The Impact of Food Loss and Waste Reduction Practices on Consumer Grocery Store Choice

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Abstract

Efforts to reduce food loss and waste (FL&W) have gained increasing attention in both policy and retail settings, yet little is known about how such initiatives influence consumer behavior in grocery store selection. To address this limitation, we conducted a discrete choice experiment to determine how consumers respond to grocery stores committing to varying levels of FL&W reduction, different FL&W verification methods (self-reported, third-party, or government-certified), and benefit framings of why to reduce FL&W (hunger versus environmental impact) when selecting a grocery store. Using the results of a mixed logit model, we predicted the probability of store choice under two scenarios: one which varied the level of FL&W reduction and another which varied the verification mechanism. Government verification positively influenced store choice, while third-party verification had no statistically significant impact. Additionally, framing FL&W reduction as addressing hunger leads to a stronger consumer grocery store preference than environmental framing. Traditional factors like product variety, overall shopping expenses, and travel time impacted choice, highlighting a retailer's need to balance these factors with FL&W reduction elements. Results can inform policymakers and retailers interested in designing effective FL&W reduction strategies that can offer a competitive advantage.

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Chapter One

Introduction

Food loss and waste (FL&W) is a pervasive challenge in the United States (U.S.), with an estimated 30-40% of all food produced going uneaten, costing the nation approximately $218 billion annually (Environmental Protection Agency, 2024a; 2024b). Following a global push toward reducing food waste, the United States Department of Agriculture (USDA) and Environmental Protection Agency (EPA) have set a goal to halve FL&W by 2030. A significant portion of FL&W[1]—approximately 11%—occurs at the retail level (Buzby, Wells, and Hyman, 2014).

Grocery stores, as critical players in the food supply chain, have an opportunity to adopt FL&W reduction programs to contribute to national FL&W reduction goals. However, retailers are likely to implement these programs only if they positively impact profitability, particularly by attracting and retaining customers. Understanding how consumers perceive FL&W reduction efforts and whether these perceptions influence store choice can help inform policies and initiatives that encourage retailers to adopt FL&W reduction strategies.

To encourage food retailers to voluntarily commit to reducing FL&W, the USDA and EPA launched the U.S. Food Loss and Waste 2030 Champions (FL&W Champions) program in 2016. Participating retailers commit to reducing FL&W within their operations by 50% by 2030 (USDA, 2025). There are currently 45 corporate participants, including Aldi, Kroger, and Walmart. However, the program is voluntary and lacks a formal verification process in contrast to programs like the USDA's Organic label or the EPA's Energy Star label. Without a

[1] The USDA uses the term "food loss and waste" to broadly refer to reductions in edible food mass across all stages of the food supply chain (USDA, n.d.).

standardized verification process, businesses may struggle to credibly communicate their waste reduction efforts to consumers, making it difficult to differentiate themselves from competitors that do not actively reduce waste. This lack of transparency may also lead to consumer skepticism, reducing the effectiveness of FL&W programs as a market-driven incentive. To address this potential weakness, the *Reduce Food Loss and Waste Act* was introduced in March, 2025 (U.S. Congress, 2025). If passed, the bill would direct the USDA to create a verification process that signifies successful compliance with the certification process for food retailers.

Food retailer participation in a FL&W reduction program, particularly after the introduction of a verification process, depends on the perceived value of the program. Adopting FL&W reduction programs likely increases operating costs (e.g., time, added labor, renewed infrastructure, etc.), and since grocery retailers often operate on thin profit margins (FMI, 2023), their participation depends in part on whether participation offers a competitive advantage by appealing to consumers.

Thus, the purpose of this study is to investigate the influence of a grocery store's FL&W reduction program on consumer store choice using a hypothetical discrete choice experiment (DCE). Since many grocery stores have already implemented some type of FL&W reduction program, the focus of this study is not on the initiation of a FL&W program (i.e., comparing stores with and without FL&W reduction programs) but variation in program attributes, which include quantity of food waste reduction and method of verifying the reduction.

We also considered the influence of framing the benefits of the FL&W reduction in terms of environmental sustainability or hunger alleviation. This not only reflects the possibility that different methods of reducing FL&W in grocery stores have different benefits to society (e.g., donations to food pantries are more likely to reduce hunger, while better inventory management

may be more likely to benefit the environment) but also allows us to investigate the possibility that the specific benefits of FL&W reduction may influence consumer valuation of the reduction level. Additional grocery store level attributes included price, travel time, and availability of perishable products to capture important determinants of grocery store choice from the prior literature (Richards and Liaukonyte, 2022, Taylor and Villas-Bos, 2016; Manuere, 2023).

We make several contributions to the FL&W and store choice literature. First, the influence of a grocery retailer's commitment to FL&W on grocery store choice has not yet been explored in the literature. This is despite that research shows that consumers have increasingly expressed a desire to reduce food waste and view food waste as an important issue (Neff et al., 2015). Second, we explore the possibility that the value of a grocery store's FL&W reduction program may stem from the perceived value of FL&W reduction more broadly. Respondents were randomly assigned to one of three framing groups—no benefit, environmental benefit, or hunger benefit—to examine whether framing FL&W benefits in terms of environmental sustainability of hunger alleviation influences store choice decisions.

Finally, we investigate the potential value, from the perspective of the consumer, of formalizing a FL&W program by including verification method, which could include verification by the participating store, third-party, or government agency, as an attribute. While consumers may value FL&W reduction efforts for their environmental and societal benefits, their trust in these programs could depend on the credibility of the claims made by retailers.

It is possible government certification or third-party labels could enhance this credibility and influence consumer preference, as suggested by studies on labeling in other contexts, such as for energy efficient products (Truong et al., 2021; Darnell et al., 2016). Discovering if verification of

waste reduction claims influences store choice could be of interest to regulatory agencies (i.e., EPA, USDA, third-party) and retailers.

Retailers may be hesitant to adopt FL&W reduction programs unless they see a clear benefit to their business, but it remains unclear whether shoppers take these efforts into account when choosing where to buy groceries. If consumers respond positively to waste reduction commitments, grocery stores may have a market-driven incentive to adopt FL&W reduction practices or seek a verified label, if available. Ultimately, these findings can help inform retailer practices and guide policymakers as they consider strategies for promoting FL&W reduction. Accordingly, we present the following hypotheses:

Hypothesis 1:

Wider assortment variety will increase the probability of grocery store choice while additional travel time or higher price premiums will decrease the probability of grocery store choice.

In addition to these traditional store choice factors, we hypothesize that the presence of verification mechanisms and the framing of societal benefits will influence consumer preferences.

Hypothesis 2:

The presence of third-party and government verification mechanisms for FL&W reduction claims will increase the probability of store choice.

Hypothesis 3:

Framing FL&W reduction benefits as addressing hunger will have a stronger positive impact on grocery store choice compared to framing these benefits as mitigating environmental harm.

Chapter Two

Background and Review of Literature

FL&W represents a critical sustainability challenge with significant environmental and social implications. In a retail landscape increasingly shaped by environmental and social concerns, understanding whether FL&W programs impact store choice is critical to developing programs and policies to contribute to national goals for reducing FL&W. This study builds on prior research by integrating FL&W reduction attributes—both in terms of reduction quantities and verification mechanisms—into the store choice framework. It also examines if framing the benefits of FL&W reduction as environmental or hunger-related influences consumer preferences.

While increasing the quantity of FL&W reduction seems clearly likely to increase the probability of store choice, the influence of verification and societal benefits of reduction are less clear. The U.S. Environmental Protection Agency's (EPA) Wasted Food Scale prioritizes certain FL&W reduction actions on a tier system, giving precedence to preventing waste and donating food before other actions like composting or landfill diversion (Environmental Protection Agency, 2024c). This classification system emphasizes the dual benefits of FL&W reduction: mitigating environmental harm and addressing food insecurity, which has also been highlighted by previous research (Ellison, Muth, and Golan, 2019). Yet, it remains unclear whether consumers value FL&W reduction benefits in ways that influence their store choices, especially when such attributes are explicitly framed to highlight either environmental or hunger-related outcomes.

For example, stores that demonstrate higher levels of FL&W mitigation or rely on verified claims could appeal to consumers who prioritize sustainability. Research shows that when

businesses adopt sustainable practices, such as using low-emission transportation for distribution and promoting eco-friendly product selections, and market the use of these practices, it positively impacts consumer perceptions, repeat patronage, and shopping intentions (De Canio, Martinelli, & Endrighi, 2023; Hofenk et al., 2019).

In this study, we also explore how verification of claims impact consumer-preference. As mentioned earlier, the proposed 2025 *Reduce Food Loss and Waste Act* would establish a formal certification process and label for FL&W reduction efforts by grocery retailers, administered by the USDA. This initiative aims to enhance transparency and provide consumers with a reliable way to assess retailers' sustainability practices, potentially influencing their store choice decisions. Prior studies have shown that third-party or government-sponsored certifications increase consumer trust and positively influence purchase behavior (Darnell et al., 2016; Truong et al., 2021). For instance, consumers perceive third-party certifications as credible due to their independence, while government-sponsored labels like Energy Star are widely trusted and have a strong influence on behavior (Guo, Lu, and Hang, 2021; Hatanaka et al., 2005).

In the context of FL&W reduction, third-party and government certifications could provide consumers with reliable signals of a store's commitment to sustainability. Yet, no research to date has examined whether these verification mechanisms could influence grocery store choice with respect to FL&W. Understanding how verification impacts consumer preferences offer valuable insights for regulatory agencies and retailers as FL&W reduction efforts gain attention in the public sphere.

Decades of research have explored other factors influencing grocery store choice, identifying a range of attributes that shape consumer decision-making. Price and travel time are consistently highlighted as primary determinants, with consumers prioritizing stores that minimize monetary

and time costs (Manuere, 2023; Jaravaza and Chitando, 2013; Popkowski Leszczyc et al., 2000). For example, Manuere (2023) highlights that price is a significant factor influencing where consumers shop, with higher prices discouraging store choice. Longer travel distances reduce the likelihood of store choice, as consumers value convenience and accessibility (Kyureghian and Nayga, 2013; Taylor and Villas-Bos, 2016). Specifically, Jaravaza and Chitando (2013) find that additional travel time negatively impacts the likelihood of selecting a store, as proximity often outweighs other factors.

Product assortment has also emerged as a significant influence on store choice. Studies show that consumers value stores offering a wide variety of products, particularly in perishable categories (Briesh and Chintagunta, 2009; Singh and Sandhu, 2021). While price sensitivity remains a factor, the ability to meet diverse needs often outweighs cost considerations. Given the importance of price, travel time, and availability of perishable products to consumer store choice we also include these as attributes in our DCE. These prior findings establish our first hypothesis (Hypothesis 1).

Chapter Three
Conceptual Framework

Understanding consumer decision-making within the context of grocery store choice involves analyzing how individuals evaluate and choose between alternatives. This process is grounded in random utility theory, which proposes that consumers aim to maximize utility when faced with a set of alternatives. This decision is influenced by the price of the goods or services, the consumer's income, individual preferences, and the characteristics of the goods or services. The utility U_{ijt} derived from choosing a particular alternative can be expressed as a combination of observable attributes and unobservable factors (McFadden, 1974):

$$U_{ijt} = \beta' X_{ijt} + \varepsilon_{ijt} \quad (1)$$

where X_{ijt} represents observable attributes of each alternative *j* for individual *i* and choice task *t,* β is a vector of taste parameters capturing the weight or importance of each attribute, and ε_{ijt} is an error term capturing unobservable influences on utility, which is independent and identically distributed extreme value.

Individual *i* will choose alternative *j* if and only if $U_{ijt} \geq U_{ikt}\ \forall\ j \neq k$. Utility, however, is unobservable, thus we can estimate only the probability that individual *i* chooses alternative *j*:

$$P_{ijt}(X_{jt}; \beta) = \Pr(X_{jt}\beta + \varepsilon_{ijt} > X_{kt}\beta + \varepsilon_{ikt}, \forall\ j \neq k) \quad (2)$$

This can be rewritten using the deterministic utility component V_{ijt} as:

$$P_{ijt} = \Pr(V_{jt} + \varepsilon_{ijt} > V_{kt} + \varepsilon_{ikt}, \forall\ j \neq k) \quad (3)$$

In this study, the observable attributes X_{jt} include shopping basket price premium, additional travel time, product assortment levels, FL&W reduction quantities, and verification mechanisms.

Table 1 provides a summary of the attributes and their levels. These attributes were chosen based on prior research that identifies price, travel time, and product assortment as key factors in store choice (Briesch et al., 2009; Singh and Sandhu, 2021). The FL&W program attributes were selected to explore how FL&W reduction quantity and verification mechanism impact consumer preferences and how they are prioritized relative to the standard store attributes.

Table 1. Attributes and Levels for the Discrete Choice Experiment

Attribute	Attribute Levels
	Store Attributes
Product Category Variety or Assortment	**- No perishable products (canned, dried, shelf-stable products only)** - Limited availability of perishable products in addition to nonperishables (one or two options for each type of fresh or frozen fruit and vegetables, meat, dairy) - Wide variety of perishable products in addition to nonperishables (three or more options for each type of fresh or frozen fruit and vegetables, meat, dairy)
Shopping Basket Price Premium (%)	Groceries for one week cost the: **- Same as what you typically pay** - 10% more than you typically pay - 20% more than you typically pay
Additional Travel Time (minutes)	The total time it takes for you to travel to the grocery store: **- No longer than amount of time you currently travel** - 5 minutes longer than you typically travel - 10 minutes longer than you typically travel
	Food Loss and Waste Program Attributes
Quantity of food loss and waste reduction	Grocery store's commitment to reduce annual food loss and waste from the current level by: **- 25%** - 50% - 75% - 100%
Verification of retailer's FL&W reduction quantity	Grocery store's food loss and waste reduction is verified by: **- The grocery store reports its own reductions** - An independent private company (i.e. third-party) - The government

Note: Bolded phrases serve as the reference category in the model

In traditional utility models, price is often a key attribute influencing utility. However, in this study, a shopping basket price premium (**Table 1**) is used as a relative price measure instead of an absolute price value. This approach reflects the challenge of defining a single representative price for grocery store choice, given the variation in household shopping habits, geographic factors, and personal preferences. The price premium captures a proportional change in the respondent's typical spending, providing a consistent relative measure of price change.

The estimated coefficients (β) (Equation 2) quantify the relative importance of each attribute. Total utility is dependent on these coefficients, or partial utilities, given by different attributes of the alternatives (Lancaster, 1972). For example, a positive coefficient for FL&W reduction quantities indicates that consumers derive greater utility from stores implementing higher levels of FL&W mitigation. To model the choice process, we specify the deterministic utility component which will serve as the foundation for our empirical estimation:

$$V_{ijt} = \beta_1 BasketPricePremium_{ijt} + \beta_2 AdditionalTravelTime_{ijt} + \beta_3 FLWReducQuant_{ijt} + \beta_4 ThirdParty_{ijt} + \beta_5 Government_{ijt} + \beta_6 LimitedVariety_{ijt} + \beta_7 WideVariety_{ijt} \quad (4)$$

Since individual preferences vary, the probability that respondent *i* selects alternative *j* in choice occasion *t* is given by:

$$P_{ijt} = \int \frac{e^{V_{ijt}}}{\sum_k e^{V_{ikt}}} f(\beta) d\beta \qquad (5)$$

where V_{ijt} is the deterministic utility component described in Equation 4. The denominator ensures that probabilities sum to 1 across all alternatives in the choice set. The function $f(\beta)$ represents the probability distribution of random coefficients and $d\beta$ denotes integration over this distribution.

Chapter Four
Methods

4.1 Survey Experiment

This study utilized a discrete choice experiment (DCE) in which respondents were asked, in an online survey, to consider choosing a grocery store where they will do most of their shopping. Prior to beginning the choice tasks for the DCE, respondents were randomly assigned to one of three framing groups: hunger benefit, environmental benefit, and no benefit which serves as the control.

Table 2 contains the text shown to respondents in their framing groups. The hunger benefit group was informed that the FL&W reduction practices at the stores they would evaluate primarily benefit hungry families. The environmental benefit group was told the practices primarily benefit the environment. The control group received no additional information about FL&W benefits.

Table 2. Benefit Framing

Hunger Benefit Framing	Environmental Benefit Framing
Many grocery stores are adopting new programs to help reduce the amount of food that they are unable to sell and have to send to the landfill. While reducing food waste can help protect the environment (by reducing the amount of water used in agriculture, or food being sent to a landfill) or decrease hunger (by increasing the amount of food available for hungry families) the food waste reduction programs adopted by the grocery stores you will choose between **will mostly benefit hungry families.**	Many grocery stores are adopting new programs to help reduce the amount of food that they are unable to sell and have to send to the landfill. While reducing food waste can help protect the environment (by reducing the amount of water used in agriculture, or food being sent to a landfill) or decrease hunger (by increasing the amount of food available for hungry families) the food waste reduction programs adopted by the grocery stores you will choose between **will mostly benefit the environment.**

After respondents were provided information on the context of the choice experiment, including the benefits framing, they were presented with a series of choice tasks asking them to consider a typical grocery shopping occasion and select one store. Each choice task included two grocery store options and the ability to opt-out (choose neither store). **Figure 1** contains an example choice task. **Table 1** describes the attributes and attribute levels.

Price premium, additional travel time, and assortment level were included as attributes based on prior research that identifies these as primary determinants of store choice, while the quantity of FL&W, and verification mechanism were included to determine the influence of store level FL&W efforts on store choice (Taylor and Villas-Bos, 2016; Briesh and Chintagunta, 2009; Singh and Sandhu, 2021).

The price and travel attributes in the choice experiment were designed to represent relative changes from the respondents' typical shopping experience. For instance, price premiums were presented as 10% and 20% higher than what respondents typically pay at their usual store, and travel time was framed as five minutes and ten minutes longer than they typically travel.

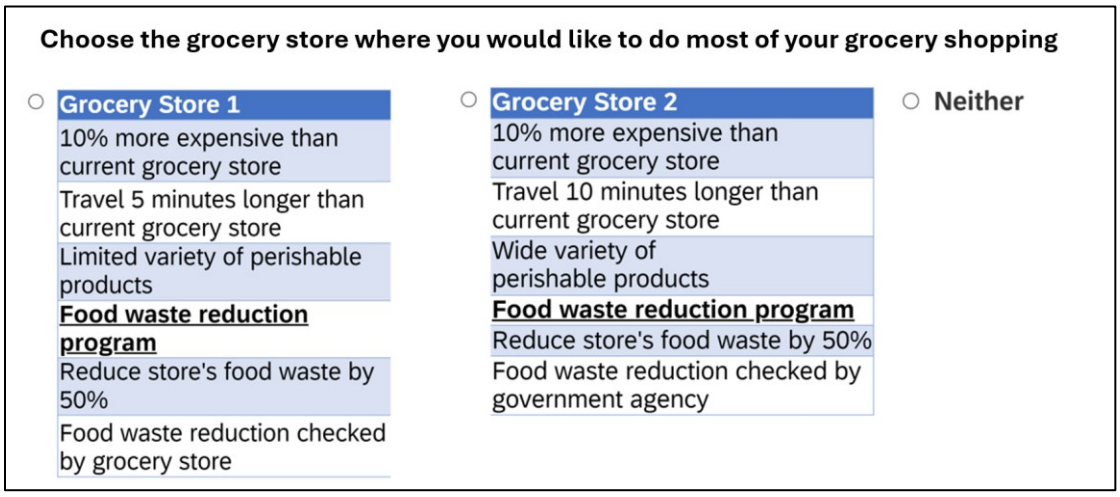


Figure 1. Example Choice Task

This approach not only reflects the challenge of defining a single representative price and travel time for grocery store choice but also presents the respondent with a tradeoff between the time and money cost of grocery store utilization and FL&W program attributes.

This study utilized an efficient orthogonal sequential design generated using NGENE software to structure the discrete choice experiment. The design aimed to optimize statistical efficiency while minimizing the cognitive burden on respondents. A total of 36 choice tasks were created using a D-efficient design, which balances covering all relevant attribute combinations while minimizing the number of questions needed. To further reduce the cognitive burden on participants, respondents were randomized into one of three blocks so that each respondent completed only twelve choice tasks. The order of choice sets and alternatives were also randomized to reduce bias from an ordering effect.

4.2 Discrete Choice Experiment Design

4.2.1 Study Sample

The survey was administered online via Qualtrics in October 2023 to 1,844 individuals. Participants were restricted to those who live in the United States (U.S.), are at least 18 years old, and identify as the primary food shopper in their household (the individual who does most of the grocery shopping for their household). Quotas were used to ensure the sample was representative of the U.S. population based on age, race, and income. Before the survey's full launch, a soft launch was conducted with a small subset of respondents to test the survey's functionality and clarity; no significant issues were identified. Institutional Review Board approval was obtained prior to data collection (IRB-20-06141-XM), and all protocols adhered to human subjects research guidelines.

Following the choice tasks, respondents were asked about their grocery shopping habits and attitudes, including how much they typically spend on groceries, how far they typically travel to shop, and what type of store they use. They were also asked to indicate their level of agreement with two statements— "Food waste is an issue because it has a negative impact on the environment" and "Food waste is an issue because that food could be used to feed the hungry"— using a Likert-scale response format. These variables are displayed in **Table 3**. These responses help contextualize store choice decisions, including whether respondents associate it with environmental harm or hunger. Trust in private companies and government agencies was also measured to give further context to preferences for verification mechanisms.

4.2.2 Analytical Plan

The mixed logit (MXL) model was chosen for the analysis because it is more flexible than simpler models like the multinomial logit. The MXL accounts for random taste variations by assuming that certain preference parameters follow continuous distributions rather than being fixed across individuals (Train, 2009). This allows the model to capture differences in sensitivity to attributes like price premium, travel time, or FL&W reduction quantities.

The following represents the utility of individual i (i =1,…,1844) from selecting alternative j $\in$ {Store 1, Store 2, Opt-out) at choice occasion t (t=1,…12):

$$U_{ijt} = \beta_1 BasketPricePremium_{ijt} + \beta_2 AdditionalTravelTime_{ijt} + \beta_3 FLWReducQuant_{jt} + \beta_4 ThirdParty_{jt} + \beta_5 Government_{jt} + \beta_6 LimitedVariety_{jt} + \beta_7 WideVariety_{jt} + \varepsilon_{ijt} \quad (6)$$

where ε_{ijt} is an error term, and coefficients capture the average effect of the corresponding attribute on utility.

Table 3. Survey Variables and Definitions

Variable	*Definition*
Weekly Grocery Spending	The total amount (in dollars) typically spent by respondents on groceries each week
Weekly Shopping	1 if respondent grocery shops at least once per week; 0 if otherwise
Uses Car	1 if respondent uses a car to travel to the grocery store; 0 otherwise.
Online Grocery Shopper	1 if respondent uses online grocery shopping services; 0 otherwise.
Primary Store - Supermarket	1 if primary grocery store is a supermarket; 0 otherwise.
Primary Store - Superstore	1 if primary grocery store is a superstore; 0 otherwise.
Distance <1 Mile	1 if primary grocery store is less than 1 mile away; 0 otherwise.
Distance 1-4 Miles	1 if primary grocery store is between 1 and 4 miles away; 0 otherwise.
Distance 5-10 Miles	1 if primary grocery store is between 5 and 10 miles away; 0 otherwise.
FL&W - Negative Environmental Impact	1 if respondent agrees or somewhat agrees that food waste negatively impacts the environment; 0 otherwise.
FL&W - Hunger Impact	1 if respondent agrees or somewhat agrees that addressing food waste could help address hunger; 0 otherwise.
FL&W - Reduce Through Food Choices	1 if respondent agrees or somewhat agrees they can reduce food waste by carefully choosing what they purchase; 0 otherwise.
FL&W - Reduce Through Store Choice	1 if respondent agrees or somewhat agrees they can reduce food waste by carefully choosing their grocery store; 0 otherwise.
Trust - Private Companies	1 if respondent indicates a moderate amount, a lot, or a great deal of trust in private companies; 0 otherwise.
Trust - Government Agencies	1 if respondent indicates a moderate amount, a lot, or a great deal of trust in government agencies; 0 otherwise.

The MXL estimation treated basket price premium and additional travel time as random parameters with normal distributions and the remaining variables as fixed. To determine the appropriateness of treating basket price premium and additional travel time as random, we used a likelihood-ratio test to compare the models with random versus fixed coefficients and rejected the null hypothesis that the random parameters did not improve model fit. For continuous variables (i.e., basket price premium, additional travel time, and FL&W reduction quantity), the coefficients quantify the change in utility per unit increase of the attribute. For dummy variables, the coefficients represent the change in utility relative to the baseline level of the attribute. The baseline for each dummy variable is bolded in **Table 1**.

Although DCE modeling is most often used to derive willingness-to-pay for specific attributes, our focus is on the likelihood of a consumer choosing a store based on certain attributes. Thus, we instead used the results of the MXL model to predict the probability of store choice for each individual. For each respondent in the survey, this MXL prediction provides three probabilities for each choice task: one for choosing Store 1, one for choosing Store 2, and one for opting-out (i.e., choosing neither store). The probabilities then sum to 1 across each choice task for each respondent. Since we were interested in the likelihood of choosing any store, we summed the probabilities of choosing either Store 1 or Store 2 for each choice task.

These probabilities were calculated for two scenarios. In the first we varied the level of FL&W reduction (i.e., set the value of the FL&W variable to values of 25, 50, 75, or 100) while holding all else constant. In the second scenario we varied the method of verification (i.e., set the value of the verification mechanism to self-report, third-party, or government) while holding all else constant. Separate models were estimated for each framing group, which allowed us to

determine the impact of framing the benefits of FL&W reduction. Bootstrapping was used to generate the 95 percent confidence intervals for the average predicted probability.

To illustrate this process, consider a scenario where the FL&W reduction level is set to 25 percent. In this case, for each choice task, the FL&W reduction variable was fixed at 25 percent for both Store 1 and Store 2, while all other attributes remained at their observed values. Using the estimated coefficients from the MXL model, we computed the probability of each respondent selecting Store 1, Store 2, or opting-out using Stata's predict command. This function leverages the estimated coefficients from the MXL model and calculates the probability of selecting each alternative for each choice task. We summed the probabilities of choosing Store 1 or Store 2 and used bootstrapping to generate the 95 percent confidence interval for the average predicted probability of store choice.

Chapter Five

Results and Discussion

5.1 Descriptive Statistics

To ensure that randomization was successful for the three framing groups, we tested for statistically significant differences across their demographic information and level of trust in private companies and government agencies; results are displayed in **Table 4**.

Table 4. Test of Independence across Framing Groups

Variable *Socio-demographic Characteristics*	**Full Analytical Sample (n=1776)**	**No Benefit Framing (n=600)**	**Environmental Benefit Framing (n=593)**	**Hunger Benefit Framing (n=583)**	***p* value**[1]
White	60.8%	63.2%	60.7%	58.3%	0.233
Hispanic	17.8%	17.3%	17.4%	18.9%	0.736
Black	10.4%	10.0%	9.8%	11.5%	0.580
Other	11%	9.5%	12.1%	11.3%	0.328
Average Age	47.8	48.6	47.6	47.3	0.374
Female	70.2%	70.7%	70.7%	69.3%	0.840
Household Income					
0-50k	36.6%	35.8%	35.8%	38.3%	0.032**
50-100k	33.6%	31.3%	28.3%	29.7%	0.388
100k+	29.8%	32.8%	35.9%	32.1%	0.035**
College Degree	40.1%	39%	39.3%	42%	0.506
Trust in Private Companies	59%	58.08%	57.26%	61.64%	0.261
Trust in Government Agencies	48%	48.04%	49.50%	47.49%	0.771

[1]For continuous variables, we conducted an analysis of variance (ANOVA); for categorical variables, we used a Pearson chi-squared test. ** $p < 0.05$, * $p < 0.10$

There was a difference in the share of people at a household income under $50,000, with a slightly higher representation in the hunger benefit framing group. Similarly, there was a difference in the share of people at an income level of $100,000 or higher, with slightly more representation in the environmental benefit framing group. There were no other statistically significant differences across the framing groups for race, age, gender, household income, possession of a college degree, or trust in private companies or government agencies.

Table 5 describes the main socio-economic and demographic characteristics of respondents in our sample and provides comparison statistics at the national level. The average age of the respondents was 47.8 years. The sample had a higher proportion of female respondents than the national average, which likely stems from the primary shopper inclusion criteria as women are more often the primary food shoppers of the household (Schaefer, 2019).

Table 5. Respondent Demographics and Socioeconomic Characteristics

Respondent Characteristics	***Average (standard deviation)***	***National Average***
Age	47.8 (18)	39.2
Percent Female	70.8%	50.5%
Race/Ethnicity		
White	60.4%	57.1%
Hispanic	17.7%	19.4%
Black	10.4%	11.8%
Other race/ethnicity	10.9%	10.7%
College degree	40.1%	36.2%
Household size	3.28 (2.12)	2.49
Households with children	36%	28.8%
Household income in 2022		
Below $50,000	36.9%	32.3%
Between $50,000 and $100,000	33.6%	28.8%
Greater than $100,000	29.4%	38.9%

Source: National averages are from the U.S. Census Bureau, 2023 American Community Survey 1-Year Estimates (Tables DP05, S1501, S1101, and S1901).

Approximately 60% of respondents were White, 18% were Hispanic, 10% were Black, and 11% were of another race or ethnicity. Household size was larger than the U.S. average at 3.28 as was proportion of households with children at 36% compared to the national average of 29%. Household income was fairly evenly split between those under $50,000, between $50,000-$100,000, and greater than $100,000. Compared to the national average, our sample had lower representation in the highest income category, with 29% of households earning over $100,000 compared to 39% at the national level. Thus, there was slightly higher representation in income category below $50,000 and between $50-100,000.

In addition to socioeconomic characteristics, we also asked about respondents' grocery shopping behavior, and results are displayed in **Table 6**. On average, respondents spent $114 on groceries. About 73% shopped at least once per week, most drove to the grocery store (84.8%), and about 40% utilized online shopping. The majority shopped at a supermarket (35.7%), followed by superstores (31.1%), then grocery stores (20.5%). The majority traveled between 1-4 miles (43.9%), followed by 5-10 miles (26.2%), and less than one mile (16.4%).

We also wanted to gain insight into their baseline perceptions of the relationship between FL&W and store choice, its impacts, and their role in it. By gauging whether consumers believe store choice can impact FL&W, we establish context for exploring how FL&W reduction programs may influence store preferences. These results are also displayed in **Table 6**.

While most respondents agreed that FL&W negatively impacts the environment (68.4%), a larger proportion, 83.3%, believed that addressing FL&W could help alleviate hunger. Similarly, 84.4% of respondents felt they could reduce FL&W through their personal food choices at a grocery store, but fewer (64.9%) believed that their choice of store could have a similar impact.

Table 6. Respondents Typical Grocery Shopping Behavior

Grocery Shopping Behavior	***Average***
Typical weekly spending on groceries	$114 ($88.90)
Grocery shops at least once per week	72.8%
Uses car to get to grocery store	84.8%
Uses online grocery shopping	41%
Primary grocery store type	
Supermarket	35.7%
Superstore	31.1%
Grocery Store	20.5%
Other	12.7%
Distance traveled to primary grocery store	
Less than 1 mile	16.4%
Between 1 and 4 miles	43.9%
Between 5 and 10 miles	26.2%
Food Loss and Waste Attitudes	
Agree that food waste has a negative impact on the environment	68.4%
Agree that addressing food waste could address hunger	83.3%
Agree I can reduce food waste through my food choices at a grocery store	84.4%
Agree I can reduce food waste through my choice of grocery store	64.9%

Note: (*n=1844*) *is the total number of respondents. Sample size varies across variables due to differing amounts of missing data.*

This suggests that consumers may have viewed individual actions, such as selecting the right products, as more directly impactful than broader, store-level choices. These results give more context for interpreting the decisions made in the DCE, particularly regarding respondents' beliefs about the impact of grocery store choice on FL&W. For example, if respondents do not see a connection between store choice and FL&W, it could influence how they weigh FL&W attributes when selecting a store. Similarly, if they do not see a connection between environmental impact and food waste, it may influence how they respond to the environmental benefit framing.

5.2 Results of Discrete Choice Experiment

Table 7 presents the coefficients of the mixed logit model, showing how store attributes influence store choice across the framing groups. As anticipated (Hypothesis 1), both basket price premium and additional travel time show a negative relationship with store choice, confirming that consumers are less likely to choose a store as total grocery costs increase, or travel time becomes longer. The limited and wide variety variables are all positive and statistically significant. While government verification positively impacts store choice for the two benefit framing groups, it is not statistically significant for the no benefit group, and third-party verification is not statistically significant for any of the three groups.

Table 7. Coefficients of Store Attributes from Mixed Logit Model

	No Benefit Framing		**Hunger Benefit Framing**		**Environmental Benefit Framing**	
Random Parameters	Parameter Estimate	Standard Deviation	Parameter Estimate	Standard Deviation	Parameter Estimate	Standard Deviation
Basket Price Premium	-0.092*** (0.005)	0.0607 (0.009)	-0.090*** (0.005)	0.072 (0.008)	-0.080*** (0.005)	0.049 (0.009)
Additional Travel Time	-0.033*** (0.005)	7.23E-05 (0.003)	-0.013* (0.005)	6.58E-05 (0.000)	-0.015** (0.005)	0.006 (0.022)
Non-random Parameters						
FL&W Reduction Quantity	0.010*** (0.001)		0.010*** (0.001)		0.008*** (0.001)	
Third-Party	-0.015 (0.043)		0.044 (0.047)		0.070 (0.043)	
Government	0.090 (0.047)		0.115* (0.045)		0.110* (0.044)	
Limited Variety	0.648*** (0.049)		0.573*** (0.051)		0.546*** (0.049)	
Wide Variety	1.218*** (0.066)		1.122*** (0.065)		1.078*** (0.063)	

*Note: Standard errors in parenthesis. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$*

Finally, the quantity of waste reduction demonstrates a consistent positive relationship with store choice and is statistically significant across all groups, revealing that consumers are more likely to choose a store as its FL&W mitigation increases.

To interpret the estimates from **Table 7**, we first explore store choice at different FL&W reduction levels across the three framing groups, using average predicted probabilities, presented in **Figure 2.**

The horizontal axis represents the average probability that an individual chooses a store versus opting-out at the four simulated FL&W reduction quantities. We determine statistical significance by comparing the 95 percent confidence intervals from the bootstrapping output, where an overlap in confidence intervals signifies the differences are not statistically significant. The exact values of the confidence intervals are displayed in **Table 8**.

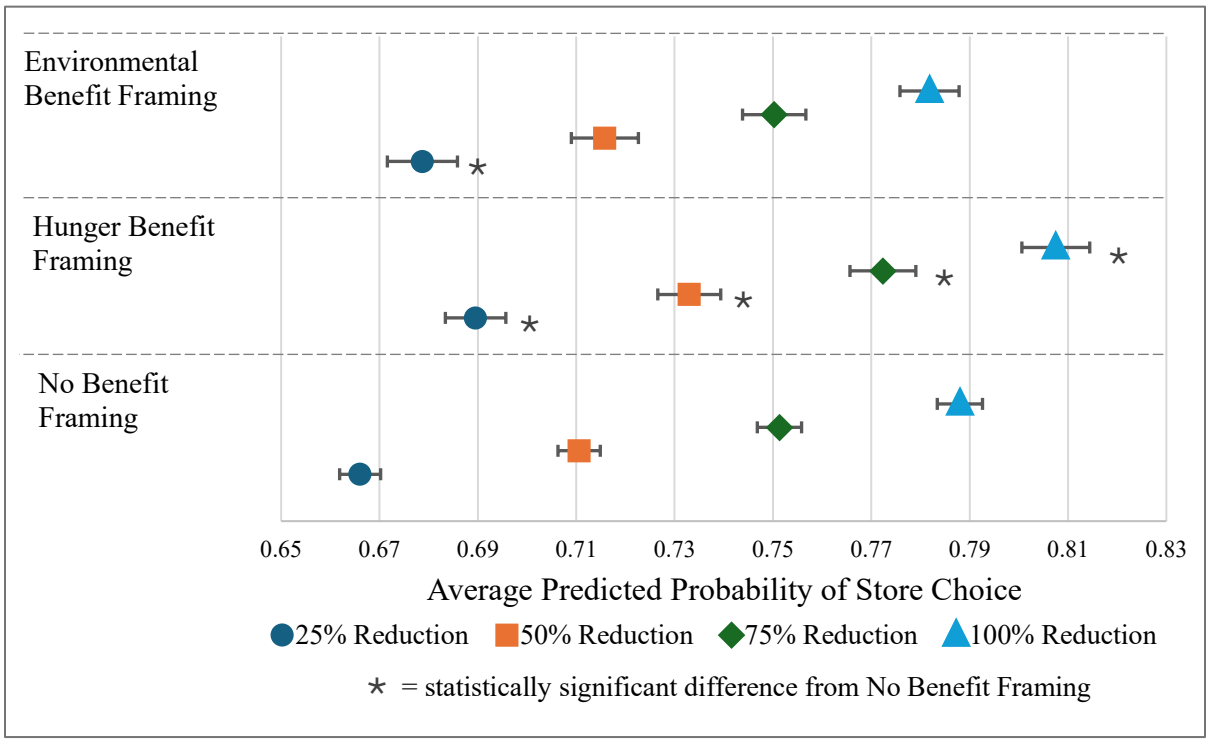


Figure 2. Average Probability of Store Choice by FL&W Reduction Quantity and Framing Group

Table 8. Predicted Probability Results of FL&W Reduction Levels by Framing Group

	No Benefit Framing			Hunger Benefit Framing			Environmental Benefit Framing		
Reduction Level	Avg. Prob	LCI	UCI	Avg. Prob	LCI	UCI	Avg. Prob	LCI	UCI
25% Reduction	0.666	0.662	0.670	0.690	0.683	0.696	0.679	0.672	0.686
50% Reduction	0.711	0.706	0.715	0.733	0.727	0.739	0.716	0.709	0.723
75% Reduction	0.751	0.747	0.756	0.772	0.766	0.779	0.750	0.744	0.757
100% Reduction	0.788	0.783	0.793	0.808	0.801	0.814	0.782	0.776	0.788

Note: LCI refers to Lower Confidence Interval, UCI refers to Upper Confidence Interval, and Avg. Prob refers to Average Predicted Probability

The results show that the probability of store choice increases as FL&W reduction quantity increases, as the confidence intervals do not overlap between reduction quantity levels within each group. Further, we examine the influence of benefit framing on store choice (Hypothesis 3) by comparing the results for each level of food waste reduction between the two benefit framing groups (environmental or hunger benefit) with the no benefit framing group, which serves at the control. The hunger benefit framing group is significantly different than the control at all four levels of reduction, as noted by the asterisks in **Figure 2**. The environmental benefit group is significantly different at only the lowest reduction level (25%) but not at the other three levels.

Following the analysis of FL&W reduction quantities, we examine the role of verification mechanisms in influencing store choice (Hypothesis 2). **Figure 3** illustrates how the probability of selecting a store varies based across the methods of verifying waste reduction—government, third-party, or self-report—and the benefit framing provided to respondents. The exact values of the probabilities and confidence intervals can be found in **Table 9**.

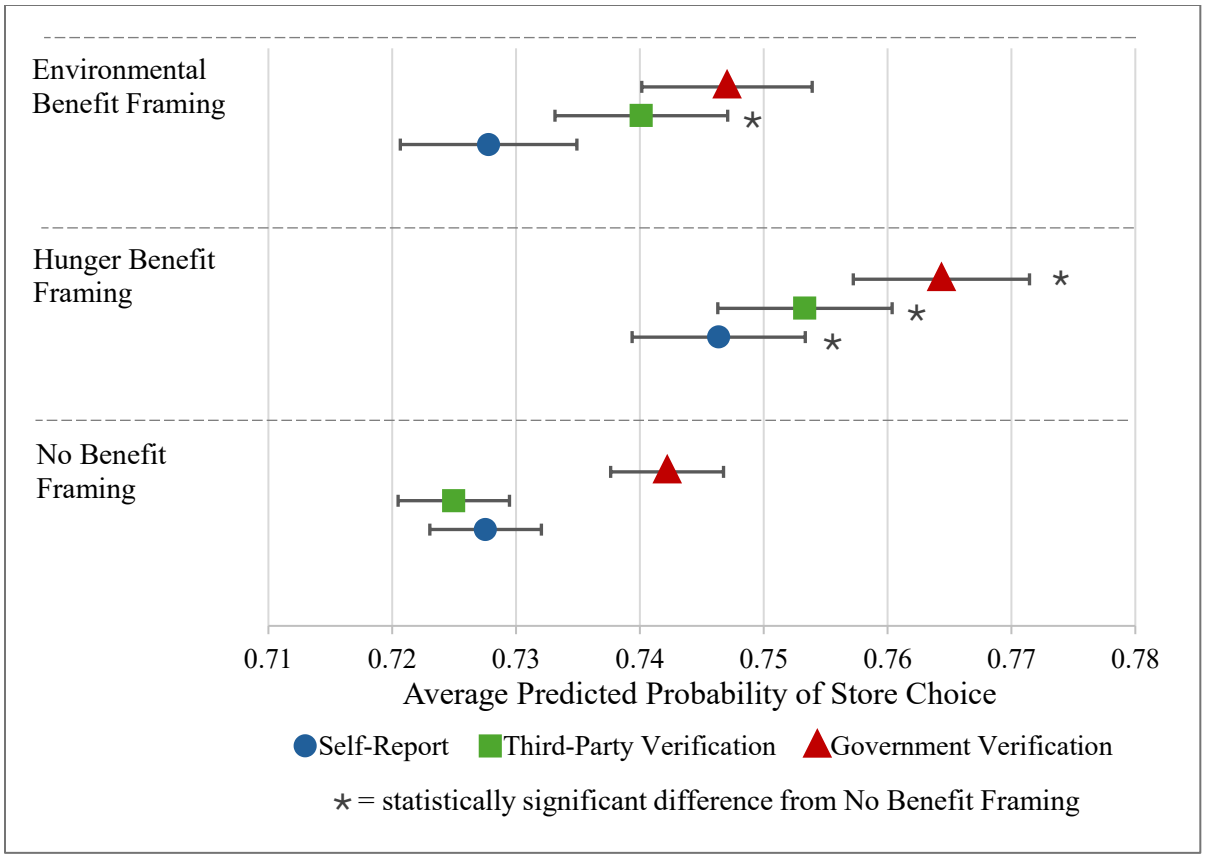


Figure 3. Average Probability of Store Choice by Verification Mechanism and Framing Group

Table 9. Predicted Probability Results of Verification Mechanism by Framing Group

Verification Mechanism	No Benefit Framing			Hunger Benefit Framing			Environmental Benefit Framing		
	Avg. Prob.	LCI	UCI	Avg. Prob	LCI	UCI	Avg. Prob	LCI	UCI
Self-report	0.728	0.723	0.732	0.746	0.739	0.753	0.728	0.721	0.735
Third-party	0.725	0.720	0.729	0.753	0.746	0.760	0.740	0.733	0.747
Government	0.742	0.738	0.747	0.764	0.757	0.771	0.747	0.740	0.754

Note: LCI refers to Lower Confidence Interval, UCI refers to Upper Confidence Interval, and Avg. Prob refers to Average Predicted Probability

Self-reporting served as the base or control level for verification mechanism, since it does not require external verification of the FL&W reduction. Thus, as a first step, we want to determine if consumer's value external verification for a store's FL&W by comparing results across verification mechanism within each framing group. Within each framing group, government verification consistently leads to greater probability of store choice than self-reporting. Third-party verification is no different than self-reporting across any of the three framing groups, as the confidence intervals overlap within each framing group.

Following this initial comparison, we also want to examine the value of benefit framing in the context of the verification mechanism (e.g. does benefit framing add an additional benefit to the verification mechanism). Since average predicted store choice was only higher for government verification within each framing group, we only compare across benefit framing groups for government verification. Comparing either benefit framing (e.g. hunger or environmental) group to the control (e.g. no benefit framing) we find that there is no overlap in confidence intervals for the hunger benefit framing. Suggesting that when a store uses government verification, there is only an additional value of framing the FL&W reduction in terms of their benefit to hungry families.

Chapter Six

Summary and Implications

Efforts to reduce FL&W have gained increasing attention in both policy and retail settings, but there is little research to examine how these programs influence consumer store choice. For retailers, the ability to attract or retain consumers is a benefit of initiating or expanding FL&W reduction efforts. This study uses a DCE to explore how elements of a FL&W reduction program impact store choice compared to conventional attributes like price, travel time to store, and product variety. Respondents were also randomly assigned to a benefit framing group to determine if consumers valued who, either the environment or hungry families, benefited from the FL&W reduction.

The results indicate that FL&W reduction initiatives positively influence consumer store choice, with higher levels of waste reduction associated with greater likelihood of store choice. This suggests that higher levels of FL&W reduction can act as a competitive advantage for stores. There is an additional advantage to framing this reduction as benefiting hungry families, at every reduction quantity level that was tested (25%, 50%, 50%, 100%). There is no additional advantage to framing the FL&W reduction as benefitting the environment, except at the lowest quantity tested (25%); at the higher levels, there was no difference between environmental benefit framing and no benefit framing.

The study also shows that the method of verifying FL&W reduction claims influences store choice. Government verification consistently led to greater probability of store choice, while third-party verification was never different than self-reporting. This study furthers the literature by examining specifically how verification influences consumer perceptions of FL&W reduction programs, an area that was unexplored in the literature.

Overall, stores that reduced waste in ways that addressed hunger, like donating to food banks, saw higher probabilities of store choice than those that emphasized environmental benefits or did not communicate program outcomes (control group). Hunger-related benefit framing appears to be the most significant influence out of the framing treatments, waste reduction quantities, and verification mechanisms on consumer grocery store choice.

Consistent with prior literature, we also find that increases in cost or distances decreases the likelihood of store choice (Richards and Liaukonyte, 2022, Taylor and Villas-Bos, 2016; Manuere, 2023). This reinforces the idea that while FL&W reduction can attract shoppers, it must be balanced with traditional grocery-shopping priorities like product variety and overall price.

For retailers, these findings suggest that investing in additional FL&W reduction programs can help attract or retain customers, particularly if those efforts are framed as alleviating hunger through practices like donating to food banks. Stores implementing donation-based or food recovery programs should highlight these social benefits in marketing efforts to gain a competitive advantage. The results align with the goals of the EPA, where human-consumption focused reduction practices, like donations, are prioritized over environmental-related practices (Environmental Protection Agency, 2024c).

For policymakers, these results show that a formal FL&W certification program could improve consumer confidence in waste reduction claims, but the type of verification matters. Government verification was consistently impactful compared to self-reporting across the three framing groups. A federal standardized FL&W labeling policy, similar to USDA Organic or Energy Star, could encourage greater retail participation in waste reduction initiatives. These findings support the proposed *Reduce Food Loss and Waste Act* (U.S. Congress, 2025) that

would direct the USDA to implement an official verification system, essentially formalizing the 2030 Champions program. Third-party verification was not significant compared to self-reporting across any framing group.

The limitations of the research include that the choice experiment is based on hypothetical scenarios, which may not fully capture real-world decision making, despite a cheap-talk script. Respondents may not weigh FL&W efforts as heavily in real-world settings as they do in a survey, when faced with tradeoffs against convenience, price, or assortment variety. Future studies could further explore consumer heterogeneity by incorporating interaction terms between FL&W reduction attributes and factors such as income, environmental attitudes, or shopping frequency. Researchers could also examine the effects of different FL&W program structures (e.g., in-store discounts for nearly expired products, smaller packaging of perishable goods) on consumer choice.

Additionally, future studies could investigate whether third-party verification impacts differ when consumers are provided with more detailed information about the certifying entity. As consumer awareness of FL&W reduction continues to grow, future research should further explore how retailers can effectively balance sustainability initiatives with traditional store attributes to maximize consumer engagement and store choice.

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Vita

Aisling Grace Hagan grew up in Jonesborough, Tennessee, the oldest town in the state and the storytelling capital of the world. Growing up in the mountains of East Tennessee inspired her love for the natural world and agriculture. She earned a Bachelor of Science in Agricultural and Resource Economics from the University of Tennessee, with a minor in International Agriculture and Natural Resources. She continued at the University of Tennessee to pursue a Master of Science in Agricultural and Resource Economics, with a concentration in Natural Resource Economics. During her master's, she served as her department's Graduate Student Organization President, was a Farm Foundation USDA Economic Research Service Agricultural Scholar, and was a member of honor society Gamma Sigma Delta. She is also a Niswonger Foundation Scholar alum. Her research also includes assessing Tennessee's circular bioeconomy, analyzing willingness to pay for genomic-tested feeder cattle, evaluating the economic impact of energy production from distillery byproducts, and exploring retailer perspectives on food waste reduction practices. She is deeply grateful for the support from her family, friends, and department as she completes her degree and begins her career.