossRef]
31. Lea, E.; Worsley, A. Australian Consumers' Food-Related Environmental Beliefs and Behaviours. *Appetite* **2008**, *50*, 207–214. [CrossRef] [PubMed]
32. Benyam, A.; Kinnear, S.; Rolfe, J. Integrating Community Perspectives into Domestic Food Waste Prevention and Diversion Policies. *Resour. Conserv. Recycl.* **2018**, *134*, 174–183. [CrossRef]
33. Stancu, V.; Haugaard, P.; Lähteenmäki, L. Determinants of Consumer Food Waste Behaviour: Two Routes to Food Waste. *Appetite* **2016**, *96*, 7–17. [CrossRef]
34. Visschers, V.H.; Wickli, N.; Siegrist, M. Sorting out Food Waste Behaviour: A Survey on the Motivators and Barriers of Self-Reported Amounts of Food Waste in Households. *J. Environ. Psychol.* **2016**, *45*, 66–78. [CrossRef]

35. Kollmuss, A.; Agyeman, J. Mind the Gap: Why Do People Act Environmentally and What Are the Barriers to pro-Environmental Behavior? *Environ. Educ. Res.* **2002**, *8*, 239–260. [CrossRef]
36. Nilsson, A.; Bergquist, M.; Schultz, W.P. Spillover Effects in Environmental Behaviors, across Time and Context: A Review and Research Agenda. *Environ. Educ. Res.* **2017**, *23*, 573–589. [CrossRef]
37. Sintov, N.; Geislar, S.; White, L.V. Cognitive Accessibility as a New Factor in Pro environmental Spillover: Results from a Field Study of Household Food Waste Management. *Environ. Behav.* **2019**, *51*, 50–80. [CrossRef]
38. Van der Werff, E.; Steg, L.; Keizer, K. Follow the Signal: When Past pro-Environmental Actions Signal Who You Are. *J. Environ. Psychol.* **2014**, *40*, 273–282. [CrossRef]
39. Lacasse, K. Can't Hurt, Might Help: Examining the Spillover Effects from Purposefully Adopting a New pro-Environmental Behavior. *Environ. Behav.* **2019**, *51*, 259–287. [CrossRef]
40. Nash, N.; Whitmarsh, L.; Capstick, S.; Thøgersen, J.; Gouveia, V.; de Carvalho Rodrigues Araújo, R.; Harder, M.K.; Wang, X.; Liu, Y. Reflecting on Behavioral Spillover in Context: How Do Behavioral Motivations and Awareness Catalyze Other Environmentally Responsible Actions in Brazil, China, and Denmark? *Front. Psychol.* **2019**, *10*, 788. [CrossRef]
41. Steinhorst, J.; Klöckner, C.A.; Matthies, E. Saving Electricity–For the Money or the Environment? Risks of Limiting pro-Environmental Spillover When Using Monetary Framing. *J. Environ. Psychol.* **2015**, *43*, 125–135. [CrossRef]
42. Lanzini, P.; Thøgersen, J. Behavioural Spillover in the Environmental Domain: An Intervention Study. *J. Environ. Psychol.* **2014**, *40*, 381–390. [CrossRef]
43. Poortinga, W.; Whitmarsh, L.; Suffolk, C. The Introduction of a Single-Use Carrier Bag Charge in Wales: Attitude Change and Behavioural Spillover Effects. *J. Environ. Psychol.* **2013**, *36*, 240–247. [CrossRef]
44. Thomas, G.O.; Poortinga, W.; Sautkina, E. The Welsh Single-Use Carrier Bag Charge and Behavioural Spillover. *J. Environ. Psychol.* **2016**, *47*, 126–135. [CrossRef]
45. Whitmarsh, L.; O'Neill, S. Green Identity, Green Living? The Role of pro-Environmental Self-Identity in Determining Consistency across Diverse pro-Environmental Behaviours. *J. Environ. Psychol.* **2010**, *30*, 305–314. [CrossRef]
46. Hargreaves, T. Practice-Ing Behaviour Change: Applying Social Practice Theory to pro-Environmental Behaviour Change. *J. Consum. Cult.* **2011**, *11*, 79–99. [CrossRef]
47. EPA. *Nature and Extent of Food Waste in Ireland*; EPA: Washington, DC, USA, 2022.
48. Rodgers, R.F.; Lombardo, C.; Cerolini, S.; Franko, D.L.; Omori, M.; Linardon, J.; Guillaume, S.; Fischer, L.; Fuller-Tyszkiewicz, M. "Waste Not and Stay at Home" Evidence of Decreased Food Waste during the COVID-19 Pandemic from the US and Italy. *Appetite* **2021**, *160*, 105110. [CrossRef]
49. Mullins, L.; Charlebois, S.; Finch, E.; Music, J. Home Food Gardening in Canada in Response to the COVID-19 Pandemic. *Sustainability* **2021**, *13*, 3056. [CrossRef]
50. Marsh, P.; Diekmann, L.O.; Egerer, M.; Lin, B.; Ossola, A.; Kingsley, J. Where Birds Felt Louder: The Garden as a Refuge during COVID-19. *Wellbeing Space Soc.* **2021**, *2*, 100055. [CrossRef] [PubMed]
51. *Qualtrics*; Developed by Qualtrics, First Released 2005, Version: August, 2021; Qualtrics: Provo, UT, USA, 2022.
52. Gregory-Smith, D.; Wells, V.K.; Manika, D.; Graham, S. An Environmental Social Marketing Intervention among Employees: Assessing Attitude and Behaviour Change. *J. Mark. Manag.* **2015**, *31*, 336–377. [CrossRef]
53. Russell, S.V.; Young, C.W.; Unsworth, K.L.; Robinson, C. Bringing Habits and Emotions into Food Waste Behaviour. *Resour. Conserv. Recycl.* **2017**, *125*, 107–114. [CrossRef]
54. Young, C.W.; Russell, S.V.; Robinson, C.A.; Chintakayala, P.K. Sustainable Retailing—Influencing Consumer Behaviour on Food Waste. *Bus. Strat. Environ.* **2018**, *27*, 1–15. [CrossRef]
55. Cicatiello, C.; Giordano, C. Measuring Household Food Waste at National Level: A Systematic Review on Methods and Results. *CAB Rev.* **2018**, *13*, 1–8. [CrossRef]
56. Smith, W.G. Does Gender Influence Online Survey Participation? A Record-Linkage Analysis of University Faculty Online Survey Response Behavior. *ERIC Doc. Reprod. Serv.* **2008**, ED501717.
57. Waitt, G.; Phillips, C. Food Waste and Domestic Refrigeration: A Visceral and Material Approach. *Soc. Cult. Geogr.* **2016**, *17*, 359–379. [CrossRef]
58. Fraser, C.; Parizeau, K. Waste Management as Foodwork: A Feminist Food Studies Approach to Household Food Waste. *CanFoodStudies* **2018**, *5*, 39–62. [CrossRef]
59. Duroy, Q.M. The Determinants of Environmental Awareness and Behavior. *J. Environ. Dev.* **2005**, 1–26.
60. Di Talia, E.; Simeone, M.; Scarpato, D. Consumer Behaviour Types in Household Food Waste. *J. Clean. Prod.* **2019**, *214*, 166–172. [CrossRef]
61. Van Geffen, L.; van Herpen, E.; van Trijp, H. Household Food Waste—How to Avoid It? An Integrative Review. In *Food Waste Management*; Närvänen, E., Mesiranta, N., Mattila, M., Heikkinen, A., Eds.; Springer International Publishing: Cham, Switzerland, 2020; pp. 27–55. ISBN 978-3-030-20560-7.
62. Maki, A.; Carrico, A.R.; Raimi, K.T.; Truelove, H.B.; Araujo, B.; Yeung, K.L. Meta-Analysis of pro-Environmental Behaviour Spillover. *Nat. Sustain.* **2019**, *2*, 307–315. [CrossRef]
63. Mudaliar, P.; McElroy, M.; Brenner, J.C. The Futility and Fatality of Incremental Action: Motivations and Barriers among Undergraduates for Environmental Action That Matters. *J. Environ. Stud. Sci.* **2022**, *12*, 133–148. [CrossRef]

64. Wiernik, B.M.; Ones, D.S.; Dilchert, S. Age and Environmental Sustainability: A Meta-Analysis. *J. Manag. Psychol.* **2013**, *28*, 826–856. [CrossRef]
65. Lorenzini, J.; Monsch, G.-A.; Rosset, J. Challenging Climate Strikers' Youthfulness: The Evolution of the Generational Gap in Environmental Attitudes Since 1999. *Front. Political Sci.* **2021**, *3*, 633563. [CrossRef]
66. Department of The Environment, Climate and Communications. *Ireland's National Food Waste Prevention Roadmap*; Department of The Environment, Climate and Communications: Dublin, Ireland, 2022.
67. Reed, B. Shifting from 'Sustainability' to Regeneration. *Build. Res. Inf.* **2007**, *35*, 674–680. [CrossRef]