Evaluating United States Consumers' Willingness to Pay for Fresh Culinary Herbs

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ABSTRACT

The demand for fresh culinary herbs in the United States has grown significantly in recent years, driven in part by increasing consumer interest in healthy, flavorful food options. This study investigates U.S. consumer preferences and willingness to pay (WTP) for fresh herbs based on production method, geographic origin, packaging format, and herb species, using a Discrete Choice Experiment (DCE) and mixed logit modeling across three event treatments (i.e., Holiday, Non-Holiday, and Meal-at-home). Results suggest that consumers are willing to pay significant premiums for organic, sustainably grown, local, domestically produced herbs relative to their respective baselines. Pre-cut herbs were preferred over potted and pick-your-own options, highlighting the importance of convenience for consumers. While parsley and basil were more valued than cilantro, the event treatments had a minimal effect on most attribute valuations, suggesting stable preferences regardless of social context. These results underscore the importance of credence attributes and convenience-driven packaging in consumer decision-making for fresh herbs and suggest that marketing strategies can remain consistent with consumer preferences across social contexts.

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CHAPTER ONE

INTRODUCTION

Consumer demand for fresh, local, and sustainably produced food has increased significantly in recent years, reshaping food purchasing behavior across the United States (USDA AMS, 2014; Warsaw et al., 2021). Among these products, fresh culinary herbs are gaining attention not only for their culinary and nutritional qualities, but also for attributes such as perceived freshness, origin, and environmentally conscious production (Adams & Salois, 2010; Warsaw et al., 2021). As demand increases, so does the need to understand factors that influence consumer preferences for these products.

This study investigates how consumers value different attributes of fresh herbs, including origin (domestic, local, or imported), production method (conventional, organic, or sustainable), and product packaging (pre-cut, potted, or pick-your-own). Additionally, it explores whether social context, evaluated through different event treatments, such as a Holiday event, a Non-Holiday, or a Meal-at-home, moderates consumer preferences. While contextual influences have been previously observed in food purchasing behavior (Jaeger & Rose, 2008; Li et al., 2020), little is known about how these dynamics affect complementary goods like culinary herbs.

Previous studies demonstrated that origin information impacts consumers' willingness to pay (WTP) for fresh produce, including locally grown tomatoes (Yue & Tong, 2009), leafy greens (Dieli et al., 2024; Seong et al., 2024), and strawberries (K. Darby et al., 2006). The increased availability of fresh, local food products, including herbs, has been documented in the United States, reflecting growing support for regional food systems and shortened supply chains (Martinez et al., 2010; USDA AMS, 2014). Other research has focused on consumers' increased interest in high-quality produce, which is associated with better flavor and safety perceptions

(Schaarschmidt, 2016) and includes fruits, vegetables, and extra virgin olive oil (Eyinade et al., 2021; Rizzo et al., 2020).

However, relatively few studies have focused on culinary fresh herbs, and to our knowledge, none have considered how consumption setting and social pressure (i.e., event treatment) may influence consumer choices for these products. This is an important omission, as the value consumers give to credence attributes (e.g., origin, organic certification) may depend not only on intrinsic preferences, but also on the perceived social desirability of the purchase context (Jaeger & Rose, 2008; Li et al., 2020).

This study contributes to the literature in three ways. First, it estimates U.S. consumer preferences and WTP for key extrinsic attributes of fresh culinary herbs. Second, it evaluates how preferences vary across event treatment, simulating real-life consumption context. Finally, it assesses whether social context influences the valuation of high-quality attributes, such as organic production, local sourcing, or convenience-oriented packaging.

To do so, a discrete choice experiment (DCE) was designed using real-world herb attributes and administered via an online survey. A mixed logit model was used to estimate heterogeneity in preferences and WTP. Results show consistent premiums for organic, sustainable, local, and convenience-oriented packaged herbs across event treatments. While social settings were hypothesized to influence these valuations, the findings suggest that consumer preferences for fresh herbs remain stable regardless of the occasion.

CHAPTER TWO

LITERATURE REVIEW

The demand for fresh culinary herbs in the U.S. has experienced significant growth in recent years, driven by increasing consumer interest in healthy and new food options (Gundala & Singh, 2021; Hall & Dickson, 2011). According to market reports, sales of fresh herbs in North America reached approximately $1.35 billion by 2024, with projections indicating a rise to $2.19 billion by 2030 (Horizon Grand View Research, 2025). This growth reflects a compound annual growth rate (CAGR) of 8.4% from 2025 to 2030 (Horizon Grand View Research, 2025).

As reported by USDA's National Institute of Food and Agriculture (USDA NIFA), domestic fresh-cut herb farms produced about $65 million worth of domestic herbs in 2019, whereas over $294 million in fresh herbs are imported each year (USDA NIFA, 2025). Additionally, the USDA's Foreign Agricultural Service (FAS) indicates that herbs originate from more than fifty countries (L. Nguyen et al., 2019; USDA FAS, 2025). According to the International Federation of Organic Agriculture Movements (IFOAM) and the Research Institute of Organic Agriculture (FiBL), over half the total value of herb imports came from just five countries, including Mexico, Canada, Peru, the Netherlands, and Israel (FiBL & IFOAM, 2025; L. Nguyen et al., 2019).

Agricultural census data from the USDA's National Agricultural Statistics Service (NASS) shows domestic production of fresh-cut herbs is concentrated in five states: Arizona, California, Florida, Hawaii, and Texas, which together account for 69% of the fresh-cut herbs produced and consumed domestically (USDA NASS, 2025).

Herb Quality and Controlled Environmental Agriculture

Supply chain disruptions, seasonal variation, and post-harvest management practices are all factors that influence the availability and quality of fresh herbs (Barbosa et al., 2015; Schaarschmidt, 2016). Although there is no immediate concern regarding herb scarcity, complications during transportation and storage may impact freshness and perceived quality (Schaarschmidt, 2016). Specifically, fresh herbs sourced from international suppliers may suffer quality degradation due to inconsistent cold chain logistics and inadequate preservation techniques, leading to product loss and an imbalance in the market supply (L. Nguyen et al., 2019). Fresh herb production encounters several environmental issues, including climate change, weather fluctuation, water availability, and pest and disease pressure (USDA, 2022a).

Technological advancements in controlled environment agriculture (CEA) and precision farming offer potential solutions to challenges by improving resource efficiency and crop yields (Graamans et al., 2018; Kalantari et al., 2018). However, a primary concern in CEA is its economic feasibility, particularly for small producers, due to high capital and operating costs associated with these technologies (Barbosa et al., 2015; Goldberger, 2011). Still, potential advantages such as year-round production, heightened product consistency, and the ability to meet premium market demands may justify the investment in CEA systems (Graamans et al., 2018; Kalantari et al., 2018).

It is important to distinguish between CEA, greenhouse production, and hydroponic systems, as these terms are often used interchangeably but refer to different components of modern production systems. CEA is an umbrella term that encompasses both indoor vertical farms and greenhouse systems, where environmental factors such as light, humidity, fertilization, and irrigation are precisely managed (Barbosa et al., 2015; Kalantari et al., 2018). Hydroponics,

one of the most common cultivation techniques under CEA, involves growing plants in a soilless, nutrient-rich water solution and is typically housed within greenhouses or indoor facilities (Tyson et al., 2010; USDA, 2018).

Demand for Organic and Sustainable Produce

Consumer interest in organic and sustainably produced food has grown steadily over the past two decades, driven by health, environmental, and ethical concerns (Eyinade et al., 2021; Gundala & Singh, 2021; Zepeda et al., 2007). This trend is further supported by the increased availability of certified organic products in markets across global supply chains (H. V. Nguyen et al., 2019). However, organic production remains a tiny segment, accounting for only two percent of global farmland (FiBL & IFOAM, 2025). According to the USDA's Economic Research Service (ERS), the U.S. has the largest market for organic foods, totaling $64 billion in annual retail sales as of 2023 (USDA ERS, 2023). Within this market, fruits and vegetables are the leading category, with retail sales of about $20.5 billion, reflecting the growing mainstream appeal of organic options (USDA ERS, 2025). However, in the U.S. fresh herb market, domestic organic production is estimated to be around 3% of total herb output, with most of organic herbs supplied via imports (FiBL & IFOAM, 2025; USDA ERS, 2023).

Research consistently shows that consumers are willing to pay a premium for organic fresh food products. For instance, Carlson and Jaenicke (2016) report average premiums of approximately 20% for organic fruit, vegetables, and leafy greens (except for spinach), with even higher premiums observed for salad mixes (60%) and eggs (82%), compared to their conventional alternatives. A similar study by Ureña et al. (2008) pointed out gender-based differences in WTP: although both men and women are willing to pay for organic products, men were willing to pay an additional 1.9% to 5.2% in specific categories, including meat, oil, wine,

nuts, and cereal categories (Ureña et al., 2008). Furthermore, recent studies suggest that Millennials and Gen Z, are driving demand for organic products due to their strong concerns for sustainability, transparency, and health-conscious eating (Jakubowska et al., 2024; Whole Foods, 2024).

Organic farming restricts the use of synthetic pesticides and instead requires biopesticides and integrated pest management (IPM) methods, which can have different modes of action and are perceived as less negative to the environment when compared to synthetic pesticides (Gundala & Singh, 2021). These perceptions are reinforced by beliefs about superior nutritional value and environmental benefits while reducing potential chemical exposure, which increases the likelihood of buying organic options (Eyinade et al., 2021; Rizzo et al., 2020). However, these perceptions do not always align with scientific evidence and production realities. Systematic reviews have found little to no consistent evidence supporting significant nutrient differences between organic and conventional produce (Dangour et al., 2009; Smith-Spangler et al., 2012). Moreover, organic production is not pesticide-free. Organic-approved pesticides, such as copper-based fungicides and botanical insecticides like neem oil, are often used at higher frequencies than their conventional counterpart, due to their narrower spectrum of control compared with synthetic pesticides (Goldberger, 2011; Winter & Davis, 2006).

These misconceptions highlight the importance of credence attributes, which are defined as product qualities that consumers cannot verify themselves but believe due to labeling or marketing (M. Darby & Karni, 1973). Consequently, consumer education about the actual practices allowed in organic production systems may be a key factor in shaping more informed purchasing decisions.

According to the University of Florida, Institute of Food and Agricultural Sciences (UF/FIAS), many commercial leafy green and culinary herb producers, particularly those supplying large U.S. grocery retailers, rely on a combination of greenhouse-based CEA systems and soilless media (e.g., coco coir, peat, or composted bark) to grow potted herbs organically (UF/IFAS, 2021). Historically, these soilless systems faced challenges in meeting the requirements for organic certification, as organic production was interpreted to required soil-based systems, thereby excluding hydroponics (USDA, 2018). However, updated interpretations of the USDA National Organic Program (NOP) have allowed for certain hydroponic or container-based systems to qualify for certifications, as long they demonstrate compliance with organic principles such as soil conservation, biodiversity, and minimal synthetic input use (USDA, 2018; USDA AMS, 2014, 2016). This ongoing debate reflects a broader tension between evolving agricultural technologies and regulatory frameworks aimed at supporting consumer trust in the organic label.

Demand for Locally Produced Goods

Consumer interest in locally grown fresh produce has increased in recent years, as consumers become more concerned about issues related to food origin, freshness, and sustainability (USDA, 2022b; USDA ERS, 2021; Warsaw et al., 2021). Locally grown products are often preferred over imports or even non-local domestic products, due to their perceived superior freshness and quality, which are associated with shorter transit distances (Adams & Salois, 2010; Martinez et al., 2010; Yeh & Hirsch, 2023). Additional purchase drivers include support for local economies, community engagement, and transparency in production practices (USDA AMS, 2014; USDA ERS, 2021; Warsaw et al., 2021). Consumers also value to know the farmers and understand the production practices behind their food, which enhances both trust and

satisfaction with the products (Warsaw et al., 2021; Yue & Tong, 2009). Many of these benefits increase the perceived value of local products. For example, in a choice experiment on tomatoes, customers were willing to pay a premium for locally produced tomatoes when compared with non-local ones (Yue & Tong, 2009).

Based on USDA ERS (2021), local food sales were $9 billion in 2020, accounting for 3% of total agricultural sales in the U.S. This is an increase over the 2015 value ($8.7 billion), which lends supporting evidence of U.S. consumers' interest in locally produced food products (USDA, 2022b). Other evidence of heightened interest in local food systems is the increase in the number of farmers markets, from 1,755 markets in 1994 to 8,761 in 2019 (Warsaw et al., 2021). Direct farm sales include both fresh foods and value-added products such as bottled cheese, milk, wine, jams, and meat (USDA, 2022b; USDA ERS, 2021).

However, the structure of local food marketing channels has evolved. As reported by USDA (2022b) and USDA ERS (2021), the share of direct local food sales made through intermediaries and institutions (such as grocery retailers and food services providers) rose from 39% to 46% from 2015 to 2020. In contrast, direct-to-consumer local food sales decreased from 35% to 32%. This shift suggests that consumer interest in local food is still strong, but retailers and intermediaries now play a growing role in connecting consumers with local food products.

Packaging Influence on Customer Preferences

As mentioned by Rokka and Uusitalo (2008), and more recently by Steenis et al. (2017), packaging can affect consumers' perceptions of product quality, taste, convenience, and freshness. From an agricultural marketing perspective, packaging serves not only as a physical container or point-of-sale presentation but also as a signal of product attributes, thereby affecting

consumers' decisions and influences their purchasing behavior (Rokka & Uusitalo, 2008; Steenis et al., 2017).

Convenience plays an important role in consumer decision-making, particularly for people with limited time due to busy lifestyles (Koutsimanis et al., 2012; Steenis et al., 2017). Products that reduce preparation time, such as pre-cut herbs, are ready to use without additional processing, often command a price premium due to perceived added value (Koutsimanis et al., 2012; Pollard et al., 2002; Rokka & Uusitalo, 2008). Currently, there is a wide variety of packaging options available, including pre-cut herbs, whole-packed herbs, pick-your-own herbs, and potted herbs, each targeting different consumer needs and potentially contributing to market growth. Pre-cut herbs trimmed, packaged in plastic clamshells or sealed containers, and are ready to use, making them especially appealing to time-constrained consumers (Ragaert et al., 2004). Similarly, whole-packed herbs are harvested but remain uncut and are packaged with stems and leaves intact to preserve freshness. In many settings, they are often grouped or merchandised alongside pre-cut herbs.

Simultaneously, concerns about environmental sustainability are reshaping packaging preferences. Research shows growing consumer resistance to plastic packages and a preference for reduced or biodegradable alternatives (Piracci et al., 2023; Tanase et al., 2017; White & Lockyer, 2020). This trend is particularly relevant in the fresh herb segment since small product volumes may appear over-packaged relative to their content. As a result, eco-conscious consumers are increasingly motivated to choose alternatives like pick-your-own, potted herbs, or even home-grown herbs, which offer more sustainable, reusable and interactive options (Galhena et al., 2013; Porter, 2018).

Pick-your-own herbs are typically presented in-store as living plants with scissors provided for consumers to cut and purchase only the amount they need, providing the consumer with a sense of involvement and food waste minimization (Hall & Knuth, 2019; Porter, 2018). Potted herbs, on the other hand, are sold as entire plants in soil within a pot. These herbs can be kept alive for longer periods, allowing consumers to harvest multiple times. Compared to pick-your-own options, potted herbs require more care but offer longer-term use through the ability to harvest fresh herbs as needed, offering a more interactive and eco-friendly option (Hall & Knuth, 2019; Porter, 2018; Steenis et al., 2017).

The diversity in packaging formats reflects efforts to meet heterogeneous consumer preferences and needs. However, there is limited empirical evidence on how these preferences vary under different usage contexts. Further exploration into how packaging preferences shift across different social settings can provide insights for targeted production and marketing strategies in the fresh herb market.

Social and Situational Effects on Consumer Expenditure

Consumers' decision-making process is influenced not only by individual preferences but also by a range of social and situational factors, including cultural norms, peer influence, and perceived social risk (Haghighian et al., 2017; Jaeger & Rose, 2008; Xie & Wang, 2003). One well-documented phenomenon is social facilitation, in which the presence and behavior of others while eating alters people's choice and the intake of food (Castro, 1997; Herman, 2015; Jaeger & Rose, 2008). For example, people model their consumption based on the behavior of peers, using others' intake as a guide for appropriate behavior (Roth et al., 2001). However, according to a review by Herman (2015), it is more likely to observe social facilitation among friends dining together than among strangers. The difference is likely associated with a higher eagerness to

make a positive impression on strangers than on friends, since the perceived social risk is higher (Tice et al., 1995).

Perceived risk is especially relevant in contexts where consumers prepare or share food with others. In these situations, the social pressure of guests not liking the food they are consuming can influence purchase decisions. Consumers often purchase safer or known food to avoid potential adverse evaluations (Bearden & Etzel, 1982; Jaeger & Rose, 2008; Xie & Wang, 2003). In contrast, when cooking in a more familiar context (i.e., cooking with friends or for the household), using new recipes or new ingredients may be perceived as less risky, resulting in a higher likelihood to try unfamiliar or new food products (Motoki et al., 2022; Wakefield & Inman, 2003).

These contextual effects have been observed in different studies. In an Iranian study conducted by Haghighian et al. (2017), social gatherings increase demand for aromatic ingredients, cultural traditions dictate specific ceremonial uses, and resource accessibility affects quality preferences. Similarly, Boncinelli et al. (2019) and Bearden and Woodside (1978) illustrated the role of context on wine and beer consumption. Premium brands were found to be used during festive, restaurant, and business occasions, as well as gifts, since they were considered higher quality and more prestigious. However, in the everyday context (e.g., watching TV, working from home), consumers choose cheaper or more convenient brands. This is because, in this context, the inherent characteristics (e.g., taste or source) are valued more than the social value or status they can give to the buyer (Boncinelli et al., 2019). These context-based premiums reflect both social signaling (e.g., impressing guests) and institutional factors such as restaurant pricing structures (Angelini et al., 2025; Bearden & Woodside, 1978).

In the context of fresh culinary herbs, these premium prices associated with social and situational effects may be less pronounced, due to the complementary role of herbs in meal preparations. Since herbs are typically used in small quantities to enhance the flavor or visual appeal of dishes, rather than as core components of a meal, consumers may perceive them as lower risk an may not adjust their preferences substantially across social context compared to more central or hedonic food items (Wakefield & Inman, 2003). Nevertheless, context may still influence herb choice, particularly if presentation, freshness, or convenience are perceived as more important when consumers are hosting others and aim to serve visually appealing or high-quality meals.

CHAPTER THREE

HYPOTHESES

The overall objective of this analysis is to provide an overview of U.S. consumer preferences for culinary herbs and assess whether different culinary herb attributes (production methods, origin, packaging, and herb type) generate added value from the customers' perspective. Based on the literature review, several hypotheses were formed to address the overall research objective: assessing consumer preferences and WTP for herbs.

Given growing consumer interest in organic and sustainable production for fresh produce (Eyinade et al., 2021; Gundala & Singh, 2021; L. Nguyen et al., 2019; Rizzo et al., 2020), we hypothesize the following:

H1: U.S. consumers will have a higher WTP for organically produced herbs compared to conventionally produced herbs.

H2: U.S. consumers will have a higher WTP for sustainably produced herbs compared to conventionally produced herbs.

Consumers are generally willing to pay a premium for fresh produce from local and close origins over imported ones (Adams & Salois, 2010; Martinez et al., 2010; USDA ERS, 2021; Warsaw et al., 2021; Yeh & Hirsch, 2023). Given this information, we hypothesize similar results for fresh herbs. Specifically:

H3: U.S. consumers will have a higher willingness to pay for locally grown herbs compared to imported herbs.

H4: U.S. consumers will have a higher willingness to pay for domestically grown herbs compared to imported herbs.

Consumers tend to prefer packaging formats that offer convenience and require minimal additional processing, such as pre-cut or pre-washed herbs, as these options save time and effort in meal preparation (Pollard et al., 2002; Ragaert et al., 2004; Rokka & Uusitalo, 2008). Given the influence of packaging on consumer preferences, we hypothesize:

H5: U.S. consumers are likely to show a higher WTP for fresh culinary herbs presented in pre-cut packaging compared to those offered as potted or pick-your-own options.

Consumers' buying decisions are also influenced by social context and perceived social risk. During events involving guests, consumers are more likely to buy products associated with higher quality to reduce negative evaluations (Bearden & Etzel, 1982; Li et al., 2020; Xie & Wang, 2003). Given that organic fresh produce is perceived as higher quality than conventionally produced products (Eyinade et al., 2021; Gundala & Singh, 2021; Rizzo et al., 2020), which may increase their appeal in social settings, we hypothesize:

H6: U.S. consumers' WTP for organic herbs (compared to conventionally grown herbs) will be higher for event situations (Holiday, Non-Holiday) than in the Meal-at-home context.

Similarly, consumers perceive locally grown fresh produce as higher quality than imported items (Eyinade et al., 2021; Warsaw et al., 2021; Yeh & Hirsch, 2023) and may prefer them more in social situations to enhance impressions or ensure quality (Boncinelli et al., 2019; Li et al., 2020; Xie & Wang, 2003). We therefore hypothesize:

H7: U.S. consumers' WTP for locally grown herbs (compared to imported herbs) will be higher for event situations (Holiday, Non-Holiday) than for Meal-at-home.

CHAPTER FOUR

METHODOLOGY

Consumer demand theory, as proposed by Lancaster (1966), suggests that utility is a function derived from the characteristics that make up a good rather than the good itself. For this reason, consumers seek products or services with the optimal combination of attributes, given their preferences, budget, and needs. Each product attribute can be characterized as a tangible attribute, which is directly observable (e.g., color, size, design, packaging) (Quest, 2023), or as a credence attribute, which is not directly observable and must be communicated to the consumer through labeling (e.g., origin, production method) (M. Darby & Karni, 1973; Quest, 2023). Both tangible and credence attributes contribute to consumers' utility derived for items (Maute & Forrester, 1991).

For this study, the utility was calculated for five culinary herbs attributes (herb species, package, production method, origin, price), where each attribute had three levels (**Table 1**). These attributes are extrinsic, meaning they do not affect the taste of the herbs. Instead, they are external characteristics that are considered to add value to a product. To define the attributes used in the study, we observed fresh herb attributes at different retail locations (e.g., online, grocery stores, farmer's market, specialty store).

First, the "Production practices" attribute included three production methods commonly used to grow herbs. The three distinct options included "Organic" for the farms that are USDA Organic Certified, "Sustainably Grown" for the farms that use sustainable production methods, such as integrated pest management (IPM), crop rotations, and reduced water (Cabugos, 2021; USDA NIFA, 2020), and "Conventional" for the farms that use conventional production methods.

Table 1. Discrete Choice Experiment Attributes and Corresponding Levels

Attribute	**Definition**	**Attribute Levels**
Price	Price for half (0.5) ounce of the herb in U.S. dollars.	$1.99, $3.49. $4.99
Origin	The location where the herbs were grown.	Local, Domestic, Import*
Herb species	Herb species that are displayed in the choice.	Parsley, Basil, Cilantro*
Production Practices	Production practices employed for growing herbs.	Organic, Sustainable, Conventional*
Package	Entire herb plant in a 4-inch pot with soil. Herbs available along with scissors to cut and pay for what you cut. Herbs are pre-cut by the farmer and packaged.	Potted Pick-your-own Pre-cut*

* Indicates base value for comparison.

Secondly, the “Origin” attribute restricted the geographical area where the herbs were grown relative to where they were sold. There were three options: local, domestic non-local, and imported. “Local” meant that the herbs were grown nearby and had a short transportation distance to the retailer; “Domestic” indicated the herbs were from the U.S. but were not locally grown; and “Import” meant the herbs were from another country besides the U.S.

Next, the “Herb species” attribute consisted of basil, parsley, and cilantro, three of the most commonly consumed fresh herbs in the U.S. (USDA FAS, 2025; USDA NASS, 2025). These herbs share similar agronomic characteristics, such as herbaceous growth habits and relatively short cultivation cycles, which make them comparable in terms of packaging logistics and production requirements. However, despite the similarities at a production level, they have different flavor profiles and are normally used in different culinary contexts, making them not substitutes from a consumer preferences perspective.

Similarly, the “Package” attribute represented the retail presentation of herbs in the retail market. These included “Pre-cut”, where herbs were cut previously and packaged in plastic clamshells; “Potted”, where the full herb plant was in a 4-inch pot; and “Pick-your-own”, which allowed customers to cut the herb in store from live plants and pay only for the ounces cut. Each option represents varying levels of convenience and customer involvement, which may impact preference. For instance, the pre-cut option is the easiest, where customers “grab and go” with their product. The potted option potentially gives greater longevity and can be planted and cared for, which may provide psychological, aesthetic, or other gardening benefits beyond the primary culinary benefit (Hall & Dickson, 2011; Hall & Knuth, 2019). The pick-your-own option may be viewed as fresher than the pre-cut due to still being attached to the roots, but it requires less responsibility and potential waste than the potted option.

Regardless of package type, all herbs were the same quantity (0.5 oz), which aligned with common retail quantities sold. For the purposes of this study, these herb packaging options were considered close substitutes, as they all represent alternative retail formats available to consumers within the same purchase context. While whole-packed herbs (unprocessed herbs sold in full stems) are present in the market, they were not included as a standalone attribute level in the DCE because their usage context, packaging, and consumer perception closely resemble the pre-cut format. Also, in many retail outlets, whole-packed herbs are displayed or sold with pre-cut herbs, limiting their distinctiveness as a substitute alternative. Including only three clearly differentiated formats improved choice clarity and ensured attribute parsimony, a key principle in experimental design to reduce participant fatigue and enhance model interpretability (Caputo & Scarpa, 2022; Louviere et al., 2000).

Lastly, the "Price" was given by three price points, including $1.99, $3.49, and $4.99 per 0.5 oz of fresh herbs. These prices were selected based on online searches and retailer visits, generating a realistic range of market prices determined from available herbs (pre-cut, potted, pick-your-own) in the U.S.

Justification for Discrete Choice Modeling

The DCE methodology is a commonly adopted approach for studying consumers' preferences through displaying scenarios consisting of choice tasks (Lizin et al., 2022; Louviere et al., 2000). DCEs are well known for having high internal validity, that is, being able to find causal relationships from the experimental variables and not from external factors (Brooks & Lusk, 2010). In contrast, their external validity, or the extent to which results can be generalized to real-life scenarios and make inferences to other groups outside the experimental context, is limited (Hensher et al., 2015). However, Brooks and Lusk (2010) provide empirical support for

both internal and external validity of DCEs. In their study, they compared stated preference data with revealed preference data from actual milk purchases and found a strong correlation between the two. Their study found a high correlation between stated and revealed preference parameters. This suggests that, under well-designed conditions, DCEs can generate preference estimates that are not only internally valid but also aligned with real consumer behavior. In the past, DCE have been used to estimate premiums for leafy greens produced in indoor agriculture systems (Seong et al., 2024), organic and local attributes in fresh produce (Yue & Tong, 2009), for organic and clean labels in ready to eat meals (Uddin & Gallardo, 2021).

Discrete Choice Experiment Design

The DCE included three treatments: a Holiday event (cooking and serving guests for a holiday celebration, e.g., Thanksgiving), which accounted for 32.8% of the sample (n=803); a Non-Holiday event (cooking and serving guests for a get-together, e.g., a weekend dinner party) with 33.1% of the sample (n=811); and Meal-at-home (cooking and serving the immediate household members), which accounted for the remaining 34.1% of the sample (n=832).

The treatments were designed based on Louviere et al. (2000) ensuring they mimic real-life situations where consumers make purchasing decisions about culinary herbs. This division allowed for a detailed analysis of how different event treatments influence purchasing behavior for fresh herbs. The participants were randomly assigned to one treatment to avoid bias (Kish, 1968) and to ensure that the findings are generalizable (Rubin, 1974) (see Appendix B to see the study scheme).

Given the number of alternatives per choice task (two alternatives and one opt-out option) and attribute levels (**Table 1**), the full factorial design will follow equation (1):

$$t = L^{J*K} \qquad (1).$$

Here, *t* is the number of potential choice tasks, *L* is the number of attribute levels, *J* is the number of alternatives per choice task, and *K* represents the number of attributes (Hensher et al., 2015; Louviere et al., 2000). Following the formula (3^{2*3}) there are 59,049 potential combinations of herb attributes.

Given that participant fatigue often occurs at a maximum of 20 tasks (Johnson & Orme, 1996), a D-efficient design was used through JMP software (Pro 17; Cary, NC) to reduce the number of choice options. A total of eleven scenarios were generated with a D-efficiency of 87.7%. D-efficiency is a measure of the statistical efficiency of a design (Kuhfeld, 2009). It can be interpreted as the ratio between the efficiency of the chosen design and the efficiency of the optimal design (Huber & Zwerina, 1996; Kuhfeld, 2009) where an acceptable cut-off level is typically around 70% (Kuhfeld, 2009; Louviere et al., 2000).

Consequently, each treatment consisted of eleven scenarios, meaning each person made eleven choices within the event treatment. The treatments and attributes were defined prior to the DCE scenarios. Thus, participants all started the DCE with the same information in terms of definitions and necessary knowledge of the attributes described in the scenarios. All study procedures and protocols were approved by the university's institutional review board (IRB-23-07410-XM).

Survey Instrument

The research was conducted using an online survey platform (Qualtrics XM; Provo, UT). The survey was launched in two rounds, six months apart (May and November 2023) to determine the seasonality effect on choice. Previous research shows that season impacts purchasing behavior for fresh produce (Bond et al., 2009), beef products (Ardeshiri et al., 2019), and sweet products like chocolate and ice cream (Moskowitz & Beckley, 2009). Consumers in

the fresh herb market were the population of interest. Potential participants were screened to ensure they were adults (18 years or older), living in the U.S., and had purchased fresh herbs within the three months prior to taking the survey.

Econometric Procedures

To estimate how consumers value fresh herb attributes, we applied the Random Utility Maximization (RUM) model, proposed by McFadden (1973), which assumes individuals make choices that maximize their utility subject to observable and unobservable components. Following this framework, the indirect utility that consumer *i* obtains from choosing alternative *j* in choice occasion *t* is modeled as:

$$U_{ijt} = V_{ijt} + \epsilon_{ijt} = \beta' x_{ijt} + \epsilon_{ijt} \ (2)$$

where V_{ijt} is the observable component of indirect utility respondent *i* receives from selecting herb *j*; X_{ijt} is a (1 × N) vector of attributes associated with herb *j*, including price. β' is a vector of marginal utility parameters assumed to follow some distribution; ϵ_{ijt} is an independent and identically distributed (IID) type-I extreme value (Gumbel) error term (Train, 2003).

Since utility is not observed directly, only the probability that individual *i* selects alternative *j* can be estimated, as:

$$P_{ijt} = \Pr\left(V_{ijt} + \varepsilon_{ijt} > V_{ikt} + \varepsilon_{ikt};\ \forall\, j \neq k\right) = \Pr\left(V_{ijt} - V_{ikt} > \varepsilon_{ikt} - \varepsilon_{ijt};\ \forall j \neq k\right) (3)$$

Based on this framework, consumer preferences for the attributes in the DCE can be analyzed using different models. One of the most common is the Mixed Logit Model (Hensher et al., 2005; Train, 2002). The mixed logit model, also known as the random parameter logit model, allows for greater flexibility and better prediction of customer behavior than the conditional logit model (Train, 2009). Specifically, the model captures random preference heterogeneity and does not require the premise of independence of irrelevant alternatives (Hensher & Greene., 2003).

There are two alternative approaches that can be considered as alternatives to the mixed logit model: the Latent Class Model and the Conditional Logit (Train, 2002). Latent class model (LCM) is a method employed in determining the groups (or classes) within broad categories of a population concerning observed indicators (Greene & Hensher, 2003).

Several methods can be used to determine which model best fits the data. Here, we used post-estimations of likelihood-ratio tests (Train, 2009). Akaike information criterion (AIC) shows the model fit by imposing a penalty for the number of parameters used in the model to avoid over-fitting (Burnham & Anderson, 2010), while the Bayes information criterion (BIC) also displays model fit though with a higher penalty to the number of parameters used in the model (Schwarz, 1978). According to the AIC and BIC criteria, the mixed logit model was chosen as the most appropriate model for data analysis (See Appendix A).

When considering the mixed logit model for all treatments (Holiday, Non-Holiday, Meal-at-home), the corresponding attribute levels are coded as binary dummy variables (0, 1), with one level in each attribute omitted to avoid multicollinearity and serve as the baseline (reference value). Specifically, the baselines were: import for origin (relative to domestic and local); cilantro for herb species (relative to basil and parsley); conventional for production practices (relative to organic and sustainable grown); and pre-cut for packaging type (when compared to pick-your-own and potted). As such, the assumed deterministic portion of consumer *i's* indirect utility function from choosing alternative $j \in$ {Herb 1, Herb 2, Opt-out} during choice occasion *t* takes the form:

$$U_{ijt} = ASC_{ij} + \mu Price_{jt} + \beta_{i1}Local_{jt} + \beta_{i2}Domestic_{jt} + \beta_{i3}Parsley_{jt} + \beta_{i4}Basil_{jt} + \beta_{i5}Organic_{jt} + \beta_{i6}Sustainable_{jt} + \beta_{i7}Potted_{jt} + \beta_{i8}PickOwn_{jt} + \epsilon_{ijt} \quad (4)$$

U_{ijt} is the utility that individual *i* derives from alternative *j* in choice task *t*. ASC_j is an alternative-specific constant capturing the mean utility of choosing *j* relative to the opt-out alternative. β_{ik} represents the individual-specific marginal utility for attribute level *k*, and these coefficients are assumed to follow a normal distribution to account for unobserved taste heterogeneity across individuals. The coefficient μ represents the marginal utility of income and is assumed to be fixed across individuals. $Price_{jt}$ represents a continuous variable indicating the price level of alternative *j* in task *t*. Finally, ε_{ijt} is an i.i.d. extreme value type I error term that captures unobserved factors affecting utility.

In this study, the alternative-specific constant (ASC) for the opt-out option was modeled as a random parameter, which may lead to heterogeneous baseline utilities for not purchasing any of the offered herb options. In other words, the decision to opt out is not expected to be uniform across individuals and event treatments, as factors such as social pressure, food expectations, and personal norms may influence the utility derived from declining purchase. Modeling the opt-out ASC as random allows for capturing unobserved heterogeneity in participants' general willingness to engage with herb products across varying social settings. This approach is supported by Train (2009), who highlights that any parameter can be modeled as random when individual variation is expected. Given that consumers adjust their preferences and risk tolerance based on the perceived social significance of the occasion (Jaeger & Rose, 2008; Wakefield & Inman, 2003), this specification provides a more flexible and realistic representation of consumer choice behavior in varied meal occasions. Thus, the random ASC specification reflects the potential variability in the psychological and situational drivers of opting out across different individuals and scenarios.

The coefficient estimates for every attribute and price were taken using Stata (Stata Corp LLC, version 18.0, College Station, TX, USA) software. Equation (5) calculates individual i's WTP for attribute *j* by dividing the negative of the estimated coefficient by the coefficient estimate of price. Mathematically, this is expressed as:

$$WTP_{ij} = -\frac{\beta_{ij}}{\mu} \qquad (5)$$

However, we are also interested in calculating a population-level estimate. With the random parameter logit, WTP is a non-linear function of random parameters, which means more precise procedures are necessary. The Stata program is used to compute the WTP statistics for each attribute by the bootstrap method. To conduct valid statistical inference and compare WTP estimates between treatments, we need to use a method that takes into consideration this nonlinearity. In this study, the Krinsky-Robb simulation technique was employed. This method draws repeatedly from the estimated parameter distribution, generating confidence intervals (CI) at a 95% confidence level (Krinsky & Robb, 1986).

These intervals were then visually and numerically compared across event treatments. Following established practice, the absence of overlap confidence intervals was used as an indication of a statistically significant difference in mean WTP values between event treatments. The 95% confidence interval for the difference in WTP was derived using percentiles (e.g., the 2.5th and 97.5th percentiles) of the simulated distribution. If this confidence interval did not contain zero, the difference was considered statistically significant at the 5% level. It is a useful approach for calculating standard errors and confidence intervals of nonlinear functions of estimated coefficients (Krinsky & Robb, 1986).

Usually, 1,000 simulations are often sufficient to construct reasonably robust confidence intervals (Hensher et al., 2015). We used the default of 1,000 Krinsky-Robb replications

implemented in Stata to ensure higher precision and reduce simulation noise in the confidence bounds for nonlinear estimates such as WTP (Hensher et al., 2015; Krinsky & Robb, 1986).

CHAPTER FIVE

RESULTS

Summary Statistics

A total of 2,446 valid responses were obtained, with 1,219 and 1,227 responses for the first (May) and second (November) rounds of data collection, respectively. Compared to the most recent 2023 U.S. Census Bureau report, the sample overrepresents female respondents (73% of the sample) (**Table 2**). This may be attributed to the topic (culinary herbs) or screening procedures. Specifically, potential participants were screened to ensure they had recently purchased fresh herbs. Research shows women are more involved in household and grocery shopping (in general) and the decision-making process of buying groceries than men (Bakewell & Mitchell, 2003) and that gender affects the frequency of shopping and the decision-making process for food items (Meyers-Levy & Loken, 2015; Ünal & Ercis, 2008). In terms of age, the sample had a median age of 49.7 years, which is higher than the U.S. median age of 38.9 years. The difference in median age may be explained by the different approaches to gathering statistics about the U.S. population. The national median age consists of individuals of all ages, including children. In contrast, respondents in this study had to meet the requirement of being 18 years old or older. Given that individuals under 18 years old are approximately 22.1% of the U.S. population, the exclusion of children in the sample likely contributed to the higher observed median (U.S. Census Bureau, 2023). Therefore, the age distribution in this study is expected to skew older, reflecting the population segment most likely responsible for grocery shopping and culinary herb purchasing. The mean household income of the sample was $66,594, which is slightly lower than the U.S. median income of $75,149, indicating that the sample may slightly underrepresent higher-income households.

Table 2. Summary statistics from an online consumer survey used to identify factors impacting fresh herbs consumption in the U.S. (n=2,466).

Variable	**Description**	2023 Qualtrics survey		U.S. Population[1]
		Mean	**Std. dev.**	**Mean**
Age	Median	49.707	16.225	38.9
Gender	% Female	72.77%	0.445	50.40%
Income	Mean	$66,594	54.37	$75,149
Household size	Mean	2.61	1.384	2.57
Education	Bachelor's degree or higher	36.83%	0.482	34.30%
Urban	% of people living in Urban areas	22.12%	0.415	26.70[2]
Suburban	% of people living in Suburban areas	55.27%	0.497	52.00%[2]
Rural	% of people living in Rural areas	22.61%	0.418	21.40%[2]
White / Caucasian	Mean	78.58%	0.41	75.50%
African American	Mean	13.12%	0.338	13.60%
Native American	Mean	6.30%	0.243	1.30%
Native Hawaiian	Mean	0.29%	0.053	0.30%
Asian	Mean	2.37%	0.152	6.30%
Hispanic	Mean	4.09%	0.198	19.10%

[1] (U.S. Census Bureau, 2023).
[2](The Department of Housing and Urban Development, 2017).

However, the household size of the sample (mean = 2.61) closely aligns with the U.S. average (mean = 2.57), suggesting that the sample is representative in terms of household size. The sample also closely mirrors the U.S. population in terms of education, with 36.83% of respondents holding a bachelor's degree or higher, compared to 34.30% in the general population. However, there are some differences in geographic distribution: the sample slightly underrepresents urban areas (22.12% vs. 26.70%) and slightly overrepresents suburban areas (55.27% vs. 52.00%), while rural representation is similar (22.61% vs. 21.40%). These differences may reflect variations in access to fresh herbs or interest in culinary topics across geographic regions.

Finally, the sample's racial and ethnic composition shows some deviations from the U.S. population. While the sample closely matches the U.S. population in terms of White/Caucasian (78.58% vs. 75.50%) and African American (13.12% vs. 13.60%) representation, it underrepresents Asian (2.37% vs. 6.30%) and, more notably, Hispanic (4.09% vs. 19.10%) populations. Also, 6.3% of respondents identified themselves as Native American, a proportion considerably higher than their representation in the general U.S. population (1.3%) according to the 2023 U.S. Census.

These deviations between the survey demographics and the U.S. Census data are likely a result of the sampling methodology conducted by the online panel provider. Although the study was not designed to examine differences across racial groups, these differences should be acknowledged when considering the generalizability of the results. These discrepancies may be due to cultural differences in culinary herb usage or participation rates in online surveys.

Mixed Logit Model Estimates

The coefficients from the mixed logit model are presented in **Table 3**, which estimated the likelihood of consumer preferences for fresh culinary herbs across different purchasing event treatments: Pooled analysis (n=2,466), Holiday event (n=803; 32.8%), Non-Holiday (n=811; 33.1%), and Meal-at-home (n=832; 34.1%).

The coefficients indicate the direction and strength of the relationship between each attribute and the participants' utility. The baseline comparisons for each category were as follows: cilantro (vs. parsley and basil), conventional production (vs. organic and sustainable), pre-cut (vs. potted and pick-your-own), and imported (vs. local and domestic).

Several similarities were noted across the event treatments. The variable price had a significant negative effect on utility, as expected. Basil and parsley consistently showed strong positive effects relative to cilantro. Certified organic and sustainably grown herbs showed increased utility compared to conventionally produced ones. Finally, local and domestic origins were preferred over imported, aligning with previous findings in preference for local sourcing.

Potted herbs and pick-your-own packaging had negative effects on utility relative to pre-cut herbs in most event treatments. However, the packaging did have several variances including the pick-your-own having a negative impact relative to pre-cut for the Non-Holiday event treatment and being not significant for the Holiday and Meal-at-home treatments. The potted herb attribute was not significantly different from pre-cut herbs in the Meal-at-home treatment.

Importantly, the standard deviations (SDs) of several random coefficients were statistically significant, indicating meaningful heterogeneity in preferences across consumers. For example, attributes such as opt-out, parsley, basil, and certified organic showed significant variation in utility across respondents.

Table 3. Mixed Logit Model Coefficients for Fresh Culinary Herbs Across Event Treatment

Attribute	**Pooled Analysis** Coefficient (Std. error)	**Holiday Event** Coefficient (Std. error)	**Non-Holiday** Coefficient (Std. error)	**Meal-at-home** Coefficient (Std. error)
Price	-0.539*** (0.014)	-0.519*** (0.024)	-0.496*** (0.024)	-0.606*** (0.025)
Opt-out	-2.576*** (0.079)	-2.412*** (0.134)	-2.531*** (0.137)	-2.798*** (0.141)
Parsley	0.380*** (0.043)	0.440*** (0.077)	0.459*** (0.072)	0.266*** (0.073)
Basil	0.488*** (0.040)	0.445*** (0.070)	0.585*** (0.071)	0.440*** (0.069)
Potted	-0.187*** (0.031)	-0.169*** (0.055)	-0.311*** (0.055)	-0.068 (0.054)
Pick-your-own	-0.103 (0.033)	-0.112 (0.058)	-0.142** (0.056)	-0.067 (0.058)
Certified Org.	0.778*** (0.043)	0.829*** (0.075)	0.689*** (0.075)	0.815*** (0.076)
Sust. Grown	0.461*** (0.039)	0.540*** (0.068)	0.365*** (0.067)	0.475*** (0.067)
Local	0.807*** (0.035)	0.795*** (0.062)	0.803*** (0.061)	0.836*** (0.060)
Domestic	0.755*** (0.033)	0.751*** (0.057)	0.740*** (0.057)	0.775*** (0.057)
Standard deviations (SD of random coefficients)				
Opt-out	2.103*** (0.058)	2.080*** (0.104)	2.152*** (0.112)	2.261*** (0.118)

Table 3. Continued

Parsley	1.377*** (0.045)	1.511*** (0.083)	1.289*** (0.077)	1.389*** (0.080)
Basil	1.461*** (0.041)	1.450*** (0.072)	1.471*** (0.074)	1.431*** (0.068)
Potted	0.665*** (0.036)	0.657*** (0.062)	0.658*** (0.059)	0.640*** (0.065)
Pick-your-own	0.300*** (0.093)	0.359*** (0.131)	0.239 (0.140)	0.469*** (0.112)
Certified Org.	0.449*** (0.036)	0.344*** (0.071)	0.475*** (0.060)	0.550*** (0.057)
Sust. Grown	0.018 (0.089)	0.008 (0.126)	0.004 (0.122)	0.012 (0.295)
Local	0.575*** (0.045)	0.639*** (0.075)	0.573*** (0.078)	0.518*** (0.085)
Domestic	0.058 (0.085)	0.003 (0.138)	0.139 (0.150)	0.024 (0.117)
N	2446	803	811	832
LR chi2(9)	5,572.220	1,818.610	1,823.480	1,920.280
Log-likelihood	-23,514.843	-7,747.781	-7,828.509	-7,926.632
AIC	47,067.690	15,533.560	15,695.020	15,891.260
BIC	47,244.360	15,689.070	15,850.720	16,047.450
Prob > chi2	0.000	0.000	0.000	0.000

[1]-***, **, * indicate significance at 0.001, 0.01, and 0.05, respectively, relative to the base attribute levels (cilantro, pre-cut, conventional, imported).

On the other hand, variables such as pick-your-own (for the Non-Holiday event treatment only), sustainably grown, and domestic have standard deviations that are not statistically significant, suggesting relatively uniform preferences across the sample for these attributes. This suggests that for some attributes, consumer valuation is consistent, while for others, preferences vary substantially, both in magnitude and possibly in direction.

WTP Estimates

The WTP analysis revealed significant differences in consumer preferences for fresh culinary herb attributes and across different event treatments: Holiday, Non-Holiday, and Meal-at-home. To assess whether consumers' WTP estimates significantly differed across event treatments, confidence intervals were constructed using the Krinsky and Robb simulation method. If zero was not included within the bounds of the confidence interval, the difference was interpreted as statistically significant at the 5% level (Johnston et al., 2017). Statistically significant differences among treatments ($p < 0.05$) are indicated by different letters (**Table 4**).

The Opt-Out alternative showed a statistically significant and negative WTP in the pooled results (-$4.78), indicating that consumers generally obtain more utility from selecting one of the herb alternatives rather than opting out. This behavior persisted between event treatments, with no significant differences in the opt-out WTP estimates observed across them.

In terms of WTP for herb species, in the pooled sample, WTP estimates were positive and statistically significant for parsley ($0.71) and basil ($0.91) compared to cilantro, indicating that consumers were willing to pay a premium for both herbs compared to the baseline (cilantro).

Table 4. U.S. Consumers' Willingness to Pay Estimates for Fresh Culinary Herbs Across Event Treatments.

Attribute	**Pooled WTP**		**Holiday Event**		**Non-Holiday**		**Meal-at-home**	
	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI
Optout	-$4.78	(-$5.10, -$4.47)	-$4.64	(-$5.22, -$4.10)	-$5.10	(-$5.74, -$4.51)	-$4.62	(-$5.13, -$4.14)
Parsley	$0.71	($0.55, $0.86)	$0.85	($0.55, $1.14)	$0.93	($0.64, $1.22)	$0.44	($0.20, $0.67)
Basil	$0.97	($0.77, $1.05)	$0.86	($0.60, $1.11)	$1.18	($0.91, $1.45)	$0.73	($0.52, $0.94)
Potted	-$0.35	(-$0.46, -$0.23)	-$0.33[a]	(-$0.53, -$0.12)	-$0.63[b]	(-$0.85, -$0.41)	-$0.11[a]	(-$0.28, $0.07)
Pick-your-own	-$0.19	(-$0.31, -$0.07)	-$0.22	(-$0.44, $0.01)	-$0.29	(-$0.52, -$0.05)	-$0.11	(-$0.30, $0.09)
Cert. Organic	$1.44	($1.30, $1.59)	$1.60	($1.34, $1.87)	$1.39	($1.12, $1.67)	$1.35	($1.13, $1.58)
Sust. Grown	$0.86	($0.73, $1.00)	$1.04	($0.81, $1.30)	$0.74	($0.50, $1.00)	$0.79	($0.59, $1.01)
Local	$1.50	($1.38, $1.61)	$1.53	($1.32, $1.74)	$1.62	($1.40, $1.83)	$1.38	($1.21, $1.55)
Domestic	$1.40	($1.29, $1.52)	$1.45	($1.24, $1.67)	$1.49	($1.27, $1.72)	$1.28	($1.11, $1.46)

Different letters indicate statistically significant differences among treatments at the 5% level. Significance between treatments was estimated using the Krinsky-Robb method for mean comparison.

When comparing event treatments, participants consistently had positive WTP values for parsley and basil relative to cilantro. However, the overlapping confidence intervals among event treatments indicate that the differences across the treatments are not statistically significant. This suggests that consumers value parsley and basil in a consistent way regardless of the event treatment.

A similar trend was observed in the packaging attribute: consumers needed a discount for potted herbs compared to pre-cut herbs (baseline). In the pooled data, consumers expressed a negative WTP for potted herbs (-$0.35), indicating a general preference for pre-cut options. Among event treatments, the greatest discount was observed in the Non-Holiday (-$0.63), which was significantly different from both the Meal-at-home (-$0.12; $p<0.001$, and the Holiday (-$0.35; $p=0.048$) event treatments. In contrast, no statistically significant difference was found between the Holiday and Meal-at-home treatments ($p=0.121$). These results suggest that potted herbs are particularly less desirable during Non-Holiday social events and slightly more acceptable for home meals and holiday-related events. However, they are still less preferred than pre-cut herbs across event treatments.

For the pick-your-own packaging, the average WTP was negative (pooled data) compared to the pre-cut option (-$0.192). Although mean values ranged from –$0.11 to –$0.29, no statistically significant differences were observed across treatments. However, within event treatment tests indicated that pick-your-own was significantly less preferred than the pre-cut option in both the Holiday event and Non-Holiday groups ($p < 0.05$), but not in the Meal-at-home treatment (no significant difference). This overall trend suggests a general consumer preference for ready-to-use, pre-cut herbs over more labor-intensive formats.

Production practices impacted WTP values. Compared to conventionally grown herbs (baseline), consumers were willing to pay a significant premium for both organically grown herbs and sustainably grown herbs. In the pooled sample, organic herbs showed a higher WTP ($1.44), followed by sustainably grown ($0.86), relative to conventionally grown herbs. None of the production methods estimates were significantly different across treatments, suggesting that organic and sustainable herbs increase value regardless of the event treatment.

Lastly, regarding origin, both local and domestic herbs had significant, positive WTP in the pooled results. Local herbs had the highest WTP ($1.50), followed by domestic herbs ($1.40), when compared to imported herbs. These positive preferences remained consistent across event treatments, with no statistically significant differences in WTP between treatments. This indicates that the preference for geographically closer sources is stable regardless of the event treatment in which the herbs are consumed.

CHAPTER SIX

DISCUSSION

The findings of this research provide valuable insights into consumer preferences and WTP for fresh culinary herbs, particularly in relation to species, production methods, origin, and packaging in different event treatments. The results align with the growing literature on consumer behavior in the fresh produce market, while also offering new perspectives on how these factors influence purchasing decisions for fresh herbs. Below, we discuss the key findings in the context of the existing literature and hypotheses, while also addressing why some results are significant while others are not, likely due to the complementary nature of fresh herbs in consumer diets.

Production Methods: Organic and Sustainable Herbs

The results support H1 and H2, indicating that U.S. consumers value organically and sustainably produced herbs over conventionally grown herbs. This aligns with previous research showing that consumers are willing to pay a premium for organic and sustainably grown products due to perceived health benefits, reduced pesticide residues, and environmental considerations (Eyinade et al., 2021; Rizzo et al., 2020). The WTP for organic herbs was consistently higher across all event treatments, but not significantly different (not supporting H6). This suggests that consumers perceive organic and sustainably grown herbs as higher value relative to conventionally grown herbs, but that the occasion (i.e., event treatment) of use did not influence those valuations.

Origin of Herbs: Local and Domestic Preferences

The results support H3 and H4, confirming that consumers are willing to pay a higher premium for locally and domestically grown over imported herbs. No significant differences

were observed across event treatments (counter to H7). These results may be a product of consumers' association of local herbs with greater freshness and quality (Adams & Salois, 2010; Martinez et al., 2010; USDA ERS, 2021). This preference is driven by the perception that locally sourced products are fresher, support local economies, and have a smaller environmental footprint due to reduced transportation distances (Warsaw et al., 2021; Yue & Tong, 2009). Together, these results highlight the potential for local and domestic production to generate premiums over imported alternatives.

Packaging: Convenience vs. Sustainability

The results support H5, as consumers showed increased value for pre-cut herbs over potted or pick-your-own options. The pick-your-own premiums were not significantly different across treatments. For the potted herb option, participants required the largest discount in the Non-Holiday and Holiday event treatments. This may be partially attributed to the heightened convenience of the pre-cut option (Pollard et al., 2002) or to the fact that events occur on specific days/times, meaning that having a potted plant did not provide any additional benefits over pre-cut. For instance, if it were a Meal-at-home, having a potted plant may be more beneficial due to being able to harvest herbs multiple times rather than a single use.

Event Treatments: Holiday and Non-Holiday vs. Home Meals

As previously mentioned, the results do not support H6 and H7, showing that consumers do not place a higher value on organic or locally grown herbs during event treatments (Holiday and Non-Holiday) compared to the Meal-at-home treatment. This finding diverges from previous studies suggesting that social settings increase risk perceptions and shift preferences toward attributes with perceived higher quality (Boncinelli et al., 2019; Li et al., 2020). These results suggest that the event treatment has a limited effect on consumer preferences for fresh herb

production methods and origins, as evidenced by the lack of significant differences across treatments. For example, both organic and local generated premiums (compared to conventional and imported) across event treatments, but the results were not significant across treatments, showing consistency across social contexts. Similarly, the WTP for potted herbs was consistently low across all treatments, indicating that packaging preferences are relatively stable regardless of the event treatment.

A potential explanation lies in the complementary nature of herbs. As secondary ingredients often used as flavor enhancers or garnishes, rather than as the centerpiece of a meal, herbs may not carry the symbolic value or hedonic value needed to activate socially motivated preferences. Prior research has found that consumers are willing to pay more for premium wine or organic meat (primary or indulgent products) during social gatherings (Candeias & Alonso, 2020; Enriquez & Archila-Godinez, 2022). However, this behavior may not extend to fresh herbs, which are often seen as secondary-ingredients items (Boncinelli et al., 2019; Candeias & Alonso, 2020).

Additionally, the consistent WTP values across treatments suggest that fresh herbs are perceived as low-risk purchases, making consumers less sensitive to the context in which they will be consumed. This aligns with research showing that social pressure has less influence on purchases of foods perceived as habitual, utilitarian, or complementary (Wakefield & Inman, 2003).

CHAPTER SEVEN

IMPLICATIONS

This study provides valuable implications for producers, retailers, and marketers running in the U.S. fresh herb sector. The results reveal consistent consumer preferences for locally and domestically produced herbs, as well as those labeled as sustainable or organically grown, given that these attributes generated significant premiums over conventional and imported alternatives. These preferences are held across all event treatments, suggesting that consumer valuations of these attributes are robust and context independent. This stability enables producers to market high-value attributes consistently, without the need for context-specific promotions, supporting a uniform marketing strategy across consumption occasions.

Additionally, the consistent preference for pre-cut herbs over potted and pick-your-own options reinforces consumer demand for convenient, ready-to-use formats. However, the literature and results also point to potential tension between convenience and sustainability, with some consumers concerned about plastic use and seeking environmentally friendly packaging (Piracci et al., 2023; White & Lockyer, 2020). Firms can use this information by investing in innovative, eco-friendly packaging solutions that align with both environmental concerns and consumer convenience. The significant heterogeneity in preferences for most attributes, especially organic production, suggests that market segmentation strategies may be effective. Targeted marketing campaigns or product labeling aimed at health-conscious or environmentally motivated consumers could increase market efficiency and WTP.

Finally, it is important to acknowledge potential limitations in generalizing of these findings. The sample overrepresented some demographic (Withe/Caucasian and Native American) groups and underrepresented others; particularly Hispanic and Asian populations,

compared to U.S. Census data. While the study was not intended to analyze outcomes by race or ethnicity, this imbalance may limit how broadly the findings can be applied to the U.S. population. Future research should look to include samples that are more demographically representative in order to better capture the diversity of consumer preferences.

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APPENDIXES

APPENDIX A

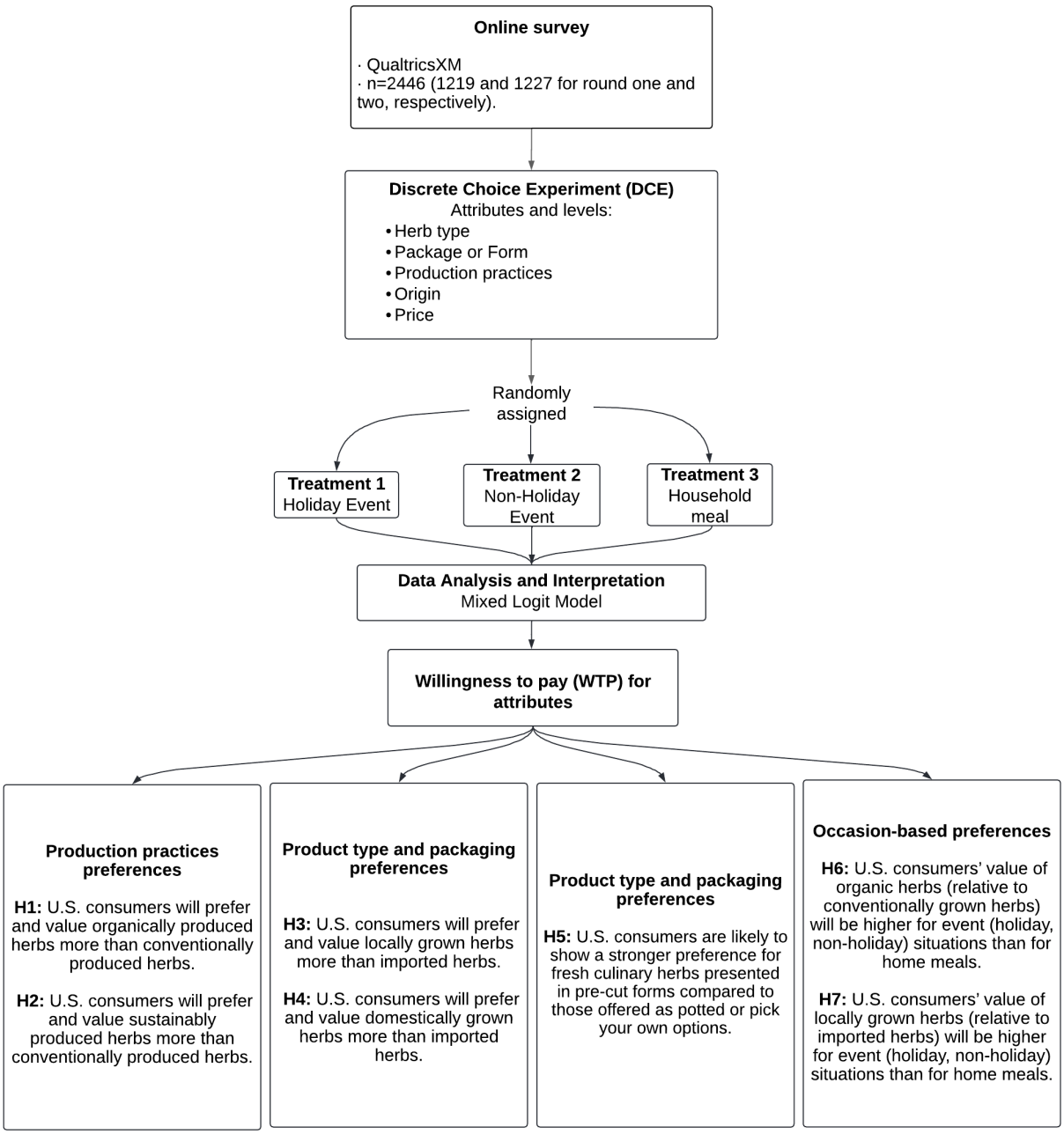
AIC and BIC values across treatments and analysis models.

	Holiday Event		Non-Holiday		Meal-at-home	
	AIC[1]	**BIC**[2]	**AIC**[1]	**BIC**[2]	**AIC**[1]	**BIC**[2]
Conditional logit	17334.17	17416.02	17500.5	17582.45	17793.54	17875.75
Mixed logit	15625.49	15781	15790.64	15946.34	16003.19	16159.38
LCA 2[3]	17062.23	17174.75	17242.61	17355.37	17590.15	17703.52
LCA 3	16518.66	16701.51	16716.81	16900.04	17092.53	17276.76
LCA 4	16348.02	16601.19	16485.54	16739.25	16834.06	17089.15
LCA 5	16238.59	16562.09	16296.34	16620.53	16562.24	16888.18
LCA 6	16116.68	16510.5	16182.17	16576.83	16445.68	16842.48
LCA 7	15918.92	16383.07	16150.49	16615.61	16444.28	16911.93
LCA 8	15874.8	16409.27	15953.64	16489.24	16220.55	16759.07
LCA 9	15691.12	16295.92	15917.01	16523.09	16249.23	16858.6
N	803		811		832	

[1] Akaike information criterion (AIC).[2] Bayes information criterion (BIC).[3] Latent class analysis (LCA) followed by the number of classes (e.g., LCA 2 equates to 2 classes).

APPENDIX B

Study Structure



VITA

Originally from Guatemala, Carlos Rosales completed his undergraduate studies in Agribusiness Administration at Zamorano University. Motivated by his interest in sustainable agriculture and food systems, he pursued a Master of Science degree in Agricultural and Resource Economics at the University of Tennessee, Knoxville. His research focused on understanding consumer preferences for fresh culinary herbs using discrete choice experiments and mixed logit modeling. During his time as a graduate student, he also explored topics related to local food systems, willingness to pay, and environmentally sustainable production practices. Upon graduation, he plans to pursue a career that bridges applied economic research and sustainable development initiatives. He is deeply grateful for the academic guidance of his committee and the unwavering support of his family and mentors throughout his academic journey.