

# Attitudes and Subjective Norms Predicting Perceived Behavioral Control of Food Waste Reduction: Evidence from the Kurdistan Region Using the Theory of Planned Behavior.

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## ABSTRACT

Food waste has become a pressing global sustainability challenge, reflecting both environmental degradation and inefficient resource utilization. This study explores the relationships between attitudes, subjective norms, and perceived behavioral control (PBC) toward food waste reduction in the Kurdistan Region of Iraq, guided by the Theory of Planned Behavior (TPB). A quantitative approach was applied using an online survey of 205 respondents from Duhok City, employing a convenience sampling technique. Data were analyzed using SPSS version 26 through descriptive statistics, reliability and validity tests (Cronbach's alpha, KMO, and Bartlett's test), and multiple regression analysis. The results revealed that attitudes ( $\beta = 0.46, p < .001$ ) and subjective norms ( $\beta = 0.30, p < .001$ ) significantly influence perceived behavioral control ( $R^2 = 0.314$ ), indicating that moral attitudes and social influence are key predictors of individuals' perceived capacity to reduce food waste. The study confirms the applicability of the Theory of Planned Behavior in understanding food waste reduction-related perceptions in emerging economies and highlights the importance of public education, social campaigns, and household awareness programs. The findings provide valuable insights for policymakers, educators, and environmental organizations seeking to foster behavioral change and sustainability in the Kurdistan Region of Iraq.

## 1. Introduction

Food waste is one of the most critical global sustainability challenges, representing not only a loss of valuable resources but also a major contributor to environmental degradation and greenhouse gas emissions. According to the Food and Agriculture Organization (FAO), approximately 1.3 billion tons of food around one third of all food produced for human consumption is wasted or lost each year (Vilariño et al. 2017; Karus & Karus 2018). This issue becomes even more alarming when juxtaposed with the fact that nearly one billion people worldwide continue to experience hunger and malnutrition (FAO et al. 2021). The paradox of abundance and scarcity within the same global food system underscores both moral and practical imperatives for reducing waste and promoting sustainable consumption. Food waste occurs at all stages of the supply chain, from agricultural production and transportation to retail and household consumption, but consumer behavior is considered one of the most decisive factors. Studies estimate that roughly 35% of total food waste worldwide can be attributed to

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household-level behaviors (Zhang et al. 2020). These behaviors are shaped by psychological, cultural, and social factors that determine individuals' attitudes and practices toward food usage and disposal. Consequently, addressing the behavioral dimension of food waste has become a priority for sustainability research and policy initiatives (Kör et al. 2021). In the context of Iraq's Kurdistan Region, food waste is an emerging yet under-researched concern. While comprehensive national data are scarce, prior evidence suggests that municipal solid waste in urban centers such as Sulaimania contains a high proportion of food residues, highlighting the significant organic component of waste streams in the region (Hama et al. 2021). The region faces additional pressures such as rapid urbanization, population growth, and environmental stressors linked to limited water availability and rising temperatures (Sulaiman et al. 2022). These challenges make it imperative to understand how individuals' perceptions, values, and social norms influence their daily consumption and waste practices. Without such understanding, policy interventions risk remaining ineffective or unsustainable at the local level. The Theory of Planned Behavior (TPB) (Ajzen 1991) provides a useful framework for exploring the psychological determinants of food waste behavior. According to TPB, human actions are driven by three main constructs: attitudes, subjective norms, and perceived behavioral control. Numerous studies have validated TPB in explaining sustainable food practices across cultures (Visschers et al. 2016; Wang et al. 2022; Chen 2022), but empirical applications in Middle Eastern contexts remain limited. Moreover, contextual elements such as religiosity, cultural food habits, and moral beliefs may interact with these constructs, producing unique behavioral patterns (Elshaer et al. 2021; Aydin & Yildirim 2021). Recent studies from the Middle East and comparable developing regions emphasize that food waste behaviors are deeply embedded in cultural, familial, and religious norms, which differ substantially from Western consumption contexts (Elshaer et al. 2021; Aydin & Yildirim 2021; Bhatti et al. 2023).

## **2. Theoretical Framework and Hypotheses Development**

The Theory of Planned Behavior (TPB) (Ajzen 1991) serves as the conceptual foundation for this study and has been widely applied to explain food waste and other pro-environmental behaviors. Recent empirical and review-based studies have confirmed the robustness of the TPB framework in the context of food waste reduction, demonstrating its effectiveness in explaining how attitudes, subjective norms, and perceived behavioral control shape household food waste behaviors (Russell et al. 2017). More recent evidence further supports the applicability of TPB in sustainability research, particularly in understanding environmentally responsible consumption practices (Kör et al. 2021; Chen 2022).

### **2.1. Attitudes**

Attitudes reflect an individual's overall evaluation of performing a behavior, whether it is viewed as favorable or unfavorable (Ajzen 1991). In the context of food waste, positive attitudes often stem from ethical, environmental, or financial considerations (Zhang et al. 2023; Hubinger 2022). People who believe that reducing food waste is morally right, environmentally necessary, or economically beneficial are more inclined to engage in waste-minimizing behaviors. Prior studies confirm that favorable attitudes significantly predict intentions to reduce food waste across diverse populations (Salins & Aithal 2022). Thus, individuals with stronger positive attitudes toward minimizing food waste are expected to demonstrate higher confidence in their ability to control and manage their food consumption effectively.

### **2.2. Subjective Norms and Social Influence**

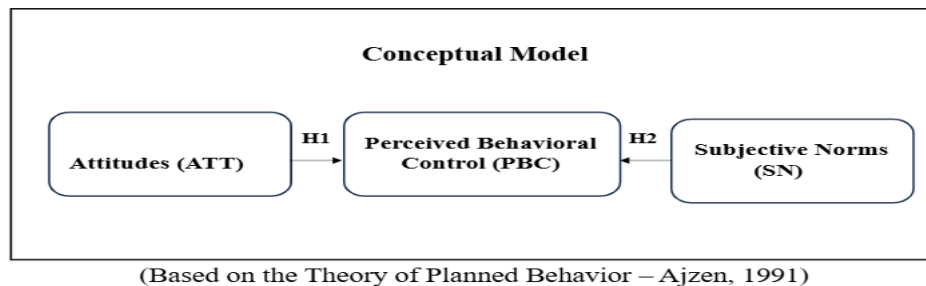
Subjective norms refer to the perceived social pressure from important others, such as family, friends, or society, to perform or avoid certain behaviors (Ajzen 1991). When individuals believe that people close to them approve of food waste reduction, they are more likely to conform to these expectations (Visschers et al. 2016). Social approval can strengthen personal motivation to act sustainably, particularly in collectivist societies where communal norms carry substantial weight. Evidence from neighboring Middle Eastern and Asian contexts shows that cultural and moral influences, including religiosity and family expectations, play a vital role in shaping individuals' food consumption and waste practices (Elshaer et al. 2021; Aydin & Yildirim 2021; Bhatti et al. 2023). Accordingly, subjective norms are anticipated to positively influence individuals' perceived behavioral control by reinforcing a sense of responsibility and social accountability.

### 2.3. Perceived Behavioral Control (PBC)

Perceived behavioral control represents the degree to which individuals feel capable of performing a particular action (Ajzen 1991). In the domain of food waste, this includes confidence in one's ability to plan meals, store food properly, or reuse leftovers effectively (Russell et al. 2017; van der Werf et al. 2019). Individuals with higher PBC tend to engage more consistently in sustainable consumption behaviors, as they perceive fewer barriers and greater personal agency (Ang et al. 2021). Furthermore, prior research indicates that perceived control not only directly affects behavior but may also be influenced by other TPB constructs, such as attitudes and subjective norms (Wang et al. 2022).

### 2.4. Conceptual Model

Drawing upon the Theory of Planned Behavior (TPB), this study conceptualizes the relationships among attitudes, subjective norms, and perceived behavioral control in the context of food waste reduction in the Kurdistan Region. The proposed model posits that attitudes and subjective norms are positively associated with individuals' perceived behavioral control regarding food waste reduction. In line with TPB assumptions, favorable moral evaluations and supportive social expectations are expected to strengthen individuals' confidence in their ability to manage food consumption and reduce waste. Figure 1 illustrates the conceptual framework of the study, showing the hypothesized relationships between attitudes, subjective norms, and perceived behavioral control in the context of food waste reduction.



**Figure 1.** Conceptual model based on the Theory of Planned Behavior (TPB)

### 2.5. Hypotheses Development

Grounded in the literature and the assumptions of the Theory of Planned Behavior, the following hypotheses are proposed:

**H<sub>1</sub>:** Positive attitudes toward minimizing food waste are positively associated with perceived behavioral control over food waste reduction in the Kurdistan Region.

**H<sub>2</sub>:** Subjective norms encouraging food waste reduction are positively associated with perceived behavioral control over food waste reduction in the Kurdistan Region.

These hypotheses reflect the expectation that moral convictions (attitudes) and social expectations (subjective norms) serve as important predictors of individuals' perceived ability to manage and reduce food waste effectively.

### 3. Literature Review

Reducing food waste is an essential component of global sustainability efforts, with major implications for environmental, economic, and ethical well-being. While prior research has explored food waste from production, supply chain, and retail perspectives (Bilska et al. 2020; Jurgilevich et al. 2016; Kör et al. 2021), growing attention has been directed toward understanding individual and household behaviors that contribute to waste generation. The Theory of Planned Behavior (TPB) (Ajzen 1991) provides a widely accepted lens through which the determinants of such behaviors can be examined. The following subsections review key empirical studies addressing attitudes, subjective norms, and perceived behavioral control as predictors of food waste reduction.

### 3.1. Attitudes Toward Food Waste Reduction

Attitudes represent an individual's cognitive and emotional evaluation of a behavior, reflecting how positively or negatively one views it (Ajzen 1991). Numerous studies confirm that individuals with more positive attitudes toward food conservation are less likely to waste food. For instance, Zhang et al. (2023) and Hubinger (2022) demonstrated that consumers' moral awareness and emotional engagement significantly influence their willingness to avoid waste. Similarly, Salins and Aithal (2022) found that individuals who associate food waste with negative emotions such as guilt or regret are more motivated to engage in sustainable practices. Research has shown that attitudes toward food waste are shaped by both cognitive processes and contextual factors. Recent studies emphasize that attitudes grounded in moral considerations, ethical responsibility, and emotional engagement are more influential in shaping food-related behaviors than purely rational evaluations (Schanes et al. 2018). Empirical and meta-analytical research further highlights the importance of moral norms, ethical awareness, and personal responsibility in reducing household food waste, demonstrating that affectively driven attitudes play a central role in sustainable consumption behavior (Ang et al. 2021; Boulet et al. 2021; Zhang et al. 2023). External conditions further influence how attitudes translate into food waste reduction behavior. Alcorn et al. (2020) observed that unclear food expiration labeling can distort consumer perceptions of food edibility, leading to unnecessary disposal. Similarly, Nikravech (2023) highlighted the importance of educational and policy-driven campaigns in correcting misconceptions and strengthening positive sustainability-oriented attitudes. Taken together, these findings suggest that interventions addressing both cognitive understanding and emotional engagement are essential for fostering enduring behavioral change. Recent meta-analytical evidence further confirms the central role of psychological and social drivers in food waste reduction. For example, Zhang et al. (2023) conducted a meta-analysis on food-waste-reducing interventions and found that attitudinal and normative mechanisms significantly influence individuals' waste-related behaviors. Similarly, Kör et al. (2021) emphasized that behavioral and awareness-based strategies are more effective than purely technical solutions in reducing household food waste. These findings reinforce the relevance of the Theory of Planned Behavior and highlight the importance of moral attitudes and social norms in shaping sustainable food consumption.

### 3.2. Subjective Norms and Social Influence

Subjective norms describe perceived social pressures or expectations that encourage or discourage certain behaviors (Ajzen 1991). In the context of food waste, family traditions, cultural expectations, and religious beliefs are closely associated with individuals' behavioral orientations and intentions (Visschers et al. 2016; Bhatti et al. 2023). Elshaer et al. (2021) highlighted that religiosity and food culture are closely associated with food-related behaviors in Saudi Arabia, where wasting food is widely perceived as both a moral and religious concern. Similarly, Aydin and Yildirim (2021) reported that moral values and habitual norms are strongly associated with waste-related decisions among Turkish households. These findings suggest that collectivist cultures, such as those prevalent in many Middle Eastern societies, are characterized by strong social norms and familial expectations that are closely linked to food waste related behaviors. Evidence from diverse cultural contexts further underscores the importance of social approval and peer influence in shaping food waste behavior. For example, Tsai et al. (2020) found that environmental concern and peer influence among younger consumers in China were significantly associated with intentions to avoid food waste. Similarly, cross-national research has shown that subjective norms, alongside moral considerations and taste-related factors, play a significant role in influencing food waste behavior in institutional and collective consumption settings (Wang et al. 2022). These findings are consistent with more recent evidence from developing and non-Western contexts, which highlights the continued relevance of family expectations, peer pressure, and social norms in shaping food waste-related practices (Bhatti et al. 2023). Evidence from Middle Eastern and culturally similar societies further indicates that family expectations, religious values, and communal norms are closely associated with food waste related behaviors and perceptions, often representing stronger normative reference points than formal regulations or individual preferences (Elshaer et al. 2021; Aydin & Yildirim 2021; Bhatti et al. 2023). In the Kurdistan Region, where family structures are strong and cultural norms emphasize hospitality and generosity, subjective norms may be particularly salient in relation to food waste perceptions. While such cultural values can be associated with

abundance and over-preparation, they may also foster collective responsibility for resource conservation when supported by targeted awareness campaigns and social initiatives. Accordingly, this study examines how social expectations and communal attitudes are associated with individuals' perceived behavioral control over food waste reduction in the region.

### **3.3. Perceived Behavioral Control (PBC) and Behavioral Capability**

Perceived behavioral control refers to an individual's confidence in their ability to perform a particular action and to manage potential obstacles (Ajzen 1991). Within food waste research, PBC includes the perceived ease of meal planning, portion estimation, food storage, and reuse of leftovers (Russell et al. 2017; van der Werf et al. 2019). Studies have shown that individuals who perceive higher control over these processes tend to waste less food and adopt more sustainable consumption habits (Ang et al. 2021). Visschers et al. (2016) confirmed that PBC significantly predicts waste-reduction behavior, noting that individuals confident in their ability to store or reprocess leftovers demonstrate lower levels of waste. Pearson and Perera (2018) proposed that targeted social marketing campaigns emphasizing practical skills such as proper food storage and meal portioning can strengthen perceived control and thereby promote waste prevention. Perceived behavioral control is not solely a matter of personal competence; it also reflects external enabling conditions. For instance, inadequate food storage infrastructure or time constraints may be associated with lower levels of perceived behavioral control, even when awareness is high (van der Werf et al. 2019). This suggests that providing individuals with not only knowledge, but also adequate resources and supportive environments is closely linked to stronger perceptions of control and more sustainable food-related practices. Overall, the literature indicates that perceived behavioral control is an important predictor of food waste behavior. However, as highlighted by Ang et al. (2021) and Chen (2022), its predictive strength is closely associated with individuals' attitudes and perceived social norms. Accordingly, the current study examines the predictive relationships among attitudes, subjective norms, and perceived behavioral control in the context of the Kurdistan Region, with the aim of providing region-specific evidence to inform local sustainability initiatives.

### **3.4. Summary of Literature and Research Gap**

The reviewed literature underscores the consistent relevance of the Theory of Planned Behavior (TPB) constructs in explaining food waste behavior across various cultural settings. However, a notable research gap exists in the Kurdistan Region of Iraq, where empirical evidence on the behavioral determinants of food waste remains scarce. Food waste is a growing environmental concern in the Kurdistan Region (Hama et al. 2021), with more recent regional and sustainability-focused studies highlighting the urgency of behavioral and policy interventions in similar developing contexts (Massoudi & Ahmed 2021; Nikravech 2023). Despite this emerging evidence, little is known about the psychological and social mechanisms driving household food waste behavior in Kurdistan. Moreover, few studies have empirically tested the applicability of the TPB within the region's unique sociocultural environment, characterized by strong familial norms, moral values, and religious influences. This study seeks to bridge this gap by examining the predictive relationships between attitudes, subjective norms, and perceived behavioral control in relation to individuals' perceived capacity to minimize food waste in the Kurdistan Region. The findings are expected to contribute not only to behavioral theory but also to the design of context-sensitive interventions and sustainable consumption strategies relevant to the Kurdish cultural context.

## **4. Methodology**

### **4.1. Research Design**

This study employed a quantitative research design to examine the predictive relationships between attitudes, subjective norms, and perceived behavioral control (PBC) in relation to individuals' intention to minimize food waste in the Kurdistan Region of Iraq. The Theory of Planned Behavior (TPB) (Ajzen 1991) provided the conceptual foundation for constructing and analyzing the study variables. A cross-sectional online survey method was selected for its efficiency in reaching a geographically diverse

population and for ensuring anonymity in responses, thereby helping to minimize potential social desirability bias.

#### 4.2. Population and Sampling

The study targeted residents of Duhok City, located in the Kurdistan Region of Iraq, as the primary population. Duhok represents a culturally and economically diverse area, providing a suitable context for examining individual food waste behaviors. The research utilized a non-probability convenience sampling technique, given the accessibility of respondents and the feasibility of online data collection. A total of 205 valid responses were obtained through the survey. According to Tabachnick and Fidell's (2019) general rule of sample adequacy ( $N > 50 + 8m$ , where  $m$  is the number of independent variables), this sample size was sufficient for multiple regression analysis. The sample also exceeded the minimum threshold of 200 participants recommended for factor analysis (Hair et al. 2019), ensuring reliable statistical testing.

#### 4.3. Data Collection Procedure

Data were collected using a structured online questionnaire administered via Google Forms between March and April 2024. The link to the survey was distributed through social media platforms (WhatsApp, Facebook, and Viber) to maximize outreach among Duhok residents. Participation was voluntary and anonymous, and all respondents provided informed consent before proceeding. The questionnaire consisted of three main constructs derived from the Theory of Planned Behavior (TPB), specifically attitudes toward minimizing food waste (eight items), subjective norms toward food waste reduction (six items), and perceived behavioral control (seven items). All items were adapted from validated scales employed in previous studies by (Kristia et al. 2023; Visschers et al. 2016) to ensure reliability and theoretical consistency. Each statement was measured using a five-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). In addition, the questionnaire included a demographic section designed to capture respondents' gender, age, education level, marital status, income, and religion, allowing for contextual analysis of behavioral variations across different sociodemographic groups. Prior to data collection, the questionnaire items were carefully reviewed and adapted to ensure clarity, cultural relevance, and contextual suitability for respondents in the Kurdistan Region. Minor wording adjustments were made to reflect local food consumption practices while preserving the original meaning of each item. The questionnaire was administered in a clear and accessible format to minimize ambiguity. A preliminary review was conducted to assess item clarity and comprehension, and no major issues were identified. Construct validity and reliability were subsequently evaluated using exploratory factor analysis, Cronbach's alpha, and related statistical tests, confirming that the adapted scales were appropriate for the study context.

#### 4.4. Ethical Considerations

Ethical research principles were carefully observed throughout the study. Participants were informed of the study's purpose, assured of confidentiality, and informed that their participation was voluntary and anonymous. No personal identifiers were collected. Ethical approval for conducting this research was obtained from the Ethical Committee of the University of Debrecen, Faculty of Economics and Business, in accordance with institutional guidelines for human subject research.

#### 4.5. Data Analysis Techniques

Data analysis was performed using IBM SPSS Statistics version 26, following a systematic multi-step procedure. First, descriptive statistics were computed to summarize the demographic characteristics of respondents through frequency distributions and percentages. Next, reliability analysis was conducted to assess the internal consistency of the measurement scales using Cronbach's alpha, where coefficients above 0.70 were considered acceptable (Nunnally & Bernstein 1994). To evaluate sampling adequacy and the suitability of the data for factor analysis, the Kaiser–Meyer–Olkin (KMO) measure and Bartlett's Test of Sphericity were applied. Subsequently, an exploratory factor analysis (EFA) was performed using the maximum likelihood extraction method with Varimax rotation to examine construct validity and identify underlying factor structures among the study variables. Although the questionnaire items were adapted from previously validated scales, exploratory factor analysis (EFA) was employed due to

the contextual and cultural adaptation of the instruments to the Kurdistan Region. EFA is considered appropriate when measurement scales are applied in new cultural or regional settings, as it allows for the examination of underlying factor structures without imposing predefined constraints. This approach provided support for the appropriateness of the adapted items and their alignment with the intended constructs within the local context. Finally, a multiple regression analysis was conducted to examine the predictive relationships between attitudes (ATT) and subjective norms (SN) in relation to perceived behavioral control (PBC), thereby testing the two proposed hypotheses ( $H_1$  and  $H_2$ ). The regression model was specified as follows:

$$PBC = \beta_0 + \beta_1(ATT) + \beta_2(SN) + \varepsilon$$

where  $\beta_1$  and  $\beta_2$  represent the standardized regression coefficients for attitudes and subjective norms, respectively, and  $\varepsilon$  denotes the error term.

## 5. Results:

### 5.1. Demographic Profile

The demographic profile of respondents is presented in Table 1. Among the 205 participants, 55.1% were male and 44.9% were female. The largest age group was 36–45 years (35.6%), followed by 31–35 years (23.9%) and 25–30 years (19.5%). Most participants had postgraduate qualifications, with 34.1% possessing a master's degree and 16.6% a Ph.D., indicating a relatively well-educated sample. In terms of marital status, 62% were married and 35.6% were single. The majority (93.7%) identified as Muslim, reflecting the religious composition of the Kurdistan Region. Regarding income, 40% reported a monthly income between \$500 and \$1,000, while 29.8% earned below \$500. This diversity in demographic background enhances the representativeness of the sample and suggests that awareness of food waste reduction behaviors spans multiple socioeconomic groups within Duhok City.

**Table 1.** Demographic information of the respondents

Variables	Description	Frequency	Percentage %
Gender	Male	113	55.1 %
	Female	92	44.9 %
Age	Less than 25 years	26	12.7 %
	25-30 years	40	19.5 %
	31-35 years	49	23.9 %
	36-45 years	73	35.6 %
	More than 46	17	8.3 %
Education	Diploma	25	12.2 %
	Bachelor	66	32.2 %
	Master	70	34.1 %
	Ph.D.	34	16.6 %
	Other	10	4.5 %
Marital Status	Single	73	35.6 %
	Married	127	62.0 %
	Divorced	3	1.5 %
	Widowed	2	1.0 %
Religion	Muslim	192	93.7 %
	Christian	4	2.0 %
	Yazidi	1	0.5 %
	No Answer	8	3.9 %
Income	Less than 500\$	61	29.8 %
	500-1000\$	82	40.0 %

	1000-1500\$	29	14.1 %
	1500-2000\$	18	8.8 %
	More than 2000\$	15	7.3 %

Source: Author's own data collection (N = 205).

## 5.2. Results of the Questionnaire Survey

This study examined the predictive relationships between attitudes, subjective norms, and perceived behavioral control in relation to individuals' intentions to minimize food waste for a sustainable future in the Kurdistan Region. The analysis begins with the descriptive results for the attitudes of construct, followed by the subsequent dimensions.

### 5.2.1. Attitudes Toward Minimizing Food Waste

Table 2 presents the frequency distributions, percentages, means, and standard deviations of the eight attitude items (AT1–AT8). The results indicate that respondents demonstrated generally strong positive attitudes toward minimizing food waste, with mean values ranging from 4.06 to 4.31 across all items. The highest level of agreement was observed for the statement “*It is immoral to discard foods while other people in the world are starving*” (AT8; M = 4.31, SD = 1.19), suggesting that moral awareness plays a central role in shaping attitudes toward food waste reduction. The lowest mean score was recorded for the statement “*Wasting food makes me feel regretful*” (AT5; M = 4.06, SD = 1.24), indicating that emotional regret, while present, is slightly less dominant than moral considerations. Overall, the average mean score of the attitude construct was 4.16, reflecting a high level of agreement among respondents. Across all items, the majority of participants selected “Agree” or “Strongly Agree,” confirming a generally favorable and ethically driven attitude toward minimizing food waste. The relatively low and consistent standard deviations across items (SD range = 1.17–1.29) indicate homogeneous response patterns among participants in Duhok City.

**Table 2.** Frequency Distribution, Percentages, Mean, and Standard Deviation of the Attitudes Variable (N = 205)

Q	Strongly Agree (5)		Agree (4)		Neutral (3)		Disagree (2)		Strongly Disagree (1)		Mean	Standard Deviation
	F	%	F	%	F	%	F	%	F	%		
AT 1	126	61.5	33	16.1	18	8.8	15	7.3	13	6.3	4.19	1.24
AT 2	118	57.6	31	15.1	27	13.2	14	6.8	15	7.3	4.09	1.28
AT 3	119	58.0	38	18.5	20	9.8	9	4.4	19	9.3	4.12	1.29
AT 4	127	62.0	32	15.6	23	11.2	9	4.4	14	6.8	4.21	1.22
AT 5	104	50.7	53	25.9	18	8.8	16	7.8	14	6.8	4.06	1.24
AT 6	122	59.5	40	19.5	21	10.2	10	4.9	12	5.9	4.22	1.17
AT 7	116	56.6	39	19	25	12.2	10	4.9	15	7.3	4.13	1.24
AT 8	137	66.8	29	14.1	18	8.8	7	3.4	14	6.8	4.31	1.19

*Note.* N = 205. Items were measured on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). Source: Author's own data.

### 5.2.2. Subjective Norms Toward Food Waste Reduction

Table 3 presents the frequency of distributions, percentages, means, and standard deviations of the six subjective-norm items (SN1–SN6). The results indicate that respondents generally reported moderately positive perceptions of social expectations related to minimizing food waste, with mean values ranging from 2.98 to 4.00 across the items. The highest mean score was recorded for the statement “*My family encourages me to minimize the amount of food I waste*” (SN2; M = 4.00, SD = 1.33), indicating that family expectations play a strong role in shaping perceptions of food waste reduction within Kurdish

households. In contrast, the lowest mean score was associated with the statement “*People who are important to me find my attempts to reduce food waste unnecessary*” (SN5;  $M = 2.98$ ,  $SD = 1.27$ ), suggesting that social support for food-saving behaviors is not uniformly reinforced across all social circles. Across all items, a substantial proportion of respondents selected “Agree” or “Strongly Agree,” indicating that subjective norms are generally perceived as supportive of food waste reduction, although some variability exists regarding peer and societal influence. The relatively narrow range of standard deviations ( $SD$  range = 1.19–1.39) reflects a consistent pattern of responses among participants.

**Table 3.** Frequency Distribution, Percentages, Mean, and Standard Deviation of the Subjective-Norms Variable (N = 205)

Q	Strongly Agree (5)		Agree (4)		Neutral (3)		Disagree (2)		Strongly Disagree (1)		Mean	Standard Deviation
	F	%	F	%	F	%	F	%	F	%		
SN 1	64	31.2	56	27.3	35	17.1	21	10.2	29	14.1	3.51	1.39
SN 2	112	54.6	34	16.6	22	10.7	21	10.2	16	7.8	4.00	1.33
SN 3	83	40.5	44	21.5	46	22.4	19	9.3	13	6.3	3.80	1.24
SN 4	57	27.8	49	23.9	63	30.7	22	10.7	14	6.8	3.55	1.19
SN 5	31	15.1	39	19	60	29.3	44	21.5	31	15.1	2.98	1.27
SN 6	45	22.0	44	21.5	54	26.3	37	18.0	25	12.2	3.23	1.31

*Note.* N = 205. Items were measured on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). Source: Author’s own data.

### 5.2.3. Perceived Behavioral Control (PBC)

Table 4 presents the frequency distributions, percentages, means, and standard deviations of the seven perceived behavioral control items (PBC1–PBC7). The results indicate that respondents generally reported a moderately high level of perceived behavioral control over minimizing food waste, with mean values ranging from 3.05 to 3.82 across the items. The highest mean score was observed for the statement “*I do not find it difficult to minimize the amount of food I waste*” (PBC1;  $M = 3.82$ ,  $SD = 1.24$ ), suggesting that many participants perceived themselves as capable of managing their food consumption and waste behaviors. In contrast, the lowest mean score was associated with the statement “*I find it difficult to prepare a new meal from leftovers*” (PBC7;  $M = 3.05$ ,  $SD = 1.33$ ), indicating that practical constraints such as limited cooking skills or time availability may reduce perceived behavioral control among some respondents. Across all items, responses showed a moderate level of agreement, reflecting a generally favorable but not uniformly strong sense of control over food waste reduction behaviors. The relatively narrow range of standard deviations ( $SD$  range = 1.20–1.35) suggests a consistent pattern of responses and relative homogeneity in participants’ self-assessments of their ability to manage household food waste.

**Table 4.** Frequency Distribution, Percentages, Mean, and Standard Deviation of the Perceived-Behavioral-Control Variable (N = 205)

Q	Strongly Agree (5)		Agree (4)		Neutral (3)		Disagree (2)		Strongly Disagree (1)		Mean	Standard Deviation
	F	%	F	%	F	%	F	%	F	%		
PBC 1	80	39.0	57	27.8	35	17.1	18	8.8	15	7.3	3.82	1.24
PBC 2	64	31.2	49	23.9	55	26.8	24	11.7	13	6.3	3.62	1.22
PBC 3	70	34.1	48	23.4	48	23.4	23	11.2	16	7.8	3.65	1.27
PBC 4	68	33.2	54	26.3	54	26.3	15	7.3	14	6.8	3.72	1.19

<b>PBC 5</b>	79	38.5	54	26.3	41	20.0	15	7.3	16	7.8	3.80	1.25
<b>PBC 6</b>	40	19.5	49	23.9	43	21.0	42	20.5	31	15.1	3.12	1.35
<b>PBC 7</b>	36	17.6	45	22.0	50	24.4	41	20.0	33	16.1	3.05	1.33

*Note.*  $N = 205$ . Items were measured on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). Source: Author's own data.

### 5.3. Reliability and Validity Analysis

The internal reliability of the measurement instruments was assessed using Cronbach's alpha, while sampling adequacy and data suitability for factor analysis were evaluated using the Kaiser–Meyer–Olkin (KMO) measure and Bartlett's Test of Sphericity. As shown in Table 5, all constructs demonstrated acceptable to excellent reliability levels. The attitudes scale yielded a Cronbach's alpha of 0.934, indicating excellent internal consistency among the eight items. The subjective norms scale produced a Cronbach's alpha of 0.782, reflecting acceptable reliability, while the perceived behavioral control scale showed a Cronbach's alpha of 0.846, representing good internal coherence among the seven items. To address potential common method bias, several procedural remedies were applied, including anonymous participation, clear and neutral item wording, and the separation of construct measures within the questionnaire. In addition, Harman's single-factor test was conducted, and the results indicated that no single factor accounted for the majority of the variance, suggesting that common method bias was not a serious concern in this study. Sampling adequacy and correlation strength were further confirmed by the KMO and Bartlett's tests. The KMO values ranged from 0.788 to 0.838, exceeding the recommended minimum threshold of 0.70 (Hair et al., 2019), and Bartlett's tests were highly significant ( $p < 0.001$ ) for all constructs. These results confirm that the data were suitable for exploratory factor analysis and that sufficient correlations existed among the variables.

**Table 5.** Cronbach's Alpha, KMO, and Bartlett's Test of the Three Constructs ( $N = 205$ )

Variable	Cronbach's Alpha	KMO	Bartlett's Test
Attitudes	0.934	0.788	313.445
Subjective Norms	0.782	0.829	455.518
Perceived Behavioral Control	0.846	0.838	400.735

Note. All Bartlett's tests significant at  $p < .001$ . Source: Author's own data collection.

### 5.4. Factor Structure and Item Loadings

Table 6 presents the mean scores, standard deviations, and rotated factor loadings for all scale items. The results indicate that all items loaded satisfactorily ( $\geq 0.58$ ) on their respective constructs, providing support for convergent validity. The attitudes factor recorded the highest eigenvalue (5.143) and explained 64.29% of the total variance, followed by subjective norms (55.43%) and perceived behavioral control (52.87%). Within the attitudes construct, the item "It is immoral to discard foods while other people in the world are starving" exhibited the highest factor loading (0.887), indicating a strong association with the underlying attitudinal dimension of food waste reduction. In contrast, the item "Wasting food makes me feel regretful" showed the lowest loading (0.665), suggesting that emotional regret is comparatively less strongly associated with the attitudes construct. For subjective norms, the highest factor loading was observed for the item "My closest friends think that wasting food is a bad thing" (0.834), reflecting the importance of perceived peer approval within this construct. The lowest loading, "The people closest to me try not to waste food" (0.648), indicates some variability in respondents' perceptions of social expectations and observed behaviors. Regarding perceived behavioral control, the item "I do not experience problems in the process of storing the excess food that I have" exhibited the highest loading (0.803), suggesting a strong association with perceived control over food management practices. Conversely, the item "I have no problem finishing the food that I have bought" showed the lowest loading (0.585), indicating relatively weaker association with the perceived behavioral control construct. Overall, the factor analysis supports the distinctiveness and internal

structure of the attitudes, subjective norms, and perceived behavioral control constructs as specified in the Theory of Planned Behavior. The results indicate that moral considerations, social expectations, and perceived control are all salient dimensions of food waste related perceptions among the study participants.

**Table 6.** Means, Standard Deviations, and Rotated Factor Loadings of Study Variables (N = 205)

Questions	Mean	Standard Deviation	Attitudes	Subjective Norms	Perceived Behavioral Control
It is immoral to discard foods while other people in the world are starving.	4.31	1.19	0.887		
It upsets me when unused products end up in the waste bin.	4.13	1.24	0.850		
Wasting food makes me feel bad.	4.12	1.29	0.840		
I was brought up to think that food shouldn't go to waste, and I still believe this	4.22	1.17	0.830		
Wasting food makes me feel guilty.	4.19	1.24	0.811		
Wasting food is against my morals.	4.21	1.22	0.776		
Wasting food is against my conscience.	4.09	1.28	0.733		
Wasting food makes me feel regretful.	4.06	1.24	0.665		
My closest friends think that wasting food is a bad thing.	3.80	1.24		0.834	
My family encourages me to minimize the amount of food I waste.	4.00	1.33		0.739	
The people closest to me try not to waste food.	3.55	1.19		0.648	
I do not experience problems in the process of storing the excess food that I have.	3.62	1.22			0.803
I have no problems reprocessing the excess food that I have.	3.65	1.27			0.771
I do not find it difficult to minimize the amount of food I waste.	3.82	1.24			0.770
I don't experience problems determining my portion of food so that later there is no food left.	3.72	1.19			0.685
I have no problem finishing the food that I have bought.	3.80	1.25			0.585
<b>Eigenvalue</b>			<b>5.143</b>	<b>1.663</b>	<b>2.664</b>
<b>Explained variance by factors (%)</b>			<b>64.292</b>	<b>55.430</b>	<b>52.865</b>
<b>Cronbach's alpha</b>			<b>0.934</b>	<b>0.782</b>	<b>0.846</b>

*Extraction method: maximum likelihood; Varimax with Kaiser normalization. Communalities (Attitudes): 0.787–0.442, Communalities (Subjective Norms): 0.696–0.420, Communalities (Perceived Behavioral Control): 0.644–0.193; cutoff point: 0.50; N = 205.*

*Source: Author's own data collection.*

### 5.5. Regression Analysis and Hypothesis Testing

To examine the predictive relationships between attitudes (ATT), subjective norms (SN), and perceived behavioral control (PBC), a multiple linear regression model was applied using IBM SPSS Statistics (Version 26). It should be noted that the regression analysis examines predictive associations between variables and does not test causal or interaction effects among the Theory of Planned Behavior constructs. The model was specified as:

$$PBC = \beta_0 + \beta_1(ATT) + \beta_2(SN) + \varepsilon$$

where  $\beta_0$  denotes the intercept,  $\beta_1$  and  $\beta_2$  represent the standardized regression coefficients for attitudes and subjective norms, respectively, and  $\varepsilon$  denotes the error term. The results, summarized in Table 7, indicate that both attitudes and subjective norms were significantly associated with perceived behavioral control. The overall regression model was statistically significant,  $F(2, 202) = 46.312$ ,  $p < 0.001$ , explaining 31.4% of the variance in perceived behavioral control ( $R^2 = 0.314$ ). Attitudes emerged as the strongest predictor of perceived behavioral control ( $\beta = 0.463$ ,  $t = 6.812$ ,  $p < 0.001$ ), indicating that more favorable moral and emotional evaluations toward food waste minimization were associated with higher levels of perceived behavioral control. Subjective norms were also a significant predictor ( $\beta = 0.298$ ,  $t = 4.213$ ,  $p < 0.001$ ), suggesting that perceived social encouragement from family and friends is associated with higher perceived ability to reduce food waste. The Durbin–Watson statistic (1.89) indicated no evidence of autocorrelation among residuals, and variance inflation factor (VIF) values below 2.0 confirmed the absence of multicollinearity. These findings support both  $H_1$  and  $H_2$ , demonstrating that attitudes and subjective norms are significant predictors of perceived behavioral control in the context of household food waste reduction. The results are consistent with prior research highlighting the importance of psychological and social factors in pro-environmental behavior (Visschers et al., 2016; Russell et al., 2017; Kristia et al., 2023).

**Table 7.** Multiple Regression Results: Predicting Perceived Behavioral Control (N = 205)

Predictor	Unstandardized B	SE B	Standardized $\beta$	t	p
(Constant)	0.843	0.214	-	3.935	< .001
Attitudes (ATT)	0.492	0.072	0.463	6.812	< .001
Subjective Norms (SN)	0.328	0.078	0.298	4.213	< .001

**Model Summary:**  $R = 0.561$ ,  $R^2 = 0.314$ ,  $Adjusted R^2 = 0.308$ ,  $F(2, 202) = 46.312$ ,  $p < .001$ , Durbin–Watson = 1.89.

*Dependent variable: Perceived Behavioral Control (PBC). Source: Author's own data collection*

### Interpretation

The regression analysis indicates that both attitudinal and normative factors are significantly associated with individuals' perceived behavioral control toward minimizing food waste. Participants who believe that wasting food is morally wrong and socially discouraged reported higher levels of confidence in their ability to manage food consumption and leftovers effectively. This finding is consistent with the Theory of Planned Behavior (Ajzen 1991), which suggests that attitudes and subjective norms are important predictors of perceived behavioral control and related behavioral intentions. Consistent with prior studies (Kristia et al. 2023), the results suggest that fostering moral responsibility and social support may be associated with stronger perceptions of empowerment to engage in sustainable food practices.

## 6. Discussion, Implications, and Conclusion

### 6.1. Discussion of Findings

The present study examined the predictive relationships between attitudes, subjective norms, and perceived behavioral control in relation to food waste reduction tendencies in the Kurdistan Region of Iraq. Guided by the Theory of Planned Behavior (TPB) (Ajzen 1991), the findings indicate that both attitudinal and normative factors are significantly associated with individuals' perceived behavioral control over food waste management. The regression results revealed that attitudes exhibited the

strongest association with perceived behavioral control ( $\beta = 0.463$ ,  $p < 0.001$ ), suggesting that moral and emotional evaluations of food waste are closely related to individuals' perceptions of their ability to manage food consumption and leftovers. Participants who viewed food waste as morally wrong or socially irresponsible reported higher levels of confidence in their food management practices. From a theoretical perspective, this relationship can be explained by TPB, which posits that favorable attitudes enhance perceived behavioral control by reinforcing internal motivation, self-regulation, and a sense of personal responsibility. In the context of food waste reduction, moral attitudes may function as internal psychological resources that strengthen individuals' belief in their capacity to plan meals, manage leftovers, and avoid unnecessary disposal. This interpretation is consistent with Visschers et al. (2016), who reported that moral obligation and guilt are important predictors of sustainable food-related behaviors. Subjective norms were also found to be a significant predictor of perceived behavioral control ( $\beta = 0.298$ ,  $p < 0.001$ ), highlighting the relevance of family and peer expectations in shaping food waste-related perceptions. Respondents who perceived that people close to them discouraged food waste reported higher levels of perceived behavioral control. This finding suggests that social approval and normative pressure may enhance individuals' confidence in their ability to reduce food waste by reinforcing socially acceptable and valued behaviors. Such results align with previous studies emphasizing the role of social expectations and family values in shaping sustainable consumption practices (Russell et al. 2017). These findings are consistent with recent empirical and review-based studies indicating that attitudinal and normative factors are among the most influential correlates of household food waste reduction (Kör et al. 2021; Leal et al. 2023; Zhang et al. 2023). In line with studies conducted in Middle Eastern and developing contexts, the present findings further suggest that moral attitudes and family-based social norms are particularly salient in relation to food waste-related perceptions in collectivist societies, where cultural values, hospitality traditions, and communal expectations strongly shape household practices (Elshaer et al. 2021; Massoudi & Ahmed 2021; Bhatti et al. 2023). In the Kurdistan Region, food-related practices are strongly shaped by cultural values emphasizing hospitality, generosity, and respect for guests. Preparing abundant meals is commonly viewed as a social obligation and a sign of honor, particularly during family gatherings, religious occasions, and celebrations. While such practices may unintentionally contribute to food waste, the present findings suggest that these same cultural norms can be reframed from supporting food waste reduction. When family members and close social circles express disapproval of wasting food or emphasize moral responsibility toward food resources, individuals may feel more capable of managing leftovers and planning consumption more carefully. In this context, subjective norms rooted in family expectations and shared moral values appear to play a particularly influential role in strengthening perceived behavioral control. These culturally embedded mechanisms highlight the importance of designing food waste reduction initiatives that align with local traditions and social values rather than relying solely on individual-level awareness campaigns. Overall, the results indicate that attitudes and subjective norms are closely associated with perceived behavioral control within the Theory of Planned Behavior framework. By demonstrating how moral evaluations and social expectations contribute to individuals' perceived capacity to manage food waste, the findings extend the applicability of TPB to environmental and consumption-related issues and reinforce its relevance within the cultural and geographic context of the Kurdistan Region.

## 6.2. Theoretical Implications

This study contributes to the theoretical expansion of the TPB by confirming its predictive power in a Middle Eastern context characterized by distinct cultural and social dynamics. The findings suggest that food-waste reduction behavior is not only an outcome of rational evaluation but also of moral conviction and social approval. By integrating moral and social aspects into behavioral control, the research supports calls from Russell et al. (2017) and Kristia et al. (2023) to include ethical and communal dimensions in sustainability-related TPB models. Furthermore, the study highlights that perceived behavioral control is strengthened when individuals perceive strong social reinforcement. This insight supports Ajzen's (2011) later refinement of the TPB, which emphasizes the feedback loop between social influence and perceived efficacy. Hence, future behavioral models addressing food waste or

sustainable consumption should account for both moral attitude strength and collective cultural expectations.

### **6.3. Practical Implications**

From a practical perspective, the results provide actionable insights for policymakers, educators, and community organizations in the Kurdistan Region. Awareness campaigns should emphasize the moral and social consequences of food waste, highlighting both ethical responsibility and community values. Religious and cultural leaders could play a pivotal role in promoting these messages, given the strong influence of family and community networks observed in this study. Educational institutions can integrate food-waste reduction modules into school and university curricula, encouraging younger generations to view responsible consumption as a moral duty. Moreover, municipalities and NGOs should facilitate programs that improve household skills related to meal planning, portion control, and leftover utilization, addressing the practical aspects of perceived behavioral control.

### **6.4. Limitations and Future Research**

While the study demonstrates robust reliability and validity, several limitations should be acknowledged. First, the research relied on self-reported data, which may be subject to social desirability bias, as respondents might overstate their environmentally responsible behavior. In addition, the cross-sectional design limits the ability to draw causal inferences or capture changes in food waste behavior over time. Second, this study employed a convenience sampling approach, which may have resulted in an overrepresentation of highly educated respondents. Consequently, the findings may reflect higher levels of awareness and pro-environmental orientation than those present in the broader population of the Kurdistan Region. While this approach was appropriate for an exploratory investigation in an under-researched regional context, future studies should employ probability-based sampling techniques to enhance representativeness and generalizability. Furthermore, the focus on Duhok City limits the generalization of the findings to other Kurdish provinces or broader Middle Eastern contexts. Future research could expand the geographic scope to include multiple cities or regions. To address these limitations, future studies are encouraged to adopt longitudinal or mixed-method approaches, combining survey data with behavioral observations or experimental designs to examine actual food waste behavior. Incorporating additional constructs such as environmental awareness, habit strength, or perceived food security may also enrich the Theory of Planned Behavior framework and improve its predictive accuracy. Despite its wide application and strong explanatory power, the Theory of Planned Behavior has several well-documented limitations. First, TPB primarily focuses on intentional and cognitive determinants of behavior and may not fully capture the role of habitual, emotional, or situational factors that influence food waste practices. Second, the theory emphasizes perceived behavioral control rather than actual behavioral constraints, which may limit its ability to explain real-world behavior in contexts where structural barriers, such as limited infrastructure or time constraints, are present. In addition, TPB-based studies relying on cross-sectional survey data are unable to account for changes in behavior over time or establish causal relationships among constructs. Finally, cultural and contextual factors such as social norms, religious values, and household traditions may interact with TPB constructs in ways that are not fully captured by the standard model. These limitations suggest that future research could benefit from integrating TPB with complementary theoretical frameworks or employing longitudinal and mixed method approaches to achieve a more comprehensive understanding of food waste behavior. In addition, although this study assessed construct validity using exploratory factor analysis, confirmatory factor analysis (CFA) could further strengthen the validation of the measurement model in future research.

### **6.5. Conclusion**

This study demonstrates that food-waste reduction in the Kurdistan Region is strongly associated with individuals' moral attitudes and social expectations. Attitudes rooted in ethical awareness and social responsibility substantially enhance perceived behavioral control, indicating that individuals who hold stronger moral convictions and perceive supportive social norms feel more capable of managing and reducing food waste. The findings affirm the relevance of the Theory of Planned Behavior in explaining pro-environmental orientations and extending its application to food sustainability issues within

developing cultural contexts. This pattern is consistent with recent empirical and meta-analytical evidence highlighting the importance of moral and social drivers in food waste reduction (Kör et al. 2021; Zhang et al. 2023). Promoting moral accountability and strengthening family and community norms may therefore represent effective strategies for reducing household food waste. By reinforcing these psychological and social drivers, policymakers and educators can support more sustainable consumption practices and contribute to global efforts to achieve the United Nations Sustainable Development Goal 12: Responsible Consumption and Production.

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