# Exploring Perceptions of Plant-Based Proteins in Dining Among University Students and Food Service Providers

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**Abstract of Dissertation**

Exploring Perceptions of Plant-Based Proteins Dining Among University Students and Food Service Providers

High consumption of animal-based foods, particularly beef, contributes to increased risks of chronic disease and environmental degradation through greenhouse gas emissions associated with livestock production. Increasing plant-based protein intake represents a promising strategy to improve public health and mitigate climate change; however, adoption depends on both individual motivations and supportive food environments. Generation Z has been identified as an environmentally conscious population with growing openness to plant-based eating, positioning universities as critical settings for advancing sustainable dietary change.

This qualitative study examines perceptions of plant-based proteins among students, university dining administrators, and contracted food service providers at a private urban university. Guided by the Socio-Ecological Model (SEM) and Social Cognitive Theory (SCT), the study explores how individual-level determinants (e.g., knowledge, self-efficacy, and expected outcomes), social influences, and institutional structures interact to shape plant-based food provision and consumption. Data were collected through document review, environmental observation, and semi-structured in-depth interviews.

Findings highlight multi-level influences on plant-based eating. At the individual level, students demonstrated awareness of the health and environmental benefits of plant-based proteins; however, their confidence in preparing and selecting nutritionally adequate meals (self-efficacy) varied and was shaped by prior exposure, cultural background, and

education. At the interpersonal level, social norms, cultural traditions, and peer dynamics influenced openness to plant-based foods, alongside opportunities for social learning through coursework, media, and campus engagement. At the institutional level, the dining environment shaped expectations and behaviors: students reported limited variety of whole-food plant-based options and an overreliance on meat alternatives, alongside a desire for improved labeling and more appealing, culturally diverse meals.

Differences also emerged in how plant-based initiatives were conceptualized and implemented. Dining administrators emphasized educational activation, storytelling, and creative integration of plant-based meals to shape preferences and normalize consumption. In contrast, food service providers focused on operational feasibility, often relying on plant-based meat alternatives and perceiving plant-based options as costly, reflecting procurement and budget constraints. Overall, the findings illustrate reciprocal relationships between individual behaviors and institutional environments. Knowledge, self-efficacy, and expected outcomes interact with dining practices and structural constraints, underscoring the need for coordinated, multi-level strategies to support plant-based protein adoption within university dining systems.

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# Chapter 1: Introduction

## Problem statement

Overconsumption of red meat has significant negative impacts on both human health and the environment. Excessive intake of red meat is linked to health issues such as heart disease, diabetes, and certain cancers, while also contributing to environmental degradation through the high emissions associated with livestock farming (Clemente-Suárez et al., 2023; González et al., 2020; Moparty et al., 2025). Reducing individual red meat consumption and promoting plant-based protein sources are therefore crucial for improving public health and mitigating climate change (Moparty et al., 2025).

Adopting sustainable diets that emphasize plant-derived foods and proteins specifically offers dual benefits: improving health outcomes by providing nutrient-rich, lower-fat alternatives to animal products and decreasing emissions from the agricultural sector (Ronto et al., 2022). Plant-forward diets not only reduce the environmental footprint but also provide protective health benefits such as lower risks of chronic diseases (Viroli et al., 2023). However, accessing and choosing foods and meals with less meat and more plant-based protein can be challenging. The food system is deeply intertwined with cultural, economic, and political factors that often prioritize convenience and cost over health or sustainability. These systems can make it difficult for consumers to make informed, sustainable choices. Therefore, it is essential to identify and implement strategies that reduce red meat consumption and facilitate the adoption of plant-based proteins. These strategies must address both the individual and systemic barriers that hinder sustainable dietary changes.

**Goal of the study**

Guided by the Socio-Ecological Model (SEM) (McLeroy et al., 1988) and Social Cognitive Theory (SCT) (Bandura, 1991), the overarching intellectual goal of this study is to understand how individual-level cognitive factors and institutional-level food environments jointly shape the feasibility of implementing a plant-based protein forward dining context in university settings to support health and environmental sustainability.

Specifically, drawing on SCT, the study examines students' knowledge, outcome expectations, and perceived facilitators and barriers related to plant-based foods and proteins, specifically, including perceptions of environmental impacts. At the interpersonal and organizational levels of the SEM, the study assesses how food service providers' and university dining administrators perceive decision-making processes, operational constraints, and capacity's influence on the availability, appeal, and promotion of meal options with plant-based proteins.

The practical goal of this study is to generate recommendations for campus-based interventions grounded in students' perspectives and lived experiences. By integrating insights from SCT (e.g., knowledge, self-efficacy, expectations, and perceived barriers) with structural and organizational influences identified through the SEM, this study aims to provide actionable guidance for initiatives such as student education, menu design and placement. Collectively, these recommendations seek to promote greater consumption of plant-based proteins and reduce reliance on animal-based food options within university dining settings.

At a macro level, this study aims to explore the role of university dining services in fostering sustainable food environments and supporting climate change mitigation efforts

through offering plant-based proteins. The research will examine both student perceptions and food service provider perspectives to identify opportunities and challenges in promoting plant-based protein options on campus. There are four research questions addressed in this study:

1. How do students understand plant-based proteins, consider the environmental impacts of their diets, and perceive the adequacy and appeal of plant-based meal offerings on campus?
2. What are students' expectations from the university regarding plant-based proteins to better support students?
3. What perspectives do food service providers and dining hall managers hold regarding the expansion of plant-based protein options?
4. What strategies are they currently implementing or planning to implement to promote plant-based and reduce animal-based purchases in university dining halls?
5. What governance structures, decision-making processes, and contextual barriers and facilitators shape how dining halls support plant-based eating?

**Novel contribution of the study**

This study is innovative in its integrated examination of student perceptions and institutional food service decision-making within the same campus dining context to inform the design of interventions aimed at promoting plant-based proteins. While prior research has extensively examined individual-level attitudes toward plant-based diets and, separately, institutional sustainability initiatives in food service settings, few studies have

empirically connected consumer perspectives with provider capacity, operational constraints, and governance structures that shape what is feasible in university dining halls.

By integrating students' perceptions of plant-based proteins and environmental impacts with perspectives on menu planning, procurement, and decision-making held by food service providers' and dining hall managers', this study advances the literature in three key ways. First, it moves beyond attitude-focused research by identifying practical mismatches or alignments between student demand and institutional supply. Second, it contributes implementation-relevant insights by elucidating how contractual relationships, provider influence, and operational constraints affect the adoption of plant-forward strategies in real-world dining environments. Third, the study adopts an intervention-oriented, formative approach, generating evidence directly applicable to the design of feasible, context-sensitive strategies to increase plant-based food consumption in higher education settings.

## Background

### 1. Understanding climate change: human impact and global emissions

Climate change, as defined but the United Nations, is a "long-term shift in temperature and weather patterns." While some climatic variability occurs naturally, extensive evidence shows that human activity—particularly the burning of fossil fuels and emissions associated with agrifood systems—is a primary driver of contemporary climate change (FAO, 2024; NASA, 2022). The combustion of fossil fuels such as coal, oil, and natural gas releases greenhouse gases (GHGs), including carbon dioxide, methane, and nitrous oxide, which trap heat in the Earth's atmosphere and contribute to rising global temperatures. In parallel, agrifood systems globally are estimated to account for

approximately one-third of total anthropogenic GHG emissions, driven by livestock production, crop cultivation, land-use change, and activities across the food supply chain (FAO, 2024). Increasing GHG concentration, caused by industrial activities such as land clearing for expanding agricultural space and development, has been observed since 1750 (Intergovernmental Panel on Climate Change (IPCC), 2023). Since that time levels of CO2 have risen by approximately 50% (NASA, 2022). In the past five decades global surface temperature has been increasing faster than in the previous 2000 years. From 1910 to 2020 the global temperature rose about 2°F (1.2°C) (NASA, 2021). In 2019, atmospheric concentrations of carbon dioxide (CO2) reached their highest levels in approximately 2 million years, while methane (CH4) and nitrous oxide (N2O) concentrations were the highest observed in at least 800,000 years (Intergovernmental Panel on Climate Change (IPCC), 2023; Lamb et al., 2021). Methane has a relatively short atmospheric lifetime of approximately 9-12 years, nitrous oxide persists for roughly 114-132 years, and carbon dioxide has a complex long-lasting impact, with portions of it persisting in the atmosphere for hundreds to thousands of years. While methane is more potent than CO2 in trapping heat over 20 years, due to its short life reducing methane emissions yields rapid climate benefits (UNEP, n.d.).

In 2019 CO2 concentration in the atmosphere was the highest in 2 million years while concentrations of methane (CH4) and nitrous oxide (N2O) were the highest in 800,000 years (Intergovernmental Panel on Climate Change (IPCC), 2023; Lamb et al., 2021). It is worth noting, that 2024 was the warmest year since 1850, when the temperatures began to be recorded (NOAA, 2024).

Economic and population growth, and associated developmental processes and activities, have been the main drivers of GHG in the past decade, consistent with the long-term trend. Affluence, in particular, associated with consumption of energy resources and consequent GHG emissions, has been on a rise until 2015. The major sources of GHG emissions are attributed to energy systems, industry, construction and buildings, transportation, agriculture, forestry, and other land uses. Globally, the largest emitting economic sector within the direct emissions Scope 1 category, defined as emissions a company causes by its operations (Oyewo, 2023), is energy systems (34%), followed by industry (24%), agriculture, forestry, and other land use (AFOLU) (21%), transportation (14%), and the operation of buildings (6%) (Lamb et al., 2021). In the U.S., however, the distribution of emissions by economic sector is slightly different - the largest emitting sector is transportation (28%), followed by electric power (25%), industry (23%), commercial and residential (13%), and agriculture (10%) (US EPA, 2026).

### 1.1. Impacts of rising temperatures and extreme weather events on global health and sustainability

The increase in temperature causes extreme weather conditions observed worldwide. The rise of sea levels, droughts and flooding, heatwaves, heavy precipitation, tropical cyclones, all have multiple implications on global development and planetary wellbeing. Droughts and floods are becoming common events around the world, posing additional risks to particularly vulnerable populations in low-resourced settings (e.g., East Africa) (Winsemius et al., 2018). Since 2000 these extreme weather conditions have affected 3 billion people, causing human suffering, geopolitical complications, and economic losses (World Bank, 2021). Droughts, defined by the World Health Organization

as “prolonged dry periods in the natural climate cycle, a slow-onset disaster,” result in water shortage in the affected area, posing serious risks to human and animal health, agriculture, economies, and the environment. More specifically, droughts could severely impact agricultural outputs, consequently leading to food and nutrition insecurity, displacement of the populations, increased violence, spread of the infectious diseases, and mental health disorders among affected populations. An estimated 55 million people globally are impacted by droughts every year (NOAA, 2025; WHO, n.d.). Floods could also damage vital infrastructure, livelihoods, and cut off communities from essential services.

Besides the extreme weather events discussed above, an increase in temperature also causes more frequent heat waves which have a significant impact on health and could cause heat-related deaths. While heatwaves are more dangerous in urban settings due to the “urban heat island” effect, non-urban communities are still exposed to and experience risks associated with intensified and prolonged heat waves (e.g., scarcity of water). Additionally, deforestation of land and decrease in green spaces in urban settings further exacerbate the risks of heat stroke for populations. Heatwaves pose greater risks to the elderly, children, and individuals with chronic diseases (WHO, 2024). According to WHO report (n.d.), between 2000 and 2016, approximately 125 million people were exposed to heat waves globally.

### 1.2. Intersection of climate change, nutrition, and health: environmental impacts of animal-derived food consumption

While GHG emissions stem from various human activities, the focus of this project is on emissions from the agricultural sector, particularly those driven by livestock

production to meet the growing human demand for meat, especially beef. Agriculture is a significant contributor to global greenhouse gas (GHG) emissions, with food systems globally accounting for 30% of total emissions and 10% in the US (CBO, 2025; FAO, 2024). Livestock production, responsible for 14.5% of these emissions, is particularly impactful due to the high emissions associated with beef and dairy production (Dillon et al., 2021; UNEP, n.d.). Additionally, agricultural soil management practices can increase the availability of nitrogen in soils, leading to emissions of nitrous oxide ($N_2O$), a potent greenhouse gas. Key sources of $N_2O$ emissions include the application of synthetic and organic fertilizers, cultivation of nitrogen-fixing crops, drainage of organic soils, and certain irrigation practices. Overall, soil management activities account for just over half of total greenhouse gas emissions from the agricultural sector. In addition, the management of croplands and grasslands can result in either emissions or sequestration of carbon dioxide ($CO_2$), depending on land-use practices and management intensity (US EPA, 2025).

Agricultural land use contributes 70% of the sector's emissions, with Asia and the Americas being major sources (FAO, 2024). Livestock farming occupies three-quarters of global agricultural land and is essential for many economies, cultures, and diets (UNEP, 2023). However, excessive consumption of meat in middle- and high-income countries contributes to environmentally unsustainable food systems and is associated with a range of adverse health outcomes, including increased risk of cardiovascular disease, type 2 diabetes, and certain cancers (Spence, 2021)(e.g., colorectal cancer), as well as broader public health concerns such as zoonotic disease transmission and antimicrobial resistance (González et al., 2020; Hayek, 2022; Manyi-Loh et al., 2018).

The growing demand for animal-based products drives deforestation, particularly in regions like the Brazilian Amazon, where cattle pastures now occupy 70% of the deforested land, contributing significantly to Brazil's carbon emissions (Filho et al., n.d.; Skidmore et al., 2021). It is worth noting that American agriculture and diet are influenced by the U.S. political agenda, which in turn influences consumers' preferences (Nestle, 2003). An analysis of the USDA's 2020 U.S. Farm subsidies and bailouts, which totaled $53 billion, showed that the U.S. Farm Policy favored production of livestock and animal feed crops over food crops and plant-based foods for human consumption (Spence, 2021). In the same year, 35% of all corn grown in the U.S. was grown for animal feed, while only 2% was grown for human consumption (Sloat et al., 2022).

Some estimates suggest that if current beef and dairy consumption levels persist, the projected global population growth to 9.6 billion and the corresponding consumption rate will deplete the available "emissions budget"— an acceptable volume of GHG by 2050 for all economic sectors (John Hopkins Center for a Livable Future, n.d.). However, reducing meat intake, especially by the countries with the highest consumption (e.g., the U.S, Brazil, Australia), could decrease agricultural emissions by 50-70% by 2050. Achieving these reductions will require a combination of strategies, including shifting consumer behavior towards more plant-based diets - diets primarily focused on consumption of food derived from plants (Tuso et al., 2013) and plant-based proteins specifically, and implementing policies and regulations to manage livestock production, promoting the development and accessibility of appealing beef and dairy alternatives, and changing societal norms by making plant-based proteins more readily available and

desirable in restaurants, cafeterias, and other food service establishments (John Hopkins Center for a Livable Future, n.d.; Ronto et al., 2022).

## 2. Population behavior insights

### 2.1. Current dietary patterns of consumption of animal and plant-based proteins in the U.S.

The U.S. Government has been providing its residents with dietary advice for over a century. Early in the twentieth century, when the leading causes of death were infectious diseases and nutritional deficiencies was prevalent, the Government strongly advised Americans to eat more to overcome malnutrition. With the development of the economy through the last century and its improvement, the prevalence of diseases associated with nutrition deficiencies declined. However, by the end of the twentieth century the leading causes of death were chronic health conditions caused by overnutrition exacerbated by excessive consumption of meats, processed foods, sugary drinks, and sedentary lifestyles (Clemente-Suárez et al., 2023; González et al., 2020; IOM, 2010; Nestle, 2003; WHO, 2023). According to the Health Eating Index (HEI) 2020 which describes quality of diet among the U.S. population on a scale 1-100, the average score for population ages 2 years and older was 58. Among the nutrition categories with suboptimal intake are whole grains (score 2.7/10), total fruits (score 2.8/5), and greens and beans (score 2.9/5) while the highest scores were assigned to total protein foods (5/5) underscoring insufficient intake of whole grains, fruits and vegetables, and sufficiency in protein consumption (U.S. Department of Agriculture, Food and Nutrition Service, Center for Nutrition Policy and Promotion, 2023).

Since 1961 global consumption of meat has increased from 2.2 oz to 4 oz per person a day, with the United States, Argentina, and Australia being among the highest consumers per capita (Our World in Data, 2023; Whitton et al., 2021). The average U.S. resident consumes about 225 pounds of meat (beef, pork, poultry) annually (Hussain, 2023), which is about 40% higher than the recommended amount (5-5.5 oz a day) according to the Dietary Guidelines (U.S. department of Health and Human Services, 2024). The revised Dietary Guidelines for Americans, 2025-2030, however, modified the recommendation by suggesting 1.2-1.6 grams of protein from animal and plant sources per kilogram of body weight per day or 3-4 oz (U.S. department of Health and Human Services, 2024).

In 2022, meat consumption in the U.S. reached a record high, exceeding the previous record in 2021. Among all meat and poultry products, beef is the second most consumed product – an average person in the U.S. consumes about 82 pounds of beef every year, - about 60% higher than the recommended by dietary guidelines (Willett et al., 2019).

Human nutrition has implications for both personal and planetary health. Poor quality diets which consist of overconsumption of meat and processed foods, which are high in fat, specifically cholesterol, lead to primary causes of morbidity and mortality in the United States cardiovascular diseases, strokes, some cancers, and diabetes (Daniel et al., 2011; van Hoeven et al., 2024). Aligning with the trends in meat consumption, adult obesity which is a risk factor for heart disease and type 2 diabetes has been increasing in the U.S. From 1999 to 2020 the prevalence of obesity in the country rose from 30% to 42% (CDC, 2025; Powell-Wiley et al., 2021). According to the CDC estimates, in 2021, 11.6% of the U.S. adult population were diagnosed with diabetes, while 22.8% were undiagnosed, and 38% of the adult U.S. population had prediabetes (CDC, 2025). Contrary to meat-

centric diets, plant-centric diets high in fruits, vegetables, legumes, and whole grains are associated with decreased risks of heart diseases, development of obesity, cancers, and type 2 diabetes (Bye et al., 2021; Kim et al., 2019). However, these diets are not prevalent among the American population with only about 4% of Americans identifying as vegetarians or vegans (Gallup, 2023; Lacroix et al., 2022).

In the context of climate change mitigation, the added benefit of adoption of diet centered around plant-based proteins is its ability to decrease personal and agricultural carbon footprints through consumption of food with a low carbon footprint - nuts, fruits, vegetables, grains, and legumes result in 0.3 – 3 kg CO2 per 1 kg of a product, while beef - the highest carbon footprint of all food - causes 60 kg CO2 per 1 kg of beef (Ritchie, 2020). The majority of the beef production-related emissions are caused by methane emissions associated with farming and changes in land use (such as deforestation). Some nuts, on the other hand, being trees store carbon in them. Production of other plant-based foods[1] causes about 10-50% less emissions than animal-based foods (Our World in Data, 2023).

2.2. Consumer awareness and motivations for adopting plant-based proteins

Although only a small proportion of Americans follow an exclusively plant-based diet—approximately 2% identify as vegan, avoiding meat, poultry, seafood, eggs, and dairy (GFI, 2024)—a growing number of consumers are making efforts to reduce their meat consumption. Research indicates that 63% of Americans are actively trying to eat less meat (Lacroix et al., 2022; Stanley et al., 2023). According to the International Food

[1] Plant-based food products refer to food items derived from plant sources, including vegetables, grains, legumes, nuts, and seeds. These items can be consumed in their initial form or processed to mimic the texture and taste of the food items derived from animals (Venter De Villiers et al., 2024)

Information Council (IFIC) Food and Health Survey, the proportion of individuals incorporating more plant-based foods into their diets has increased from 12.9% in 2019 to 25.8% in 2022 (Stanley et al., 2023). Additionally, 28.1% of Americans report reducing their meat intake, while 18.8% have increased their consumption of plant-based meat alternatives (Stanley et al., 2023). The main drivers of these dietary shifts include rising consumer awareness of health benefits, environmental concerns, and social sustainability considerations (GFI, 2025). Additionally, Dietary Guidelines for Americans for 2015-2020 included a consideration for legumes (beans, peas, lentils, and edamame) - despite being put in a vegetables food group, guidelines noted that these foods are an excellent source of protein and can be counted as a vegetable or protein food to meet recommended intakes (U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015). In 2020 revised guidelines introduced a new name for the vegetable sub-group "beans, peas, and lentils" (formerly called "legumes (beans and peas)") – while the food items in this subgroup have not changed, the new name was thought to more accurately reflect this category (U.S. Department of Agriculture and U.S. Department of & Health and Human Services, 2020). Interestingly, the recommended amount for consumption of pulses per week was 1.5 cups, while the most recent Eat Lancet Commission Planetary Health Diet recommended consuming 0.5 cups of dried beans, lentils or peas per day - a significantly larger amount (Willett et al., 2019). The most recent 2025-2030 Dietary Guidelines for Americans recommended prioritizing high-quality protein including plant-based protein sources such as beans, peas, lentils, legumes, nuts, seeds, and soy (U.S. Department of Agriculture, 2026). However, the visual representation of the updated food pyramid shows primarily animal-based protein sources, with a small section of the image

dedicated to nuts. Inclusion of legumes into a protein food group informs Americans about non-animal-derived sources of protein, therefore, expanding the list of recommended protein sources. This consideration has positive implications for public health and environment sustainability as legumes offer higher dietary fiber intake than animal-based proteins, cause less greenhouse gas emissions.

A segmentation analysis from the Climate Change and American Diet survey identified three distinct consumer groups based on their beliefs and attitudes toward plant-based foods: Motivated (32%), Health-Conscious (42%), and Uninterested (22%). Across these segments, personal health emerged as the strongest motivator for adopting plant-based diets (Lacroix et al., 2022). While environmental concerns were the second most influential factor among the Motivated and Health-Conscious groups, global warming was the least motivating reason for plant-based eating among the Health-Conscious and Uninterested groups.

Consumer awareness of the health benefits of plant-based proteins continues to grow, as these plant-forward diets are increasingly recognized for lowering cholesterol, aiding in weight management, and improving overall nutritional intake (Villiers et al., 2024).While environmental concerns are a significant motivator for some consumers, overall awareness of the environmental impact of meat production and consumption remains relatively low (Kenny et al., 2023).

### 2.3. Consumer perception and consumption of plant-based proteins

Plant-based proteins encompass both whole-food plant sources that naturally contain protein—such as lentils, beans, peas, soy foods, nuts, seeds, and whole grains—and processed products designed to replace animal-based proteins. The latter category

includes plant-based meat alternatives (PBMAs), which are formulated to mimic the taste, texture, and functionality of meat. Whole-food plant proteins, particularly legumes, are inexpensive, widely available, and nutrient-dense, and have been a foundational component of human diets since the advent of agriculture, serving as staples across many cultures and culinary traditions. Despite their long-standing role in global diets, legume consumption in the United States remains low, averaging only 9.3 g per capita per day (Semba et al., 2021). While only 17.2 % of National Health and Nutrition Examination Survey (NHANES 1999-2018) participants consumed any pulses on a given day, higher consumption (33.3%) was among Mexican Americans and the lowest among non-Hispanic Black groups (12.0%). Additionally, higher amounts of pulses were consumed by men and groups with lower education and incomes. Among the types of pulses, beans were the most consumed pulse, followed by lentils, chickpeas, and peas. However, consumption of lentils and peas was higher among individuals with higher socio-economic status (Drewnowski et al., 2025). Therefore, the 2025-2030 Dietary Guidelines for Americans Advisory Committee's suggestion to integrate pulses from vegetables to proteins food group has a potential to increase consumer intake of these foods.

Consumer demand for plant-based protein products has increased in recent years, driven by perceived health benefits, environmental considerations, and ethical concerns related to animal welfare and meat production (Hertzler et al., 2020). However, assessments of dietary intake across the lifespan indicate that consumption of plant-based protein–rich foods remains substantially below recommended levels. Approximately 83% of individuals consume less than the recommended amounts of beans, peas, and lentils, and

60% fall below weekly recommendations for nuts, seeds, and soy products (U.S. department of Health and Human Services, 2024).

Increasing the consumption of plant-based proteins is essential for both human and environmental health. Aside from consuming plant-based whole food proteins described above, plant-based products aimed to mimic meat have been gaining popularity. The market for these alternatives continues to expand, offering a growing variety of options that appeal to mainstream consumers due to improvements in taste, texture, and functionality. Currently available plant-based meat substitutes are made from ingredients such as soy, wheat gluten, pulses, and mushrooms. These options serve as rich protein sources, mimicking nutritional profile of the animal-derived products, making them viable substitutes for conventional meats (Xavier et al., 2025). As plant-based meats gain traction, they are increasingly perceived as a healthier alternative to conventional meat (GFI, 2025; Raptou et al., 2024).

Consumer perceptions of plant-based meat are generally positive. According to the Good Food Institute (GFI), 67% of consumers consider plant-based meat healthy (compared to 35% who view animal protein as healthy), 62% recognize it as a high-protein option, and 63% acknowledge its environmental benefits (GFI, 2025). Despite this awareness, actual consumption remains relatively low—while 69% of Americans are aware of plant-based meat products, only 24% report eating them at least once a month. In contrast, 43% state they never consume plant-based meat, and 21% have never heard of these products.

Demographic trends offer insights into generational, racial, and gender differences in meat consumption. Younger consumers, particularly Gen Z[2] and Millennials[3], are more likely to report eating plant-based meat at least once a month (28%) compared to Gen X[4] (17%) and Baby Boomers[5] (10%). The racial breakdown of plant-based meat consumption shows that non-white consumers are more likely to eat plant-based meat at least once a month. While only 16% of white consumers do so, the percentage is significantly higher among Black (26%), Hispanic (25%), and other non-white consumers (25%).

Despite the strong cultural association between meat and masculinity—where meat consumption is often viewed as a marker of strength, dominance, and traditional male identity—the GFI report reveals an interesting contradiction. While societal norms suggest that men are more resistant to plant-based eating due to the perception that meat is "manly," (Culliford & Bradbury, 2020; Perez-Cueto et al., 2022; Pohjolainen et al., 2015) the report found that men are actually more likely than women to consume plant-based meat at least once a month (22% vs. 17%) (GFI, 2025).

From an economic perspective, consumers who purchase plant-based foods tend to spend 61% more on food compared to the average shopper. Additionally, 37% of plant-based meat purchasers earn over $100,000 annually, exceeding the U.S. national average income of $80,000 in 2023 (GFI, n.d.; US Census Bureau, n.d.)

The majority of plant-based meat consumers (53%) eat these products at home, while 16% reported eating meatless meats in restaurants or cafeterias, and 25% eat plant-based meats both at home and out. However, 26% of Americans reported challenges

[2] Generation Z - born between 1995-2012
[3] Millennials – born between 1980-1994
[4] Generation X – born between 1965-1979
[5] The Baby Boomer Generation – born between 1946-1964 (University of Southern California, n.d.)

associated with finding these products in the store, indicating an opportunity to attract more consumers through wider distribution of these products.

### 2.4. Barriers to uptake of plant-based proteins

Meat has long been positioned as a central component of Western diets and has historically been emphasized in U.S. dietary guidance as a primary source of protein. It is widely available, culturally familiar, and embedded in routine cooking practices. In contrast, plant-based protein sources—particularly whole-food options such as legumes—are often perceived as not having a pleasant taste and mouthfeel less accessible in public dining environment, requiring inconvenient and long preparation time, and, contributing to a less routinized approach to eating (Kuosmanen et al., 2023).

Despite broad awareness of plant-based meat alternatives, multiple barriers continue to limit their uptake. These include diet-related anxiety, social norms and expectations, limited familiarity, lack of cooking skills or knowledge, concerns about flavor and health, low availability of meatless meals in workplace settings, and food neophobia associated with PBMAs (Kenny et al., 2023). Although whole-food plant-based proteins are generally less expensive than animal-based products, plant-based meat alternatives are often priced higher. As a result, affordability and sensory appeal remain key determinants of adoption: only 45% of consumers perceive plant-based meat as affordable, and 46% report finding it somewhat tasty to very tasty—factors that directly influence intentions for future consumption (GFI, n.d.).

Among those who have not tried or have stopped consuming plant-based meat, the most common reasons include a preference for animal meat (43%), dissatisfaction with taste (38%), cost concerns (23%), and a lack of perceived necessity (22%). Concerns about

plant-based meat being overly processed or lacking sufficient protein are less prevalent, with only 5–12% of consumers citing these as barriers. These insights suggest opportunities for further development and marketing of meat alternatives to better meet consumer demand.

Additionally, expanding the diversity of taste profiles and alternative protein products presents a significant opportunity for growth. Nearly half of consumers (47%) express a desire for greater variety in plant-based meats, while 51% would like to see a broader range of protein sources incorporated into these products, such as chickpeas, lentils, navy beans, and fava beans (GFI, 2025)

These observations highlight the need for a comprehensive approach to promoting plant-based products through cross-sector collaborations involving food producers, restaurants, grocery stores, policymakers, and community-driven initiatives. These efforts should prioritize fostering consumer behaviors and attitudes that enable sustainable dietary practices (Kenny et al., 2023). Building on these insights, this study seeks to explore how university dining services can play a pivotal role in fostering a plant-forward food environment, defined as the connection between consumers and the food system, influenced by the accessibility, cost, convenience, and attractiveness of various food options (van Hoeven et al., 2024). By examining both student perceptions and food service provider perspectives, the research aims to identify key drivers and barriers to plant-based protein adoption in campus dining halls. Understanding these factors will help inform strategies for enhancing menu diversity, improving accessibility, and aligning institutional food practices with broader sustainability goals.

## 3. A unique role of Generation Z as agents of change in adoption and promotion of plant-based diets

Generation Z (Gen Z), born between 1995 and 2012, represents the largest population cohort, making their consumption behaviors highly influential in shaping societal and market trends (Raptou et al., 2024; Salguero et al., 2024). More racially and ethnically diverse than previous generations, Gen Z is also the most educated to date, with a future-oriented mindset and a strong commitment to sustainability, particularly in climate-conscious dietary choices (Buchholz, 2021; Funk, 2021). Climate change is one of their top concerns, driving calls for reforms at personal, public, and global levels. Gen Z believes in taking action to help mitigate climate change (Funk, 2021; McKinsey & Company, n.d.). Beyond embracing sustainable consumerism, they actively advocate for sustainability and influence others, playing a key role in shifting social norms around meat consumption and promoting diets featuring plant-based proteins (Buchholz, 2021; Salguero et al., 2024).

In addition to values-driven sustainability commitment, emerging research suggests that climate anxiety plays a meaningful role in shaping how Gen Z engages with environmental issues. Climate change poses significant perceived threats to the mental health, security, and prospects of children and young people. A large-scale global study (Hickman et al., 2021) of climate anxiety among youth revealed that concern about climate change is widespread, with a majority reporting high levels of distress, feelings of sadness, anxiety, anger, helplessness, and betrayal by the government.

Gen Z's worldview is shaped by their upbringing as digital natives—the first generation to grow up with widespread internet access, making information easily accessible and shareable through digital platforms. This has enabled them to curate

personalized online ecosystems, creating content and subscribing to feeds that align with their values, making them powerful influencers of public opinion. This influence is a crucial asset in normalizing plant-forward eating by advocating for institutional changes, endorsing brands that reflect their values, and generating and sharing content that shapes public discourse and drives behavioral shifts among their peers and broader audiences (McKinsey & Company, n.d.)

Gen Z represents the highest proportion of individuals who limit meat consumption, following vegan[6], pescetarian[7], or flexitarian[8] diets. Within this cohort, 65% find plant-based cuisine appealing, and 36% report consuming meat alternatives daily. Their openness to plant-based diets is a key driver in accelerating the adoption of innovative plant-based products, increasing the mainstream appeal of plant-based eating, and reshaping social norms around food consumption (Sodexo US, n.d.). While only 8% of Gen Z self-identify as vegetarians or vegans, even non-vegetarians expect vegetarian options to be available at every meal and are more likely to prefer plant-centric dishes (Fischer, n.d.). Additionally, having grown up in an ethnically diverse environment with exposure to a wide range of global cuisines, - Gen Z has developed a strong appreciation for international flavors and is open to experiencing food cultures that traditionally emphasize plant-based ingredients (Fischer, n.d.)

Gen Z's unique combination of digital savviness, commitment to sustainability, and openness to diverse food cultures positions them as key agents of change in the adoption and promotion of diets featuring plant-based proteins. Their influence extends beyond

[6] A vegan diet consists entirely of plant-based foods and excludes all animal-derived products, including meat, poultry, seafood, eggs, and dairy.
[7] A pescetarian diet follows a primarily vegetarian approach but includes seafood.
[8] A flexitarian diet is predominantly plant-based while allowing for occasional consumption of meat.

personal consumption, as they actively shape market trends, advocate for systemic reforms, and leverage digital platforms to drive broader acceptance of plant-based eating.

### 3.1. Opportunities to promote plant-based proteins in university dining halls to encourage plant-based eating

#### Institutional influence on plant-based eating

Outside of individual consumption practices, the shift toward more plant-based proteins can be supported by the menu options offered at public cafeterias in schools, hospitals, and other government facilities (Pandey et al., 2025; Rocha et al., 2025; van Hoeven et al., 2024). Because health and price are key motivating factors in adopting plant-based proteins, procurement policies that limit red meat availability at these facilities can play a crucial role in encouraging plant-based choices while promoting public health and sustainability. Additionally, institutional norms and values can shape individuals' food choices, presenting an opportunity to influence sustainable health-related decision-making (Pandey et al., 2025).

#### Gen Z and the demand for sustainable dining options

As the dominant demographic on university campuses, Gen Z's strong commitment to sustainability, preference for plant-based meals with plant-sourced proteins, and limited access to home cooking create a compelling case for university dining halls to adapt to students' dietary needs. Additionally, research on Gen Z's attitudes towards plant-based diets and proteins revealed that these products are perceived as more expensive than conventional meat options, creating an economic barrier for younger consumer groups such as university students (Raptou et al., 2024). In the U.S. context, this finding offers a unique opportunity for university campus dining halls to address price sensitivity by offering more complete and nutritionally sound plant-based meal options at all-you-care-to-eat dining

facilities. By providing a diverse selection of nutritionally balanced plant-based meals that accommodate various dietary and religious needs, universities can better support their students while promoting sustainable eating habits (Mowreader, 2024; Yoon & Jun, 2023).

## 4. Evidence from domestic and global interventions

Previously conducted interventions in France showed that offering more vegetarian meals in university cafeterias increases the likelihood of students choosing them along with student satisfaction with meal options (Arrazat et al., 2024). In Germany, a temporary ban on meat dishes did not decrease on-site sales significantly as customers did not seek conventional meat options elsewhere, while consumption of vegetarian and vegan dishes increased significantly (Merk et al., 2024). Additionally, previous studies in the U.S. examining the availability of healthy foods in campus dining environments and students' dining choices revealed that less healthful options accounted for 85% of available meals, while more healthful options, as categorized by American Heart Association (AHA) guidelines, made up only 15% (Horacek et al., 2013; Leischner et al., 2018; Tseng, 2016). As meal purchases correlated with food availability, less healthy meals were chosen more frequently than healthier alternatives. However, campus cafeterias were still recognized for offering healthier options and environments compared to other on-campus dining establishments. These findings provide further evidence supporting the need for interventions aimed at improving college students' dietary behaviors by enhancing dining hall offerings and collaborating with dining providers to create healthier campus food environments (Leischner et al., 2018; Tseng, 2016).

### 4.1. The role of university dining halls in dietary behavior formation

University dining halls can play a vital role in promoting plant-based diets, particularly during college years—a critical period when young adults establish lifelong dietary habits (Sogari et al., 2018). As students transition to a more autonomous lifestyle, they take greater responsibility for their food choices (Guiné et al., 2023). Creating an environment that supports healthy, sustainable eating is essential. University meal plans help mitigate financial barriers by addressing students' price sensitivity in all-you-care-to-eat cafeterias while expanding access to diverse, nutritionally balanced plant-based meals (Mei et al., 2021; Winn et al., 2023).

### 4.2. Strategic actions for universities

Interventions across various countries have shown that increasing the availability of vegetarian options and implementing policy-driven changes can effectively encourage plant-based choices, enhance student satisfaction, and foster healthier, more sustainable eating habits. To lead this dietary shift, universities should ensure the availability of at least one healthy and appealing plant-based dish, enhance food literacy among students and staff by providing information about available options, and implement soft measures such as reducing the proportion of animal-based ingredients in meals.

As centers of education and research, universities are uniquely positioned to lead sustainable dietary transitions. By leveraging their expertise, they can create dining environments that not only support plant-based eating but also normalize and institutionalize sustainable food choices (Krattenmacher et al., 2023).

To better understand how these strategies can be implemented in practice, this study examines how plant-based proteins are perceived, experienced, and operationalized within

a university dining system, drawing on perspectives from students, dining administrators, and food service providers.

# Chapter 2: Literature Review

## 1. Predictors of Pro-environmental Behavior (PEB)

Effectiveness of climate change mitigation is not limited by the commitments from the industries to reduce their emissions. A change towards sustainability among individuals plays a critical role in achieving net-zero emissions by 2050. Research shows that many environmental problems, climate change being one of them, stem from patterns of individual behavior that prioritize self-interest over the collective stewardship of shared environmental resources (Tirole, 2016/2017). Consequently, achieving global sustainability will require shifts citizens' daily habits in consumption, transportation, and waste management (Bergquist et al., 2023; Brody et al., 2012; López-Mosquera et al., 2015). These habits, however, are driven by perceived personal benefits, rather than the individual's morality. Change on the individual level is a highly complex process highly dependent on a number of internal and external factors, barriers and facilitators (S. Hampton & Whitmarsh, 2023; Syed et al., 2024). Understanding the determinants of decision-making regarding the pro-environmental behaviors is important for improving the public's behavior towards sustainability through development and implementation of strategic communication and creating an enabling environment for these decisions to be applied. Research shows that interventions targeting specific pro-environmental behaviors such as food consumption (e.g., reduction in red meat in diets, prioritization of local items), resource conservation (e.g., use of energy efficient appliances), and use of sustainable

transportation (e.g., biking, public transit, carpooling) delivered through dissemination of information, education, nudging, feedback, financial incentives, approaches focused on influencing social norms and applied to the real-world setting are generally effective (Bergquist et al., 2023)

Climate change mitigation behavior, or pro-environmental behavior (PEB) is defined as a purposeful action that can reduce a negative impact on the environment and directly or indirectly contributes to environmental conservation and sustainability (Bergquist et al., 2023; Brody et al., 2012; Stern, 2000; Tian & Liu, 2022). Based on the review conducted by Li et al (2019), studies on environmental behavior began in the mid-1960s with the goal of understanding how people interact with the environment. In the late 1980s, a group of multi-disciplinary researchers began to identify the variables associated with responsible environmental behavior. Their findings demonstrated that knowledge about the issue, action strategies, attitudes, self-efficacy, and perceived responsibility are strong predictors of PEB. Therefore, these information "deficit" models suggested that an increase in an individual's knowledge would increase environmental concern, subsequently leading to PEB. These models were later found to be weak, as research indicated that factors such as personal views and values play a more significant role in explaining environmentalism (Kollmuss & Agyeman, 2002; Li et al., 2019).

Among the commonly used conceptual models are Theory of Planned Behavior (TPB) (Ajzen, 1991), models of altruism and empathy, norms activation model (Onwezen et al., 2013), Social Behavioral Theory (Bandura, 1991), and Value-Belief-Norm (VBN) model (Stern, 2000; Stern et al., 1999). The Value-Belief-Norm value is particularly commonly used in studying PEB (Hong et al., 2024; Tian & Liu, 2022) because it implies

that individuals' awareness of the adverse effects on their values, and the self-ascription of the responsibility activate their personal norms and motivate a behavior. Therefore, PEBs are determined by personal attitudes, values, beliefs, contextual factors, and personal capabilities (Stern, 2000). Other research showed that residential context is a strong predictor of PEBs, suggesting that those who experience the direct impacts of environmental hazards (e.g., extreme weather events, water and air quality degradation) are more likely to support environmental policies and engage in environmentally cautious behaviors (Blake, 2001; Dahlstrand & Biel, 1997). This relationship is attributed explained by the perception of risk to self and the community, with risk to self being a stronger behavioral predictor (Carlton & Jacobson, 2013; Leiserowitz, 2006). These earlier models did not account for additional predictors of PEB such as demographic factors, culture and social norms, economic factors and financial incentives, knowledge and awareness, health benefits, geographic location, and political affiliation which were also identified as drivers of PEBs (Gifford & Nilsson, 2014). Studies focused on understanding factors that predict environmental behaviors tend to focus on a specific type of behaviors such as recycling/waste management (Brody et al., 2012; López-Mosquera et al., 2015), water and electricity saving, transportation (Brody et al., 2012; Groot & Maria, 2022; Liu et al., 2022), and sustainable diet (Carfora et al., 2020; Groot & Maria, 2022) and are not always generalizable across different countries and national identities. Building on this research, several key factors have been identified as predictors of pro-environmental behaviors, as outlined below.

**Values and "Worldview"**

Studies show that individuals' environmentalism can be explained through their views and values concerning the issue. In their review of factors that explain individuals' motivation for PEB, Brody et al (2012) identified four types of values: post-materialistic (Inglehart, 1981), religious, beliefs of environmental sanctity, and altruistic values. In contrast to materialistic values, focused on the need for economic and financial security, social stability, and law and order, post-materialistic values emphasize and prioritize the need for political freedom, aesthetics, intellectual and self-actualization, and care for the environment (Brody et al., 2012; Gifford & Nilsson, 2014). Religiosity embedded in many cultures and societies creates social norms and guides individual behavior. The importance of environmental protection was articulated in holy texts of different religions starting from the ancient world (A. J. B. Hampton & Hedley, 2022). As pointed out by Karimi et al (2022) in Islam specifically, the Holy Quran states that Allah established balance in ecosystem and environmental protection as fundamental aspects of Islam. Therefore, values associated with religious views could be attributed to pro-environmental attitudes, concerns, and behaviors (Karimi et al., 2022). Christianity, which is associated with the stewardship and responsibility for the gifts of God including nature, can also be linked to engagement with PEB. However, some studies show conflicting conclusions about religion influencing PEB in either way (Gifford & Nilsson, 2014).

Altruistic values (Hartmann et al., 2017; Stern, 2000) are a component of a personal value structure associated with one's willingness to contribute to the wellbeing of others. While the original model of personal values distinguishes between egoistic and altruistic values, some research challenges the idea of a selfless "true" altruism and suggests that

individuals may experience personal gains (e.g., moral satisfaction) from performing prosocial altruistic behavior (Hartmann et al., 2017).

Individual values play a crucial role in the context of dietary changes as a climate mitigation strategy. Research suggests that individuals who adopt plant-based diets are primarily motivated by a combination of concerns for animal welfare, personal health, and environmental sustainability (Brouwer et al., 2022; Janssen et al., 2016; Rosenfeld & Burrow, 2017). Furthermore, adherence to plant-based diets is more likely when these motivations align with an individual's ethical beliefs and health priorities (Vizcaino et al., 2021).

**Norms**

Norms have been one of the central constructs in models aimed at predicting environmental behaviors, most often being represented within the Norm Activation Theory (Onwezen et al., 2013) and The Focus Theory of Normative Conduct (Cialdini et al., 1991). According to the Moral Norms Activation theory (Onwezen et al., 2013) one engages in pro-environmental behavior as a moral response to their awareness of negative consequences of human behavior towards the environment, and the risks of unaltered personal behavior. Both theories suggest that personal, subjective, injunctive, and descriptive norms are one of the strongest predictors of the PEB (Han & Cheng, 2020; Perry et al., 2021). Influence of personal and subjective norms on PEB has been observed in studies of support for nuclear energy and use of personal cars, while injunctive and descriptive norms demonstrated their influence in research on littering and conservation behaviors (Gifford & Nilsson, 2014). Specifically related to plant-based diets, fear of missing out in social settings or deviating from societal norms can create significant

barriers to adoption (Rickerby & Green, 2024). These challenges underscore the powerful role that social and moral norms play in shaping dietary behaviors (Onwezen et al., 2021). By understanding how different types of norms influence food choices, policymakers, educators, and organizations can develop more effective interventions that leverage social influence to promote plant-based eating at both individual and collective levels.

A normative approach can be applied through public awareness campaigns, social marketing strategies, and institutional policies that normalize plant-based diets and emphasize their social and ethical benefits. For example, universities and workplaces can encourage plant-based eating by publicly showcasing commitments to sustainable food practices, incorporating peer influence to reinforce pro-environmental dietary norms, and implementing policies that make plant-based options the default choice in cafeterias and dining facilities.

**Knowledge and/or Awareness**

A meta-analysis of literature (Gifford & Nilsson, 2014; Hines et al., 1987) demonstrated that knowledge of environmental issues is another predictor of PEB and is often considered a prerequisite for behavior. Lack of knowledge can significantly alter behavioral intentions even among otherwise pro-environmental individuals. It is important to point out that knowledge is not limited to one's understanding of a cause-effect relationship on the issue; engagement in PEB also depends on knowing what specific actions need to be taken and how to implement them. In the context of climate change, conflicting information on the topic has led to widespread misconceptions. Surveys indicate that even among individuals with a high level of environmental knowledge, awareness of climate change, energy production, and resource use remains low and often

inaccurate (Gifford & Nilsson, 2014). Therefore, increasing familiarity with the issue and improving knowledge of mitigation activities can facilitate engagement in PEB.

This connection between knowledge and behavior aligns with the knowledge deficit model in behavioral sciences, which suggests that a lack of information is the primary obstacle to behavior change (Suldovsky, 2017). Consequently, many behavioral interventions rely on a one-way communication approach to influence individuals' attitudes, beliefs, or behaviors (Suldovsky, 2017). However, while knowledge is a necessary component, it is not sufficient on its own—effective behavior change strategies must also address social, emotional, and structural barriers. Research on plant-based diet adoption has shown that lack of knowledge about vegetarian diets is often one of the strongest barriers to dietary transition for non-vegetarians (Rickerby & Green, 2024). However, studies evaluating interventions promoting plant-based diets seem to suggest that education alone is insufficient to drive meaningful dietary change, highlighting the need for multifaceted approaches that incorporate behavioral and environmental influences (Bianchi et al., 2018; Ronto et al., 2022).

**Self-efficacy**

An ability to carry out a PEB is dependent on one's perception of their control over a particular individual action. In the context of environmental studies, and climate change specifically, self-efficacy in PEB implies one's belief in their ability to make a significant contribution to climate change mitigation through individual action (Brody et al., 2012). Locus of control can be a moderating factor between values and behavior (Gifford & Nilsson, 2014).

This is especially relevant in the context of dietary change, because self-efficacy—the belief in one's ability to successfully adopt new behaviors—plays a crucial role. Research has shown that a lack of knowledge and skills in preparing plant-based foods can be a significant barrier to their consumption (Havermans et al., 2021; Rickerby & Green, 2024; Viroli et al., 2023). When individuals feel uncertain about how to incorporate plant-based foods into their diet, their confidence in making dietary changes decreases, suggesting that low self-efficacy leads to weaker intentions to shift toward plant-based eating (Abebe et al., 2024; Havermans et al., 2021).

**Existing behaviors**

Driven by self-interest and personal convenience, individuals continued anti-environmental behavior is habitual in nature. Individual's engagement in PEB has a higher likelihood if these behaviors are not counterproductive to one's needs and lifestyle. Many environmental issues are caused by individuals pursuing their personal interests and not the need to protect natural resources which constitute a common good. Habits are difficult to break without a transformation of underlying values that cause the behavior (Brody et al., 2012).

Individuals tend favor familiar behaviors, selecting options they already know (Onwezen et al., 2021). Meat has long been a staple in human diets, making meat consumption a deeply ingrained and habitual behavior. Its familiarity, accessibility, and convenience reinforce existing dietary patterns, making the transition to plant-based diets more challenging (Rickerby & Green, 2024). Shifting away from meat consumption requires not only acquiring new knowledge and skills related to selecting and preparing plant-based meals but also navigating changes in social roles and identity (Brouwer et al.,

2022; Rickerby & Green, 2024). Additionally, strong emotional and cultural attachments to meat, along with the enjoyment derived from its consumption, further reinforce these habits, creating additional barriers to dietary change (Pohjolainen et al., 2015; Rickerby & Green, 2024).

**Perceived risk**

Perception of risk or threat to an individual's values activates the response. In environmental studies, these risks are associated with the degradation of natural resources and its impact on stability and security of one's values. A desire to protect values in turn motivates pro-environmental behavior (Bradley et al., 2020; De Groot & Steg, 2009; Stern et al., 1999). Perceived risk - defined as a one's perception of threat to self, family, environment, caused by climate change in this case, should not be confused with the objective risk - defined as physical vulnerability caused by proximity to a high-risk setting.

In the context of diets, perceived risk can stem from several concerns that influence individuals' willingness to adopt plant-based eating habits. One of the primary factors is the fear of nutritional inadequacy, because plant-based diets are often perceived as lacking essential nutrients such as protein, iron, vitamin B12, and omega-3 fatty acids (Perez-Cueto et al., 2022; Viroli et al., 2023). Many people associate meat with strength, vitality, and overall health, leading to the belief that eliminating or reducing meat consumption could result in negative health outcomes. This concern is further reinforced by misinformation or limited awareness of how a well-balanced plant-based diet can meet nutritional needs through alternative sources like legumes, nuts, and seeds (Lehmann et al., 2025).

Beyond health-related fears, social stigma presents another significant perceived risk (Lehmann et al., 2025). Dietary choices are often influenced by cultural norms and

social acceptance, and plant-based diets—particularly in regions where meat consumption is deeply ingrained—may be viewed as unconventional or restrictive (Lehmann et al., 2025). This concern can create emotional barriers that discourage dietary shifts, as people may prioritize social belonging over personal food choices. (Rickerby & Green, 2024).

Additionally, a lack of enjoyment of plant-based meat alternatives further contributes to resistance. While the availability of plant-based meat substitutes has increased, some consumers perceive these products as inferior in taste, texture, or overall satisfaction compared to traditional meat (Perez-Cueto et al., 2022; Rickerby & Green, 2024). Furthermore, the perception that plant-based foods are highly processed or unnatural can deter individuals from considering them as viable alternatives (Perez-Cueto et al., 2022; Rickerby & Green, 2024).

**Gender**

Research indicates that individuals who identify as female tend to be more concerned about environmental issues and are more likely to engage in PEBs than those who identify as male (Perez-Cueto et al., 2022; Rickerby & Green, 2024). This difference can be partially explained by personality traits such as compassion, social responsibility, and an orientation toward others—traits that are more commonly associated with women (Velzeboer et al., 2024). Additionally, women are often more driven by concerns about health and safety, which further influences their dietary choices (Gifford & Nilsson, 2014).

Gender differences in PEBs have been particularly pronounced in food consumption, especially in attitudes toward meat consumption and plant-based diets (Carlsson et al., 2022; Culliford & Bradbury, 2020). Women are more likely than men to reduce red meat consumption, which can be attributed to both health concerns and ethical

considerations. Traditional gender norms play a significant role in shaping these behaviors. Meat consumption has historically been associated with masculinity, strength, and dominance, whereas plant-based diets have been perceived as less masculine or even weak (Culliford & Bradbury, 2020; Perez-Cueto et al., 2022; Pohjolainen et al., 2015). These associations contribute to men's resistance to reducing meat intake, as avoiding meat may be seen as a challenge to their masculine identity (De Backer et al., 2020; Ritzel & Mann, 2021; Velzeboer et al., 2024). Moreover, men are more likely to exhibit attitudes of dominance over nature and to deny or distance themselves from concerns about animal suffering—factors that can reinforce meat consumption as a normative behavior. In contrast, women tend to express greater empathy toward animals, feel stronger moral opposition to meat consumption, and are more open to adopting plant-based alternatives (Velzeboer et al., 2024).

However, gender differences in plant-based eating appear to be less pronounced among younger generations, such as Millennials and Gen Z (Lehmann et al., 2025). Men who identify with evolving forms of masculinity, which emphasize care, sustainability, and ethical responsibility, are more likely to consume less meat than previous generations, suggesting an ongoing normative shift in dietary behaviors (De Backer et al., 2020). This generational change highlights the potential for reshaping societal attitudes toward plant-based diets, particularly by challenging outdated gender norms and promoting sustainability as a value that transcends traditional masculinity.

**Age**

As noted earlier, younger generations tend to be more concerned about the future and the environment and are more likely to hold pro-environmental values compared to

older generational cohorts. Research suggests that individuals born after 1982 demonstrate greater awareness of environmental sustainability, with Gen Z (born approximately between 1996 and 2012) emerging as particularly engaged in climate change mitigation efforts (Culliford & Bradbury, 2020).

Gen Z holds strong beliefs in human-caused climate change and sees themselves as agents of change. As the most educated generation yet, they are highly connected through digital networks, actively engaged in the flow of information, and motivated to take action to mitigate the effects of climate change (Funk, 2021; Salguero et al., 2024). This heightened awareness and commitment to sustainability influences their consumer behavior, including dietary choices. In fact, younger generations express their environmental concerns by following plant-based diets and being more open than older generational cohorts to trying different products (Villiers et al., 2024).

As a result, younger generations are more likely to accept plant-based foods and incorporate them into their diets (Lehmann et al., 2025; Onwezen et al., 2021). This shift can be attributed to multiple factors. Moving away from their family dietary environment allows for more independence in food choices, but it can also create challenges when relatives are resistant to adopting plant-based diets (Raptou et al., 2024). Social normalization of plant-based eating plays a crucial role, as younger individuals are more likely to shift their diets if plant-based eating is widely accepted and if plant-based products are readily available in stores and restaurants (Lehmann et al., 2025). This suggests that younger generations have an intrinsic interest in plant-based diets, but their actual adoption is dependent on an enabling environment that supports their dietary preferences.

**Economic capacity**

Economic capacity refers to an individual's financial ability to meet needs or make choices, typically determined by available income, wealth, and access to resources (Garner et al., n.d.).

Some pro-environmental behaviors and ecological trends imply initial investments - (e.g., purchase of electrical vehicles, replacement of appliances with energy efficient alternatives, instalment of solar panels). However, some PEBs are associated with financial gains (e.g., energy preservation, waste management, credits for purchasing eligible energy efficient devices) (Brody et al., 2012). Whether or not the activity results in loss or gain, economic factors can be a predictor of one's intention in pursuing the behavior.

Economic capacity plays a complex role in shaping dietary choices, as food selection is partially influenced by affordability (Perez-Cueto et al., 2022; Viroli et al., 2023). Some research indicates that high-income consumers in the U.S. are more likely to try meat alternatives, while other studies suggest that price and income have no significant effect on consumers' willingness to purchase plant-based meat alternatives (Szenderák et al., 2022).

Despite this, meat alternatives are generally perceived as more expensive, making them less accessible to some consumers (Rickerby & Green, 2024). Studies suggest that meat-eaters would consider switching to alternatives only if the price of the substitute was two-thirds or less of the cost of traditional meat (Carlsson et al., 2022; Lehmann et al., 2025). The perceived high cost of plant-based meat is particularly a barrier for younger consumers, as affordability plays a crucial role in their decision-making process (Raptou et al., 2024). For lower-income populations, food costs are a significantly more important

factor, often influencing their ability to purchase more sustainable options (Neff et al., 2018).

However, while price is a factor in plant-based food adoption, research on young consumers suggests that it is less influential than other considerations, such as taste, knowledge, and the perceived quality of plant-based products (Villiers et al., 2024). This insight highlights the importance of not only addressing affordability but also improving consumer awareness and perceptions of plant-based proteins and their characteristics.

As outlined above, multiple factors shape human behavior in the context of pro-environmental actions. Encouraging behavioral change often requires addressing a combination of these factors, creating an enabling and supportive environment at personal, interpersonal, community, and infrastructure levels. Several authors (Cesareo et al., 2022; Lacroix et al., 2022; Perez-Cueto et al., 2022; Reipurth et al., 2019; Ruzgys & Pickering, 2024) identified key factors that positively influence consumers' interest in choosing climate-smart, plant-based food options. Studies across different populations indicate that perceived health benefits, awareness of environmental impact, concern for food sustainability, nutritional knowledge, higher levels of education, availability of meat alternatives, cooking skills, and the perceived good taste of plant-based foods all facilitate increased interest in and consumption of plant-based diets.

Conversely, several common barriers hinder the transition to plant-based proteins. Many consumers have a strong attachment to the taste and familiarity of animal-derived foods, particularly meat (Pohjolainen et al., 2015). A low perceived personal impact of reducing red meat consumption also discourages change (Culliford & Bradbury, 2020). Additionally, a lack of cooking skills necessary for preparing meals with plant-based

proteins and the limited availability of plant-based protein menu options in restaurants further complicate dietary shifts (Pohjolainen et al., 2015). Social norms surrounding meat consumption, the cultural significance of meat-focused traditional dishes, and concerns about social acceptance reduce self-efficacy in choosing vegetarian options (Ruzgys & Pickering, 2024). Lastly, concerns about the nutritional adequacy of meatless meals present yet another barrier to reducing meat consumption (Perez-Cueto et al., 2022; Viroli et al., 2023).

Addressing these barriers requires a multi-faceted approach that not only increases awareness and knowledge but also enhances accessibility, social acceptance, and confidence in plant-based eating as a viable and sustainable dietary choice.

2. Overview of the effectiveness of interventions aimed at reducing meat-intake and increase in consumption of plant-based proteins.

For the purposes of this study, particular attention is given to interventions that address food environments. According to a systematic literature review by Kwasny et al. (2022), which analyzed 67 studies on the effectiveness of dietary interventions aimed at reducing meat consumption, most interventions primarily targeted personal factors. These included knowledge, skills, values, attitudes, sociodemographic characteristics, and personality traits. External factors, particularly those related to the food environment—such as food availability, accessibility, and the presence of plant-based options—were the second most frequently addressed. Some studies also examined interventions targeting socio-cultural factors, such as social norms.

Strong evidence supports the effectiveness of interventions that focus on personal and external factors. These include factual and emotional messaging, cooking education,

and increasing the visibility of vegetarian food options in public eateries. However, interventions aimed at shifting socio-cultural factors, such as changing social norms around meat consumption, appear to be less effective (Kwasny et al., 2022). Another systematic review by Bianchi et al. (2018), which analyzed 24 studies on interventions targeting conscious determinants of human behavior to reduce meat consumption, found that self-monitoring and individual lifestyle counseling were effective in reducing meat intake. However, simply providing information about the health or environmental consequences of meat consumption did not lead to meaningful behavioral change.

Interventions that take place in the food environment often utilize the behavioral economics technique known as "nudging," which refers to freedom-preserving strategies that guide individuals toward a particular choice without restricting other options and without imposing material incentives (Reisch & Sunstein, 2021; Sunstein, 2014). Nudging is based on the understanding that individuals do not always make rational decisions—such as choosing healthy food purely for its benefits—but instead rely on automatic thinking, such as selecting food that is visually appealing and perceived as desirable. The core principle of nudging is to make the preferred choice "easy, desirable, social, and timely" (Reisch & Sunstein, 2021). Nudging has been widely applied in pro-environmental contexts, including sustainable consumption and dietary interventions (Wee et al., 2021). A systematic review of the literature on the effectiveness of nudging interventions in pro-environmental contexts found that nudging is generally effective, particularly when multiple nudges are combined (Anderson et al., 2024; Wee et al., 2021). And this suggests that a multifaceted approach—incorporating various nudging strategies such as menu design, default options, labeling, and food placement—may enhance the effectiveness of

interventions aimed at promoting plant-based meal choices in dining halls (Cesareo et al., 2022).

Nudging interventions in food environments can take different forms. Educative nudges provide consumers with simple factual information to facilitate decision-making, such as calorie, nutritional, and environmental labels. Alternatively, labels can evoke an emotional response, encouraging consumers to try a particular food based on its taste appeal (Reisch & Sunstein, 2021). Architectural nudges, on the other hand, focus on structuring the choice environment rather than providing information. These nudges include adjusting the placement of food items on displays, positioning labels strategically, and ordering menu items in a way that subtly steers consumers toward a desirable choice (Reisch & Sunstein, 2021). Common nudging interventions in the food environment include increasing the visibility of healthy options, adjusting portion sizes, and setting plant-based meals as the default choice (Cesareo et al., 2022; Kwasny et al., 2022; Maluf et al., 2024; Pandey et al., 2025; Reisch & Sunstein, 2021).

Overall, nudging strategies such as placement, portion adjustments, defaults, and labeling are effective, low-cost, and scalable methods for promoting plant-based food choices. Beyond their potential health and environmental benefits, these interventions require minimal labor and financial investment, making them attractive strategies for food service providers (Gavrieli et al., 2022).

While studies indicate the overall effectiveness and positive reception of interventions promoting plant-based meal adoption in dining halls, the impact of these changes—as well as food service providers' interest in and willingness to pursue them—remains an area for exploration, particularly in terms of costs, logistics, procurement,

storage, recipe development, and cooking. However, providers' readiness to adopt and consistently integrate more plant-based meals is crucial for the long-term sustainability of these efforts. Few studies have examined the implications for dining facilities or the feasibility of maintaining a modified dining environment (Pechey et al., 2022). Anderson et al. (2024), whose study demonstrated the effectiveness of multiple simultaneous nudges—such as increasing the proportion of plant-based options, strategic item placement, prompts, health promotional materials, taste-focused labeling, and a "Chef's Pick" feature—in increasing plant-based meal uptake in a secondary education dining hall, noted that interventions become less feasible when they require additional staff training, menu adjustments, or increased preparation time.

While most research on promoting plant-based diets in public dining settings focuses on interventions targeting consumer behavior, less is known about the perspectives and experiences of food service providers as facilitators of these dietary shifts. However, studies examining factors that influence healthy food retail have identified key barriers to implementing and sustaining interventions that increase the availability of healthy food (Gupta et al., 2022; Trewern et al., 2021). A systematic review by Gupta and colleagues (2022) identified a lack of retailer knowledge, skills, and preferences as significant obstacles. Conversely, retailer partnerships with stakeholders—such as food suppliers, health professionals, consumers, and public and private sector organizations—have been recognized as facilitators of successful interventions. From a business perspective, factors such as profitability, organizational support, and available resources play a critical role in shaping retailers' decision-making. In many cases, a lack of enabling infrastructure leads to a prioritization of profit over health promotion. These insights highlight opportunities to

influence retailers' willingness to support plant-based food promotion through training, ongoing stakeholder engagement, and policy-driven structural changes that embed health-oriented values into retail spaces (Gupta et al., 2022).

In a study of factors influencing plant-based food promotion within food environments, van Hoeven and colleagues (2024) identified several barriers preventing food service outlets from increasing plant-based purchases. These included concerns about perceived demand and revenue risks, such as potential financial losses from expanding plant-based options, low turnover, and food spoilage. Sales data, customer demand, and geographical location were key drivers of perceived demand. Another concern was fear of consumer resistance due to pricing or portion size changes. Additionally, organizational constraints, such as limited managerial influence within hierarchical structures, restricted the ability to introduce menu changes. The availability of appealing plant-based options and the capacity to prepare them effectively also influenced providers' willingness to integrate these offerings. Practical limitations, such as space constraints and the need for infrastructure modifications, further complicated implementation (van Hoeven et al., 2024).

On the other hand, certain drivers encouraged the adoption of plant-based foods. Providers were motivated by environmental and health considerations, as well as animal welfare concerns. Some saw an opportunity to experiment with new dishes and products, while others viewed reducing meat purchases—particularly expensive organic meat—as a financial incentive. Overall, there was a growing recognition of the need to shift toward more plant-based food options across different retail settings (van Hoeven et al., 2024).

Notably, both consumer and retailer-focused research align with the socio-ecological framework, as individual, community, organizational, and policy-level factors collectively shape behaviors related to plant-based food procurement and consumption. The socio-ecological model offers a structured approach to examining the various factors that shape both consumer and provider behaviors (Gupta et al., 2022; Moore et al., 2013; van Hoeven et al., 2024). Research suggests that a multifaceted approach—targeting individual, social, and environmental factors—is more effective in driving behavioral change than interventions focused on a single level. Additionally, the integration of nudging strategies aligns well with the ecological approach, as nudges can be applied across multiple levels. For instance, to enhance students' knowledge about plant-based meals, dining halls and the broader campus environment can offer educational materials highlighting the health and environmental benefits of plant-based foods. Institutional programming can further support this by offering workshops and classes to strengthen students' skills in preparing plant-based meals. Nudges related to choice architecture within dining halls can influence students' dietary decision-making, while similar strategies can also be used to guide procurement practices and encourage food service providers to expand plant-based menu options.

While prior research has identified a range of barriers and facilitators to pro-environmental behaviors, and, more specifically, plant-based diets, as well as the effectiveness of interventions such as nudges and environmental modifications, less is known about how these factors interact within complex institutional food settings. This study addresses this gap by examining how individual, environmental, and organizational

dynamics shape the implementation and perception of plant-based proteins within a university dining system.

# Chapter 3: Methods

## 1. Study design

This sequential, multi-method qualitative study examines how university students and campus food service providers perceive and experience plant-based proteins within the campus dining environment. Guided by qualitative research principles, the study explores the "what," "why," and "how" of decision-making related to the consumption and promotion of plant-based proteins, centering participants' lived experiences to illuminate motivations, challenges, and operational realities that inform the development of more supportive plant-forward dining practices (Green & Thorogood, 2004). A qualitative approach was selected to capture the interconnected perspectives of students, food service providers, and university dining administrators, whose roles collectively shape the campus food system.

Theoretical foundation: Socio-Ecological Model and Social Cognitive Theory

The study is grounded in the Socio-Ecological Model (SEM) (McLeroy et al., 1988) and Social Cognitive Theory (SCT) (Bandura, 1991) .

SEM is particularly relevant to this study (van Hoeven et al., 2024) because it accounts for diverse personal and external factors influencing dietary behavior and emphasizes adoption of a multifaceted approach to dietary change. This approach should consider individual characteristics – such as values, knowledge, beliefs, and attitudes – while also addressing normative influences like cultural and social norms. Additionally, creating an enabling environment that facilitates behavior change, such as increasing access to plant-based meals, is crucial.

SEM emphasizes the interplay between individual and social environmental factors in shaping health behaviors and highlights the need for interventions at multiple levels (Eriksson et al., 2025; Njoku et al., 2025; Oudat et al., 2025). The model underscores the importance of targeting interpersonal relationships, organizational structures, community dynamics, and public policy to address behaviors contributing to poor dietary choices. By recognizing the interconnectedness of these factors, SEM suggests that changes in the broader social environment can lead to shifts in individual behavior while also fostering systemic changes that support healthier, more sustainable food choices.

SEM provides a comprehensive approach for understanding and evaluating students' perceptions of plant-based food, including the offerings in campus dining halls. Additionally, SEM helps assess the food environment, including position and perceptions of the food service providers on expanding plant-based options to enhance sustainability of dining services and create an environment that supports and encourages plant-based choices.

McLeroy and colleagues (1988) identified five levels of influence for health-related behavior and their surrounding conditions: intrapersonal or individual factors; interpersonal factors; institutional or organizational factors; community factors; and the public policy factors.

1. **Intrapersonal Level**: This level implies individual characteristics that influence behavior such as socio-economic status, health status, age, gender, knowledge, attitudes, beliefs, self-efficacy, and skills. Therefore, health promotion strategies that address this level need to focus on building awareness and improving knowledge of plant-based foods and their health and

environmental benefits, support positive personal experiences with these food items.

2. **Interpersonal Level**: This level suggests the influence associated with individual's social circle including family and personal relationships. Additionally, factors like social norms and social identity could also influence one's behavior. Therefore, strategies that target this level should consider normalizing plant-based eating to shape dietary behavior accordingly and reinforce acceptance of plant-based eating.
3. **Institutional Level**: This level refers to policies, regulations, and informal structures that can influence behavior such as food environment in work and educational settings, and local retail. The food environment within campus dining facilities is a critical determinant of accessibility to plant-based meals for a student population. Availability, affordability, and visibility of plant-based food options, along with food service providers' willingness to offer attractive and nutritious plant-based meals contribute to students' dietary choices. However, challenges faced by food service providers (e.g., procurement, costs, storage, recipe development, logistics) should also be considered and addressed on this level.
4. **Community Level**: This level describes formal or informal social networks, norms, and standards within the settings where social relationships occur, and characteristics that influence behavior. Those networks could include campus-wide initiatives, commitments to sustainability, partnerships, and advocacy movements to further promote sustainable food choices.

5. **Policy Level**: This level considers local, state, and federal policies, laws, regulations that support practices that influence a behavior of interest such as nutrition labels, nutrition policies and standards, advertisement, taxes and subsidies, unit and serving size regulations. Institutional commitments to sustainability and health can shape the extent to which plant-based food options are prioritized in dining halls. Policies and practices, that incentivize plant-based meals, set and adhere to sustainability goals, or mandate menu options can facilitate systematic shifts to support plant-forward food environment.

It is also worth noting SEM's emphasis on reciprocal causation implying that social and physical environment influence individuals' behavior while individuals' behaviors can also influence and shape the environment around them. This reciprocity is especially relevant to this study as it allows to explore how students' interest in accessibility and variation of plant-based meals has a potential to influence change in the food environment.

Leveraging the socio-ecological framework to promote plant-based meals in university dining halls enables a comprehensive exploration of the interplay between student interest and demand, social influences, institutional capabilities, and policy-driven change. Additionally, this approach helps identify challenges and opportunities in making plant-based food a socially normalized, prominent, and accessible option within the dining hall setting.

Social Cognitive Theory (SCT) (Bandura, 1991) emphasizes learning within a social context and posits that human behavior results from the reciprocal interaction of personal, behavioral, and environmental factors. Central to SCT are the constructs of

observational learning, outcome expectations, self-efficacy, and self-regulation, which together explain how individuals acquire and maintain health-related behaviors.

In the context of promoting plant-based protein consumption on a college campus, SCT suggests that students' dietary choices are influenced not only by individual knowledge, self-efficacy, expected outcomes, but also by their social environment. Observational learning plays a critical role, as students are more likely to adopt plant-based eating behaviors when they observe peers, faculty, or campus influencers consuming plant-based meals and experiencing positive outcomes, such as improved health, increased energy, or social acceptance. Peer modeling within dining halls, student organizations, or campus campaigns may therefore normalize and reinforce plant-based dietary practices.

Outcome expectations further shape behavior by influencing students' motivation to adopt plant-based protein consumption. When students perceive clear benefits—such as improved health, weight management, environmental sustainability, or ethical alignment—they may be more inclined to reduce animal-based protein intake and increase plant-based alternatives. Educational initiatives that communicate these benefits can strengthen positive outcome expectations and support behavior change.

Self-efficacy is another key determinant within SCT and refers to an individual's confidence in their ability to perform a behavior. In the dietary context, students who believe they are capable of selecting, preparing, and sustaining plant-based meals—despite constraints such as time, cost, or limited cooking skills—are more likely to adopt and maintain such behaviors. Campus-based interventions that provide skill-building opportunities, clear guidance, and accessible food options may enhance self-efficacy related to plant-based protein consumption.

Overall, ground the present study in SCT highlights that plant-based dietary behaviors among college students emerge from the dynamic interaction of personal factors (e.g., beliefs, knowledge, and self-efficacy), behavioral factors (e.g., current eating habits), and environmental influences (e.g., peer norms, food availability, and institutional support). This theoretical lens provides a comprehensive foundation for examining how university-level interventions can effectively promote plant-based protein consumption.

**2. Participants and Recruitment**

This study examines three key populations involved in shaping the campus food environment at George Washington University (GWU): undergraduate and graduate students, Chartwells representatives (the contracted food service provider for GWU's all-you-care-to-eat dining halls), and GWU Dining Services administrators, who oversee dining operations while balancing university policies, contractual obligations, and student needs.

Understanding the perspectives of GWU students, Chartwells representatives, and GWU Dining Services is critical for identifying the factors that shape student dietary choices and campus food retail practices. Examining these groups together allows the study to capture how plant-based eating is negotiated across multiple levels of the university dining system—from student preferences and expectations to institutional oversight and operational execution. This approach will lead to a better understanding of how structural, organizational, and governance conditions enable or constrain the availability, quality, and diversity of plant-based protein options on campus, as well as where tensions and alignments emerge between student demand, institutional goals, and operational realities.

Emerging evidence suggests that Gen Z students demonstrate relatively high engagement in PEB and growing interest in plant-based eating. As a subset of this cohort, GWU students occupy a transitional developmental stage characterized by increasing autonomy over food choices and the formation of independent dietary habits. For many students—particularly those living on campus or enrolled in mandatory meal plans—dining halls serve as a primary and consistent source of daily meals. As a result, food choices are shaped not only by individual preferences but also by what is made available, how meals are prepared, and how options are presented within the institutional dining context.

Dining halls also function as social spaces in which food decisions are made in the presence of peers, allowing shared routines, perceived norms, and social expectations to influence dietary behaviors. Variability in nutrition knowledge, cooking skills, time constraints, and financial considerations further distinguishes this population and highlights the importance of the campus food environment in shaping dietary intake during a formative period of habit development.

In parallel, Chartwells and GWU Dining Services operate within a complex institutional and organizational landscape. Their decisions are shaped by contractual arrangements, budgetary constraints, procurement systems, labor capacity, standardized recipes, nutritional requirements, and sustainability commitments. These stakeholders balance multiple, and sometimes competing, priorities—including cost control, supply chain logistics, student satisfaction, consistency across dining locations, and environmental goals—which directly influence menu design, food preparation practices, and the feasibility of plant-forward initiatives.

## Ethics Statement

The study protocol was submitted to and reviewed by The George Washington University Committee on Human Research, Institutional Review Board (IRB; FWA00005945). The research was determined to be exempt from IRB review in accordance with applicable federal regulations. The approved protocol is identified under IRB number NCR256488.

All participants provided informed consent prior to participation, and appropriate measures were taken to protect participants' confidentiality.

## 2.1. Sampling

Participants for this study were selected using Purposive Sampling (Patton, 2015). Purposive sampling implies a non-random strategy to ensure representation of a particular population in the sample. According to Patton (2015), purposeful sampling provides research with "logic and strength" as it seeks to select "information-rich cases for study in depth". Furthermore, information-rich cases offer deep insights rather than generalization, as is the case with the quantitative sampling approach. Guided by the theoretical understanding of the topic, individuals who are proficient and well informed about the topic of interest and who have an important perspective on the topic were recruited to obtain contextually rich data (Palinkas et al., 2015; Robinson, 2014).

Recruitment focused on students with experience using GWU's all-you-care-to-eat dining halls, Chartwells staff involved in food procurement, menu planning, and meal preparation, and GWU Dining Services staff who oversee dining hall operations. These groups were selected to provide complementary perspectives on the factors that facilitate

or hinder engagement with plant-based eating, offering insight into both consumer experiences and institutional decision-making processes.

In addition, two remotely enrolled GWU students who expressed willingness to participate were included following consultation with colleagues. Although these students did not have current experience using GWU dining halls, they were identified as information-rich sources. One participant had followed a vegetarian diet for an extended period and contributed comparative insights drawn from experiences with other institutional dining settings. The second provided perspectives on student dietary practices outside the campus food environment. Including these participants broadened the analytic lens beyond the immediate dining hall context and expanded racial and regional representation within the sample. While not central to the primary research focus on campus dining operations, their accounts provided valuable contextual insights into student food choices and values.

Chartwells representatives and GWU Dining Services administrators were also included as key informants due to their specialized operational knowledge and decision-making roles within the campus dining system. Their inclusion enabled analysis of institutional structures, procurement processes, and governance dynamics shaping plant-based protein provision.

The final sample included 16 participants: 11 GWU students, of whom 9 had experience dining at Chartwells-operated facilities; 2 Chartwells representatives; and 3 members of the GWU Dining Services administration. Figure 1 displays number and demographic characteristics of study participants.

Table 1: Demographic Characteristics of Study Participants

| Category | Number of Participants (n=16) |
|---|---|
| Age | |
| 18-24 | 8 |
| 25-34 | 5 |
| 35+ | 3 |
| Gender identity | |
| Female | 9 |
| Male | 7 |
| Race (students only, n=11) | |
| White | 5 |
| Black/African American | 3 |
| Asian | 3 |
| Ethnicity (students only, n=11) | |
| Hispanic or Latino/a/x | 1 |
| Non-Hispanic or Latina/a/x | 10 |
| Education level | |
| Undergraduate | 7 |
| Graduate | 4 |
| Affiliation / Role | |
| GWU Student | 11 |
| GWU Dining Services staff | 3 |
| Chartwells | 2 |
| Location / Setting | |
| On campus | 14 |
| Off campus /Remote | 2 |

### 2.2. Recruitment

GWU students were recruited through faculty and peer networks and via direct outreach to student organizations. Faculty contacts and student organization representatives distributed a recruitment flyer to prospective participants. The flyer outlined eligibility criteria and study details. Students interested in participating contacted the researcher directly, after which eligibility was confirmed and interviews were scheduled.

Chartwells' representatives were recruited through professional networks, with facilitation by GWU Dining Services staff. Given the established partnership between GWU and Chartwells, outreach involved email invitations to prospective participants.

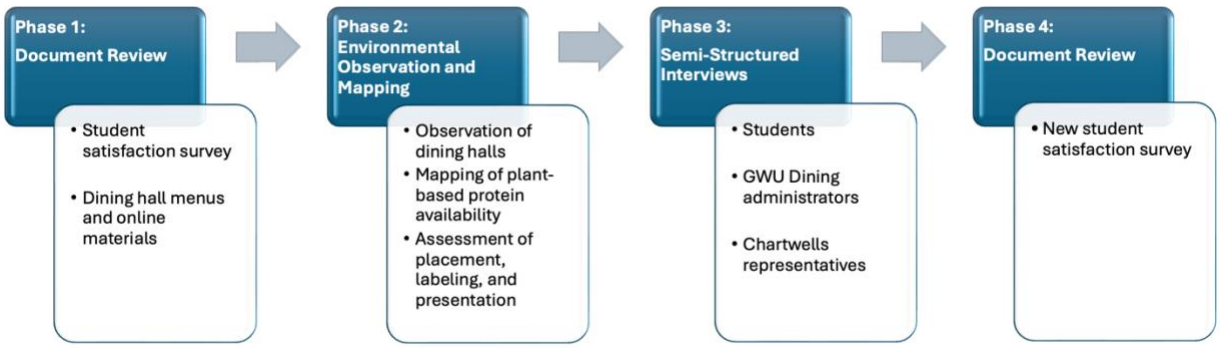
GWU Dining Services administration representatives were identified and invited through professional connections between the researcher and dining services administration.

This approach allowed for diverse perspectives while streamlining recruitment through existing institutional relationships.

## 3. Data Collection

This study employed multiple qualitative data collection methods, including document review, observations and spatial mapping, and in-depth interviews (Figure 1). Using multiple data sources enabled triangulation across methods, strengthened analytic rigor, and enhanced the credibility of findings by allowing for cross-verification of themes and perspectives. Data collection occurred sequentially, with earlier phases informing subsequent stages of inquiry.

Figure 1: Sequential multi-method qualitative study design illustrating the phased data collection process




### 3.1.Documents review

Data sources included dining hall menus, food labels, dining halls maps, and an existing consumer sentiment survey administered by GWU Dining Services. Menus and food labels were reviewed to examine how plant-based options were presented at the point of choice, including the use of descriptive language (e.g., “vegan,” “plant-based”), ingredient listings, and the presence or absence of nutritional information such as protein content. This review provided insight into how plant-based meals were framed and communicated within the dining environment.

The consumer sentiment surveys provided contextual information on students' perceptions of campus dining, levels of satisfaction, and expressed demand for specific food options, including plant-based meals. Surveys were used to inform the development of research questions, guide interview protocol design, and support triangulation during analysis by situating interview findings within broader patterns of student feedback.

### 3.2. Observations and Spatial Mapping

To better understand the campus dining environment as a lived and operational space, the study incorporated observations and spatial mapping of GWU dining halls. Observations were used to examine food availability, meal presentation, signage, and placement of plant-based proteins. This approach enabled the researcher to contextualize participant accounts and to observe environmental cues in situ, thereby enriching interpretation of interview data (Paradis et al., 2016).

Observations were conducted by the researcher between April and May 2025 and documented through detailed field notes and photographs. Spatial mapping was used to capture the layout of dining halls and the positioning of plant-based proteins relative to other food offerings. These observational data provided foundational context for interview questions and helped identify discrepancies or alignments between stated practices and observed realities.

### 3.3. In-Depth Interviews

The primary data for this study were collected through semi-structured in-depth interviews (IDIs), a widely used qualitative method in social science research for exploring participants' experiences, perceptions, and decision-making processes (Dworkin, 2012; Knott et al., 2022). The semi-structured format allowed for consistency across interviews

while providing flexibility for participants to elaborate on issues most salient to them (Green & Thorogood, 2004; Paradis et al., 2016).

Three semi-structured interview guides were developed—one tailored to each participant group—drawing on existing literature and the study's theoretical frameworks. The student interview guide was further informed by findings from the document review (including the student satisfaction survey and dining hall menus), as well as insights generated through environmental observation and spatial mapping of plant-based protein offerings at the dining halls. While tailored to each population, the guides included overlapping domains to ensure consistency across research questions. Draft guides were pilot tested with representatives of the study populations, and feedback informed final revisions prior to data collection. The final interview guides are provided in Appendix C, D, and E.

Interviews were conducted with three key participant groups: GWU students, GWU Dining Services administrators, and representatives from Chartwells - the contracted food service provider. Student interviews captured lived experiences of navigating plant-based protein consumption within campus dining environment, including discussions of knowledge, self-efficacy, social norms, access, expectations, and personal values related to plant-based eating.

Interviews with GWU Dining administrators and Chartwells representatives were conducted as key informant interviews. These participants were selected due to their firsthand, specialized knowledge of campus dining operations and institutional decision-making processes. As key informants, they provided perspectives and insights on procurement, menu development, sustainability priorities, governance structures,

operational constraints, and organizational strategy. In contrast to student participants – whose accounts reflected experiences embedded within and shaped by these systems – key informants contributed contextual knowledge regarding institutional history and nuances of the partnership that influence the provision and promotion of plant-based proteins on campus.

All interviews were conducted virtually via Zoom to accommodate participant availability and preferences. Interviews were audio-recorded and transcribed verbatim for analysis. Participants were informed about the purpose of the study and provided informed consent prior to participation. Interviews averaged approximately 60 minutes in duration.

## 4. Data Analysis

### 4.1. Data Management

All interview recordings were securely stored on the institutional GWU Zoom cloud and transcribed using Otter.ai software. To protect participant confidentiality, transcripts were initially de-identified and organized into three groups—Students, GWU Dining Services, and Chartwells. Each transcript was assigned a population-based identifier and participant number (e.g., Student_1). Transcripts were reviewed and edited to ensure accuracy and completeness, then uploaded to the GWU SharePoint cloud in compliance with IRB requirements.

For qualitative analysis, transcripts were imported into NVivo 15 (2025) software. An initial review was conducted to identify emerging themes and generate preliminary codes. Following discussion of the preliminary coding between D.F. and K.N., a faculty member with expertise in qualitative methods, transcripts were relabeled to include selected demographic characteristics to facilitate comparative analysis across participant

groups. During this stage, initial codes were also revised to improve organization and strengthen alignment with the study's theoretical constructs.

### 4.2. Codebook Outline Development

Thematic content analysis was employed to systematically organize and interpret the qualitative data and to identify key patterns across participants' accounts in relation to the study's research questions (Green & Thorogood, 2004). As a widely used qualitative analytic approach, thematic analysis allows for flexibility in identifying and interpreting patterns within the data while accommodating both inductive insights and theory-informed interpretation, making it well suited for this study (Kiger & Varpio, 2020; Naeem et al., 2023).

An initial codebook outline was developed based on the preliminary transcript review and pre-identified analytic domains aligned with the study's research questions. The codebook outline functioned as an organizing tool by clearly defining each code, its scope, and its analytic purpose. As analysis progressed, codes were iteratively refined, merged, or expanded to capture emergent themes and nuances in the data. This iterative analytic process involved examining relationships among themes, comparing perspectives across participant groups, and situating findings within the broader campus dining and food environment.

### 4.3. Data Coding

To enhance analytic rigor and transparency, a coding matrix was developed that linked each code to a detailed description, the corresponding research question, and relevant theoretical frameworks and constructs (Appendix F). This table facilitated systematic coding, supported consistency across transcripts, and strengthened alignment

between the data and the study's conceptual foundations. The final codebook included top-level codes capturing both student- and provider-level domains—such as knowledge and perceptions of plant-based proteins, social and environmental contexts, perceived barriers and facilitators, expectations of the university, and institutional decision-making processes—along with corresponding subcodes reflecting more specific themes. Throughout the analytic process, the qualitative data and emerging codebook were reviewed by D.F. and K.N. Coding decisions, code definitions, and thematic groupings were discussed and refined through iterative consultation to ensure alignment with the research questions and theoretical domains, while also allowing for inductive coding to capture emergent themes and relationships within the data. Through this collaborative review, codes were revised and expanded to support deeper exploration of patterns across participant groups and to strengthen the credibility and interpretive depth of the findings.

In addition, analytic memos and interview notes were maintained throughout data collection and analysis. Memos were used to document contextual details and analytic reflections, as well as to track emerging themes and relationships among codes over time. This memoing process supported reflexivity, enhanced transparency in analytic decision-making, and facilitated the integration of insights across data sources, contributing to a more rigorous and coherent interpretation of the data.

Data coding, memoing, and thematic analysis were done using NVivo 15 (2025) software to ensure systematic organization, retrieval, interpretation, and visualization of qualitative data.

### 4.4. Documents review

Documentary data included student satisfaction surveys, dining hall maps, and daily dining hall menus. Student satisfaction surveys from academic years 2024 and 2025 were reviewed. These surveys were administered by GWU Dining Services and assessed multiple dimensions of the dining experience, including food quality, variety, accommodation of dietary needs, cleanliness, customer service, and overall satisfaction. All survey responses were collected anonymously, and respondents had the opportunity to provide open-ended comments regarding their dining experiences, including those related to campus dining halls.

Survey data were analyzed using thematic analysis guided by the previously developed codebook. Given the nature of the survey data, only a subset of codes—primarily those related to students' perceptions of plant-based proteins within vegetarian and vegan dietary patterns, as well as expectations regarding plant-based protein food variety and availability—were applied. These data were used to complement and contextualize interview findings rather than to replicate them.

University dining hall maps were reviewed to provide contextual information on the physical and spatial organization of dining halls, including the placement and visibility of plant-based protein offerings. The maps supported triangulation by enabling comparison between students' descriptions of the dining environment and the documented layout of dining spaces.

Finally, daily menus from three GWU dining halls were analyzed to examine the availability, variety, and description of plant-based protein offerings. Menu analysis provided an additional source of evidence to assess how plant-based proteins were

presented and marketed and to corroborate student and provider accounts regarding menu composition and food availability.

Collectively, the use of interviews, surveys, menus, and spatial documents constituted methodological triangulation. This approach strengthened the credibility of the findings by allowing themes to be examined across multiple data sources, enhancing interpretive depth and reducing reliance on any single source of data.

# Chapter 4: Results

This section presents the findings from the qualitative analysis of interviews and document review, organized according to the study's research questions. Results are presented thematically, drawing on data from GWU students, Chartwells representatives, and GWU Dining Services administrators. Representative quotes are included to illustrate key themes and to preserve participants' voices.

## 1. Students' perceptions of plant-based proteins

Students' perspectives were influenced by a combination of individual, social, cultural, and environmental factors, including ethnic and cultural background, exposure to diverse food environments, family food traditions, cooking skills, educational background, health and environmental concerns, and perspectives on campus dining.

### What "counts" as plant-based protein: food environments and cultural exposure

Overall, study participants reported some knowledge of plant-based proteins, although the depth and specificity of this knowledge varied. The most commonly named plant-based proteins included tofu and beans, followed by lentils, chickpeas, grains, and seeds. Commercial plant-based meat such as Impossible and *Beyond Meat* were also frequently mentioned as plant-based protein sources. For example, one participant articulated their understanding of plant-based proteins, identifying multiple whole-food sources and emphasizing the importance of combining ingredients to meet nutritional needs:

*"So, um, like number one is tofu. I really love tofu, various forms of beans and rice. Combos are really good. They make a complete protein… Lentils as well. I also really love*

*chickpeas… Seitan is, like, phenomenal… I derive a lot of my protein from soy-based products." (Student participant 1)*

While some participants described plant-based proteins in terms of whole ingredients and cooking practices, others framed them primarily through commercially available plant-based meat. In these accounts, plant-based proteins were not differentiated by level of processing, but instead appeared as a single category shaped by what was most visible and salient in the food environment. As one student explained, when asked to describe plant-based protein sources:

*"I mean, the only ones that I really know about are soy-based proteins. And then, like, you know, derivatives of that use it, maybe, like, in Impossible or, like, uh, Impossible burgers. I know about them. I know Beyond but those are the only plant-based proteins that I'm very familiar with." (Student participant 2)*

Students' knowledge of PBPs appeared to be shaped by their broader food environments. Participants who grew up in larger cities or in ethnically diverse communities—particularly those with exposure to Asian, Southeast Asian, African, or other non-Western cuisines—demonstrated greater familiarity with a wide range of plant-based protein sources and preparation methods. These students often discussed combining ingredients to form balanced meals and described PBPs as integral, rather than substitutive, components of their diets.

**"They are just food": social norms and familiarity normalizing plant-based proteins**

Cultural background and family food traditions played an important role in shaping students' openness to plant-based proteins. Participants who grew up in households where plant-forward meals were common described PBPs as familiar and culturally normalized.

In contrast, those from food environments centered around animal-based meals often described a steeper learning curve and greater need to justify their dietary choices. One participant described how plant-based dishes were embedded in everyday eating and were normalized within their environment not requiring special labeling:

*"I think a lot of us [Californian] are vegetarian, or have grown up around a lot of like, being conscientious about food. California is very, very easy - we just have vegetarian dishes, and they're not even considered vegetarian. I think that's the biggest part. Like they're just food." (Student participant 3)*

Social support also emerged as an important facilitator. Students who had family members who followed vegetarian or plant-based diets described greater confidence in navigating PBPs and less social resistance. One student discussed how their mother's cooking made it easy for them to follow a vegetarian diet:

*"So, it's just been culturally, so I've always been vegetarian, so I guess, it's been 20 years, but usually never an issue when I was back home, because my mom would cook nutritious meals for me." (Student participant 4)*

Some students discussed social support in a way that demonstrates their friends' respect for their dietary choices, curiosity about plant-based or vegetarian meals, and openness to sharing meals. Conversely, students without such support frequently described needing to explain or defend their dietary choices, particularly around protein adequacy.

**From awareness to agency: education, media, and skill-building shaping plant-based eating**

Learning about plant-based proteins (PBPs)—and their health, environmental, and ethical implications—emerged as a critical pathway through which participants developed

confidence and agency in their dietary choices. Rather than passive information uptake, participants described learning experiences that aligned with their existing values, reinforcing a sense of personal responsibility and capability to act.

**Knowledge acquisition: academic background**

Knowledge acquisition occurred through both formal education and informal media exposure, often serving as a catalyst for sustained dietary change. Several students pointed to academic coursework as particularly influential, especially when lessons connected food systems to broader environmental or public health outcomes. One participant identified environmental science as the most impactful course in shaping their understanding of food choices:

*"I feel like in public health, we always do the educational opt out. But the way I learned about it was taking environmental science, and that was probably the most like important class, one of the most like applicable classes I took in high school." (Student participant 5)*

**Knowledge acquisition: use of media**

For others, informal learning through documentaries and online discourse played a central role in deepening awareness and strengthening commitment. These sources not only provided information but also prompted moral reflection and self-evaluation, which participants described as difficult to ignore once encountered. One participant explained how repeated exposure to environmental and ethical arguments surrounding food systems precipitated an abrupt shift toward veganism:

*"I was really into documentaries… And then I got into, like, vegan, I mean, plant-based, kind of environmental documentaries. And then on my phone I started also, like*

*looking at people debating ethical issues, environmental issues, about veganism...I'm, like, "if you have the ability to do so, why can't you do so? It's not hard". So, I just turned cold turkey that night, and I think it was easier because my culture has plant-based dishes already, whether those are through beans, lentils or vegetable like various forms of vegetable dishes with rice, we already have those." (Student participant 1)*

Students also highlighted the Culinary Medicine course as particularly influential, noting that it not only teaches the principles of healthy eating but also provides hands-on cooking experiences that enhance self-efficacy related to preparing plant-based meals. Collectively, knowledge gained through formal education and media exposure increased students' awareness, confidence, and motivation to incorporate PBPs into their daily diets.

Beyond shaping attitudes, knowledge also influenced students' dietary decision-making and eating practices, particularly around meal planning and food selection. Several participants noted that following a plant-based or vegetarian diet required more intentional planning, which in turn heightened their nutritional awareness and attentiveness to meal composition. This pattern was especially evident among students with public health or nutrition-related academic backgrounds. When describing their eating habits, students emphasized the importance of including multiple macronutrients and vitamins to ensure nutritional adequacy. Although participants held varied definitions of what constituted "healthy eating," a consistent theme was the pursuit of nutrient-dense, balanced meals that supported both physical well-being and energy levels. Limiting or fully avoiding animal-based products was often described as a catalyst for more deliberate meal construction, prompting students to rely on a wider variety of plant-based ingredients to meet their

nutritional needs. As one participant described it, avoiding meat creates greater awareness about meal composition:

"*Since I'm vegetarian, I think a lot more about what I'm putting into my body… making sure I'm getting enough supplements… thinking about what is in the food that I'm eating… I need to eat a balanced meal." (Student participant 10)*

**Role of self-efficacy in plant-based eating**

Cooking skills and recipe knowledge were repeatedly identified as key facilitators of plant-based eating. Participants who enjoyed cooking or had developed skills in preparing plant-based meals described greater flexibility, confidence, and satisfaction with consuming PBPs. These students emphasized the ability to prepare flavorful, nutritionally balanced meals using a variety of plant-based ingredients, including diverse protein sources.

In contrast, some students who primarily consumed meat expressed concerns about the limited variety of plant-based meals they felt capable of preparing. For these participants, plant-based protein options were often perceived as less preferable than meat or meat alternatives. According to their accounts, perceived limitations in flavor and variety were closely tied to lower exposure to ingredient-based plant-based proteins beyond meat substitutes. Such foods were described as requiring greater knowledge, cooking skills, and creativity to prepare in diverse and appealing ways, which in turn served as a barrier to their broader adoption. As one participant described it, having tasted meat made vegetarian meals seem more limited in flavor:

*"The only thing that I would be a little bit worried about is because I've gotten used to eating, like, half of my meals being meat, I'm worried about like, I would run out of like,*

*interesting, like, vegetarian flavor options if I were to transition fully to vegetarian meats." (Student participant 6)*

**"Not pretending to be meat": defining satisfying plant-based proteins**

While plant-based meat was widely recognized as convenient and accessible, many participants—particularly vegetarians and students following predominantly plant-based diets—expressed a clear preference for whole-food plant-based protein sources over products designed to mimic meat. For these students, avoiding animal-based foods was not solely a functional dietary choice but was tied to broader values related to health, food quality, and sensory preferences. As a result, foods intended to replicate the taste, texture, and appearance of meat were often perceived as misaligned with their motivations for reducing meat consumption. Participants who explicitly described disliking meat as a food product found the sensory characteristics of meat alternatives—such as their texture, greasiness, and heaviness—similarly unappealing, diminishing their perceived value as a staple protein source.

This perspective was reflected in students' emphasis on wanting "real" vegetarian or vegan meals rather than substitutes that attempted to replicate conventional meat-based dishes. As one student explained, vegetarian and plant-based eaters were less interested in meat substitution but rather in having complete meals whole foods-based meals:

*"It seemed like the people who were vegetarian or plant-based, they preferred than like, not pretending to be meat, like they didn't really want to eat Beyond, like, it's great that it was there and that it was consistent, but they didn't really want that. They wanted more of a main vegetarian or vegan dish that they could rely on. So, something like beans*

*and rice would be more preferable, because it's more of a main dish." (Student participant 2)*

Others echoed this sentiment by contrasting the perceived freshness of ingredient-based meals with the sensory experience of meat alternatives, noting that frequent consumption of such products felt excessive or undesirable:

*"100% [prefer] not meat alternatives. I like it when I'm out in a restaurant. I like it when I haven't had it in a while, but if I have it consistently, it makes me feel really gross in a way, because it's greasy, and I love the freshness of ingredient-based products, ingredient-based meals, so I would prefer that 100 times over. I also like the process of cooking, and that's just me. It's a personal taste." (Student participant 1)*

Importantly, students' critiques of plant-based meat were not absolute rejections of these products. Several participants acknowledged their situational value, particularly in retail or restaurant settings, where meat alternatives offer familiarity, ease of substitution, and predictability. Within the context of university dining halls, these products were recognized as operationally convenient and reliable, especially given constraints related to staffing, preparation time, and consistency. However, despite this perceived utility, plant-based meat was rarely described as a preferred or foundational component of students' diets. Instead, participants framed them as occasional or supplemental options rather than desirable long-term solutions for supporting plant-based eating on campus.

**Whole foods versus meat alternatives: conflicting cost perceptions of plant-based proteins**

Cost emerged as an additional factor shaping students' perceptions of plant-based proteins (PBPs). Many participants perceived plant-based meat to be more expensive than

whole food plant-based protein such as beans, lentils, and chickpeas. As a result, students who primarily consumed ingredient-based plant proteins (e.g., legumes, grains) did not view plant-based diets as more costly than conventional meat-centered diets, in fact, they perceived them to be cheaper. As one participant described the cost difference between plant-based proteins and meat products:

*"If I'm at the grocery store shopping for myself, it's a lot easier to do plant-based protein because it's cheap. It's canned or dry, so it stays like good longer than like meat does." (Student participant 7)*

In contrast, cost was frequently described as a barrier among students who relied on plant-based meat and associated plant-based eating with higher expenses and limited affordability. Importantly, within the context of GWU dining and required meal plans, cost differences did not directly influence students' food choices, as meals are not priced individually. However, perceptions of cost remained salient and appeared to shape broader attitudes toward PBPs, particularly when students considered food purchases outside of campus dining or anticipated future dietary practices.

**"I need meat": gendered perceptions of protein**

Gender differences were evident in how participants discussed plant-based proteins. Female participants more frequently described cooking skills, nutritional awareness, and experimentation with plant-based meals, and they articulated more detailed reasoning related to health, environmental concerns, and food quality. In contrast, male participants—while generally supportive of PBPs in principle—more often emphasized protein adequacy and convenience as central considerations.

These differences may partly reflect early exposure and socialization around food. Only one male participant reported growing up in a vegetarian environment characterized by regular consumption of meat alternatives, whereas several female participants described childhood settings that supported vegetarian or plant-based eating, included greater exposure to cooking, and fostered early interest in the health and environmental impacts of diet. These patterns align with existing literature indicating that women tend to be more open to exploring healthful dietary patterns, experimenting with meal preparation, and expressing concern for animal welfare and environmental sustainability (Carlsson et al., 2022; Culliford & Bradbury, 2020; Feraco et al., 2024). Notably, some female participants also described gendered dynamics within their households, observing that fathers and male siblings were less inclined to limit meat intake and often aligned their eating habits with their fathers' dietary preferences. As one participant described the family dynamic around vegetarian eating in their household:

*"So my mom actually ended up becoming vegetarian with me, which made it a lot easier, because she just started cooking our meals for us, and my brother and dad would add on their meat…And my dad, he's like, "No, I need it [meat]", - like it was a really hard change for him. I'd say like, the hardest out of everyone, because he's like, so he kind of like, dragged my brother. He's like, you, "I'm not gonna be the only one that eats meat. Like you got to eat this with me."" (Student participant 3)*

**"Either the same or better than meat": perceived benefits and nutritional trade-offs of plant-based proteins**

Many students associated PBPs with health benefits, including lower cholesterol, higher fiber intake, reduced fat consumption, and decreased risk of foodborne illness. This

was true for the majority of the students regardless of their academic background, indicating that there is a general awareness about some benefits associated with plant-forward diets. One participant discussed perceived health benefits of plant-based proteins in terms of fiber consumption, lowering cholesterol, and decreasing chances of getting food poisoning from animal-derived products:

*"And the benefits for me, I know like, having, like, consuming less cholesterol and like from like, for me, a big one is lower risk of, like, getting food poisoning. Having a lot more fiber is really important to me, especially because I've had a lot of like, gastrointestinal issues in the past. I think those are really important to me." (Student participant 5)*

Another student added the benefits of lowering chronic diseases:

*"I know there's various like health benefits, like, it's like gut health because there's like, a lot of fiber, or you can, like, have like, a lower risk of like diseases, if you like have chronic diseases." (Student participant 8)*

At the same time, concerns about nutrient adequacy—particularly iron, vitamin B12, and protein—were raised as well. These concerns were especially salient among physically active students and those whose families emphasized animal protein for strength or athletic performance. As one participant described it, considering nutritional adequacy of plant-based proteins as part of predominantly plant-based diet raised concerns:

*"I guess, yeah, so iron levels I was concerned about, and also, like, I am a pretty active person, so I was just also concerned. I know my parents were also concerned about, like, because in like, high school, I was playing sports a lot, so they were concerned about me I getting all the right nutrients" (Student participant 3)*

Despite these concerns, students who adhered to plant-based diets demonstrated proactive nutritional management, including evaluating nutrition labels to guide food choices and employing strategies such as dietary diversification, supplementation, and intentional meal planning to address potential deficiencies.

**"I think animal farming is contributing a lot to global warming": environmental reasoning behind dietary choices**

The vast majority of students reported considering the environmental impacts of their diets, although the frequency and intensity of these concerns varied across participants. Female students described engaging with environmental considerations more consistently than their male counterparts, and environmental benefits were frequently cited as motivations for consuming plant-based proteins (PBPs). Participants commonly referenced lower greenhouse gas emissions, reduced water use, and animal welfare as perceived advantages of plant-based diets.

Many students traced the emergence of their environmental awareness to middle and high school, often attributing it to exposure to documentaries focused on food systems, climate change, and industrial animal agriculture. These early exposures increased students' mindfulness around dietary choices—particularly the consumption of animal-derived products—and, for some, prompted requests for meat-free meals within their households, contributing to the early formation of plant-forward dietary preferences. In addition, social media platforms such as TikTok were described as ongoing sources of information about the environmental impacts of meat production, reinforcing students' concerns and shaping their food-related values. One participant described how learning

about emissions from animal agriculture became central to both their personal motivation and how they explained their dietary choices to others:

*"I know a lot about, like, the pollution and animal cruelty aspect, but I think the most pressing thing to me was the emissions especially associated with cows. I know it contributes a lot to, like, water pollution as well. So, when I talked to my family, like, why I eat more plant-based, my mom told me, "Well, it doesn't have an impact on the environment, right? Like, why do you care?". I feel like the biggest part to me, when I was explaining this to her, was like, "I think it's contributing a lot to global warming, which I think is a really big concern to me" (Student participant 5)*

However, students often differentiated between whole-food PBPs and processed meat alternatives, noting that products like Beyond and Impossible still require significant processing and may not fully align with environmental goals.

**"They're there, but they're not really options": student experiences with plant-based proteins in campus dining halls**

For many students—particularly those enrolled in mandatory meal plans—GWU dining halls represented the primary source of daily food and thus a critical piece of infrastructure supporting their dietary needs. Participants consistently reported that plant-based proteins were available across dining halls, including beans, tofu, and plant-based meat such as Beyond Meat and other imitation products. However, overall satisfaction with these options was low. Students described limited variety, repetitive menus, inconsistent quality, and an overreliance on pre-prepared foods as key shortcomings of plant-based offerings on campus.

When discussing specific options, students noted that tofu and beans were generally available but often unappealing due to their preparation—frequently under-seasoned, overcooked, or served raw as salad toppings rather than incorporated into complete meals. While some participants acknowledged that offering minimally seasoned plant-based protein ingredients serves an important purpose for students with food sensitivities or concerns about cross-contamination, many emphasized that this approach did not meet their expectations for nutritious, satisfying entrees. A recurring concern was the lack of well-prepared plant-based meals that could function as true alternatives to conventional meat-based dishes. One participant described limited variability of the plant-based dishes in the dining hall:

*"I felt like in the dining halls they would only have the same vegetarian or vegan meal every day." (Student participant 5)*

Some students identified specific plant-based dishes they enjoyed, such as chickpea-based curries or stews, but emphasized that these items were offered inconsistently and could not be relied upon as regular options.

Across interviews, students emphasized that poor preparation—described as bland flavors, undercooked grains, or overly salty and greasy dishes—significantly reduced the appeal of plant-based meals and proteins, specifically. As a result, some participants noted that although plant-based proteins were technically available, they felt as though they "did not have options" in the dining halls. This sentiment was particularly strong among students who felt confident preparing flavorful, balanced plant-based meals themselves and therefore expected food prepared by professional dining staff to meet similar standards of quality, creativity, and nutritional adequacy.

Survey responses echoed these perceptions, reinforcing the mismatch between availability and satisfaction. One respondent emphasized the need for more whole food plant-based protein options:

*"I wish there were more vegetarian and vegan options that are natural like beans, chickpeas, etc. rather than fake meat."*

While other framed their dissatisfaction in terms of quality and appropriateness for a university setting, expressing a desire for healthier, less meat-centered meals:

*"Fewer meat options and healthier vegetarian, vegan, and fish options instead. Chicken nuggets and fries belong to McDonald's, not a university cafeteria."*

These responses underscore that while plant-based proteins are present in GWU dining halls, students perceive their limited variety, inconsistent quality, and reliance on meat alternatives as insufficient to meet their dietary needs and expectations.

Taken together, students' perceptions of plant-based proteins were shaped by intersecting influences, including cultural and ethnic background, exposure to diverse food environments, family traditions, cooking skills, education, health and environmental concerns, and institutional food structures. While many students expressed openness to and interest in plant-based eating, their ability to sustain these choices was constrained by the quality, variety, and preparation of plant-based options within campus dining halls. These findings highlight the importance of institutional practices in shaping not only availability but also the desirability and usability of plant-based proteins for students, setting the stage for Research Question 2, which examines students' expectations for the university's role in supporting plant-based eating on campus.

## 2. Students' expectations from the university regarding plant-based proteins to better support students

When discussing the university's role in supporting plant-based protein consumption for health and environmental reasons, students articulated clear expectations for institutional involvement. Three interrelated themes emerged: (1) educational programming and information delivery, (2) expansion of variety and improvement in quality of plant-based offerings, and (3) marketing, visibility, and presentation of plant-based foods within dining halls.

### "We could talk about dining in the class": educational spaces and food decisions

Students consistently described the university as a site of education not only in the academic sense, but also as a setting where lifelong habits—including dietary practices—are shaped, citing coursework in public health and environmental science, first-year experience programming, and exposure to sustainability-related content as influential. Participants highlighted general education courses, first-year experience programs, and public health–related coursework as natural entry points for this content. Students also noted that education about plant-based diets could simultaneously promote cultural awareness by highlighting dietary diversity across global food traditions and demonstrating how plant-based eating can support affordability and food security—an issue viewed as especially relevant in an international campus context. One participant shared that universities are uniquely positioned to provide nutritional guidance into existing general education, particularly as students learn to manage daily life and routines:

*"I wish there was some kind of initiative to promote it [PBPs], rather than just support students who make that decision separately from the university. I feel like it's a relatively easy to reach population, like students that were already taking a bunch of*

*general education in GW, like, first year experience. I feel like we could talk about dining in that class, even just a section being like "how do you dine plant-based?" at, like, at GW, that would be great." (Student participant 5)*

Beyond formal coursework, students identified professional development events, sustainability programming, and collaborations with existing academic units (e.g., the School of Public Health, Culinary Medicine program, and sustainability minor) as effective venues for delivering nutrition and sustainability education. Another participant discussed existing health – and sustainability-focused as effective foundations for expanded educational efforts, while also highlighting the potential value of student involvement and collaboration with the dining program:

*"I think maybe just more educational stuff with things that already exist, like School of Public Health, the medical school, the Culinary Medicine program and the sustainability minor program, maybe doing some kind of programming with GW dining, with that or informational campaigns could give people more information, and maybe like developing some new recipes with dining could make it more attractive. Like, something's new, that's exciting." (Student participant 7)*

Importantly, students emphasized the value of delivering information at the point of decision-making. Suggestions included adding clear, accessible nutrition and sustainability information to dining hall websites, menus, and signage to help students align food choices with personal health goals (e.g., weight management, cholesterol reduction). One participant described potential interventions aimed at connecting health concerns with menu items, facilitating selection of the healthier meal in the dining hall:

*"They could also enrich that website [GW Dining], have in basic information on food. "If you take this, this is what it contains". Let's say, to lose weight – "if you want to lose weight, you should consider eating plant-based protein. Examples of plant-proteins are...". Have that list so I can decide. Just put basic information, because it will surprise you - many people don't know this information." (Student participant 9)*

Students also suggested framing information around outcomes that resonate with students' lived concerns—such as energy levels, health conditions, or environmental impact—rather than moralizing dietary choices. Small, passive educational cues (e.g., table cards, brief descriptions) were viewed as effective ways to "meet students where they are."

At the same time, some participants noted that peer-led initiatives—such as eco-reps and student-run vegetarian or vegan organizations—might be particularly influential, as students often respond more positively to messaging endorsed by peers rather than top-down institutional directives.

**"More whole foods and beans": students calling for expanding variety and improving quality of plant-based proteins**

Across interviews, students expressed a strong desire for expanded variety and improved quality of plant-based protein options in campus dining. Participants repeatedly emphasized that increasing plant-based offerings should not rely solely on meat alternatives. Instead, they called for more thoughtfully prepared, protein-rich vegetarian and plant-based entrées that stand on their own as complete meals.

Students frequently cited international cuisines—many of which traditionally feature legumes, lentils, and grains—as models for flavorful, satisfying plant-based dishes.

Meals such as soups, tacos, black bean burgers, and chickpea-based entrées were highlighted as examples of plant-based options that felt "complete" and enjoyable.

Several students noted that they were willing to assemble their own meals from individual ingredients, provided those ingredients were fresh, well-prepared, and flavorful. However, poor seasoning, inconsistent preparation, and lack of creativity were commonly cited barriers to choosing plant-based options.

Students also demonstrated awareness of the operational constraints dining services face, including the need to accommodate food allergies and avoid cross-contamination. While participants understood why some plant-based ingredients were offered plainly, they emphasized that this approach should not come at the expense of providing appealing, nutritious entrées.

Notably, students who felt confident preparing plant-based meals themselves expressed higher expectations for food prepared by professional dining staff. For these students, food that they considered "bland" or not well-prepared were especially disappointing.

**"Not "vegan", but "tofu fried rice": marketing, visibility, and presentation of plant-based meals**

Marketing and visibility emerged as critical factors shaping students' willingness to choose plant-based options. Students emphasized that how food is presented—physically and linguistically—influences selection.

Participants suggested that plant-based dishes should be positioned alongside comparable meat-based options rather than segregated into separate "vegan" (*Rooted*) or allergens-free (*Pure Eats*) sections. While allergen-free and dedicated plant-based stations

were viewed as important, students noted that physical separation could unintentionally stigmatize these foods and discourage experimentation among non–plant-based eaters.

Labeling practices were also frequently discussed. One participant expressed concern that labeling dishes as "vegan" deterred students who do not identify with that label, even if the dish itself was appealing:

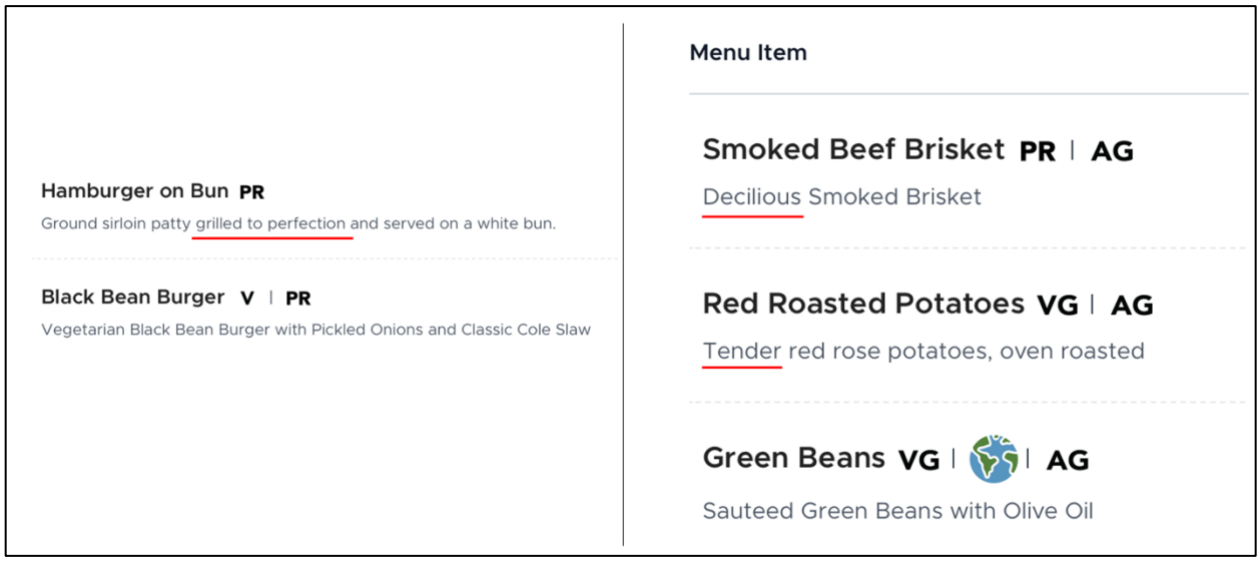
*"So, if you have tofu fried rice, you can just say something like, "tofu fried rice", not "vegan", but "tofu fried rice". Because when people see the word "vegan", they're like, "that's not for me. I'm not vegan. Why would I have vegan?" (Student participant 1)*

Instead, students preferred descriptive names, and clear ingredient lists that emphasized flavor, familiarity, and appeal. Visual presentation—such as colorful vegetables, glazes, and garnishes—was viewed as equally important, often outweighing nutritional information in influencing initial food choices.

Students also recommended offering food sampling in dining halls as a low-risk way to encourage exploration and reduce food waste. Sampling was described as a more approachable and enjoyable way to introduce unfamiliar plant-based dishes.

Finally, analysis of dining hall menus supported students' observations. Conventional meat dishes were sometimes described using evocative language (e.g., "delicious smoked brisket", "grilled to perfection"), while vegetarian or plant-based dishes were more likely to be labeled descriptively or neutrally (e.g., "sautéed green beans with olive oil"), potentially reinforcing perceptions of plant-based foods as less appealing (Figure 2).

Figure 2: Dining Hall menu example (www.dineoncampus.com)




Overall, students viewed the university as playing an active and legitimate role in supporting plant-based protein (PBP) dietary needs on campus, particularly given its influence on knowledge acquisition, food access, and daily eating routines. Participants emphasized that effective support should extend beyond simply offering plant-based options to include intentional educational programming, improved quality and variety of plant-based meals, and thoughtful marketing and placement strategies within dining halls. Across themes, students consistently highlighted the importance of normalizing plant-based foods—through curriculum integration, peer-led initiatives, appealing presentation, and non-stigmatizing labeling—rather than positioning them as niche or alternative choices. Together, these findings suggest that students expect universities not only to accommodate plant-based diets, but to actively shape campus food environments in ways that make plant-based eating accessible, appealing, and socially normative. These expectations provide an important context for examining how food service providers and dining administrators perceive their roles, constraints, and opportunities in expanding

plant-based protein offerings on campus, which is explored in the following research questions.

### 3. Food service providers' and dining managers' perspectives on the expansion of plant-based meal offerings, and strategies for promoting plant-based purchases in university dining halls

Interviews with GWU Dining Administration and representatives of Chartwells provided insight into how plant-based proteins are understood, prioritized, and operationalized within the university dining system. While both entities articulated a commitment to inclusivity, sustainability, and student satisfaction, their perspectives diverged in how plant-based proteins are framed, implemented, and leveraged as part of campus dining. The findings below outline how sustainability is conceptualized, how plant-based proteins are perceived, what strategies are currently in place, and where tensions exist between vision and practice.

#### Program context and institutional setting

GWU Dining is a relatively new program that is still under development. Chartwells holds a 10-year contract to operate campus dining services and has been building the program from the ground up. Since the beginning of the partnership, the original contract has been revised multiple times, including menu-related changes driven by student feedback. Both GWU Dining Administration and representatives of Chartwells described the dining program as iterative and responsive, with ongoing adjustments made to better align with student preferences, dietary needs, and expectations. This evolving institutional context is important for interpreting provider perspectives on plant-based proteins (PBPs), as many strategies and decisions are occurring within a system that is still being established rather than fully stabilized.

**Sustainability built into institutional systems: values, metrics, and operational focus**

Both GWU Dining Services and Chartwells described sustainability not simply as a value, but as an operational responsibility tied to measurable outcomes. One Chartwells representative noted that sustainability was "part of my KPIs for my performance," illustrating how environmental commitments are translated into formal accountability within dining leadership roles. One of the participants described a multidimensional approach to business operations:

*"I think it's imperative to how we run businesses nowadays in more ways than one. I think one we've realized the environmental impact that not doing it does. I really think we realized the social impact that not doing it does. And I think we realize the economical impact that not doing it does, right? And I think all of those things, if you want to be successful as a company or a business, you have to get behind some of the sustainability practices." (Chartwells representative 2)*

In practice, sustainability was articulated through concrete systems: waste reduction initiatives, composting infrastructure, local procurement strategies, and data-driven production monitoring designed to prevent overproduction. Providers emphasized scratch cooking practices, composting of food scraps and trimmings, and partnerships with the university to support waste diversion efforts. As Chartwells representative elaborated on data-driven production practices:

*"From a food production standpoint, we have that great system where we're looking at the data and we're making sure that those batches and all that food that we're making is really dialed in, so we're not over producing." (Chartwells representative 1)*

Sustainability was further situated within campus-wide reporting structures. Representatives referenced the university's participation in the Sustainability Tracking, Assessment & Rating System (STARS), describing it as an annual, institution-wide assessment process that includes—but extends beyond—dining services. Across interviews, sustainability was most concretely defined through operational systems—waste diversion, composting infrastructure, local procurement, and production efficiency—each tied to measurable performance indicators. While plant-based options were acknowledged as part of the broader sustainability landscape, the expansion of plant-based proteins or explicit meat reduction strategies were not described as central performance targets or primary sustainability metrics within dining operations. One participant emphasized the importance of feeding all of the student body, inclusive of meat-eaters:

*"I think we need to serve everyone. We have folks who can't eat beef, folks who can't eat chicken, folks who can't eat pork, and folks that do. So, I think that we need to support them all. I don't think we need less animal-based protein, I think we are at a pretty sweet spot. I would say that, yeah, I think we're in a good spot." (GWU Dining participant 1)*

**"We Have to Change the Story": industry narratives and the positioning of plant-based proteins**

Both GWU Dining and Chartwells acknowledged growing student interest in plant-based and vegetarian meals, recognizing that today's students—particularly Gen Z—are increasingly engaged with questions of health, sustainability, and food systems. Providers described a responsibility not only to offer inclusive options, but also to engage students in broader conversations about food, nutrition, and environmental impact.

At the same time, discussions revealed that plant-based proteins are shaped not only by availability, but by cultural narratives within the food service industry. One dining representative emphasized that broader assumptions about legumes and plant-based ingredients influence how they are perceived and accepted:

*"I think it's really important to incorporate it and to talk about it and to educate people about it… I think plant-based proteins, in themselves as ingredients, are something that the story has to change about in order for it to be successful…because there's so many assumptions that, like the beans and legumes are poor man's food that you only eat because you can't afford the other delicious things. And that's not the case at all… how do we change the narrative to make it more inviting and acceptable to be using those as your main proteins?" (GWU Dining participant 2)*

This perspective suggests that increasing plant-based engagement may require not only expanding menu items, but reframing plant-based proteins as desirable, nutritious, and culturally valuable in their own right. While both dining partners expressed openness to incorporating more plant-based dishes—and cited initiatives such as partnerships with *Beyond Meat*—neither described formal numerical targets or institutional mandates focused specifically on expanding plant-based offerings or reducing animal-based options. In practice, plant-based proteins were positioned as important components of a diverse menu, but not as part of a strategic dietary transition with defined performance goals.

**"Getting chefs to buy in": culinary creativity, partnerships, and the integration of plant-based proteins**

A central strategy for expanding PBPs on campus has been the partnership with Beyond Meat. Both GWU Dining and Chartwells described *Beyond* products as a way to

ensure reliable, allergen-conscious, and nutritionally sufficient plant-based options that could be served throughout the day in multiple formats, including sausage, burgers, crumbles, and chicken-style products. Chartwells, in particular, emphasized *Beyond* products when discussing plant-based protein availability, reinforcing students' perception of an overreliance on meat alternatives.

Chartwells also emphasized a strategy of mirroring conventional entrées with plant-based equivalents to promote inclusion in the dining experience. As one representative explained:

*"I would say at Thurston [dining hall], what we've done a better job within the last semester, is we mirror it. What I don't want is someone who's vegan to feel like they didn't get the same meal as someone else. So, when we do, you know, Gyro meat and you know pita, right? Like I want to make sure that that's balanced with a falafel or Beyond product, so it's a cohesive meal. And I think that's been really, really great, and we've gotten a ton of really positive response out of that." (Chartwells representative participant 1)*

While this approach was framed as successful by both Chartwells representative and some students from the dining experience perspective, it was also highlighted as an educational effort to increase awareness about environmental benefits of *Beyond* products - often referencing reduced carbon footprints compared to meat. Similar narratives were not extended to other whole-food plant-based proteins such as legumes, beans, grains, or nuts.

Providers also discussed an initiative to promote plant-based proteins through a recurring Meatless Monday program, during which some dining locations offered exclusively plant-based meals while others continued to serve animal-based options. This

approach was met with a "significant amount of pushback from students," highlighting the challenge of balancing sustainability-oriented programming with student preferences and overall satisfaction.

A key difference emerged between GWU Dining and Chartwells in terms of long-term vision. Chartwells tended to frame PBPs through operational feasibility, while GWU Dining articulated a broader aspiration to move beyond reliance on burgers, sausages, and nuggets toward more creative, integrated dishes that are comparable to conventional meat-based entrees.

GWU Dining emphasized the importance of embedding plant-based proteins into composed meals rather than offering them as standalone substitutes. Respondents also reflected on missed opportunities to better activate and communicate the introduction of *Beyond* products through educational campaigns, tastings, and programming that explained both availability and rationale. One representative reflected on missed opportunities to more fully activate the *Beyond* partnership through tastings and educational campaigns:

*"I think they just switched to ordering all Beyond products, like I don't think the partnership happened the way that I expected it to happen like what I had envisioned, I thought there would be a lot more activation and a lot more emphasis on it, and it just kind of it became like, Beyond Meat is the GW plant-based protein, or plant-based meat, alternative protein. I think, like what I wanted was a lot of activations, and to use it as an opportunity to educate the students but that was not in our bandwidth last semester." (GWU Dining participant 2)*

GWU Dining representatives repeatedly highlighted experiential and hands-on strategies as particularly effective for engaging students:

*"I think focusing it on the dining halls, because that's where they're going to be participating. And engaging with these plant-based proteins. So I think that would be at least the best place to start… if I were to walk into the dining hall one afternoon and see a chef teaching about different legumes, and I taste something and it's really good, I'm a lot more likely to, like, consider buying a legume the next time I'm grocery shopping…" (GWU Dining participant 3)*

Beyond product partnerships and mirrored menu design, providers also discussed softer, engagement-oriented strategies for normalizing plant-based proteins on campus. These included leveraging the campus dietitian's social media presence to share nutrition information and highlight plant-based options, hosting chef-led pop-ups and tastings in dining halls and encouraging chefs to experiment with plant-based dishes that reflect their cultural backgrounds and culinary interests. Together, these approaches positioned plant-based integration as both an educational and culinary endeavor.

In this framing, different professional roles were seen as contributing in complementary ways: the dietitian as a credible source of nutrition guidance and student-facing education, and chefs as the drivers of flavor, creativity, and day-to-day menu execution. However, GWU Dining emphasized that long-term integration ultimately depends on culinary culture and chef engagement. As one participant explained:

*"I think it's about getting the chefs to buy into the idea of being creative with plant-based proteins… if we could get them to buy in and use it as an opportunity to be like, 'Okay, I'm gonna make something special, but it's always going to be vegan, because we're also showcasing how plants can be the main protein'… Unfortunately, it doesn't work like that." (GWU Dining participant 2)*

This reflection underscores a structural constraint: while education and marketing can increase awareness, the routine normalization of plant-based proteins depends on whether culinary staff view them as an opportunity for innovation rather than as a restriction. In this sense, expanding plant-based offerings was described not simply as a procurement decision, but as a cultural shift within food service operations—one that requires both professional buy-in and institutional support.

Overall, GWU Dining and Chartwells reported a commitment to inclusivity, sustainability, and meeting student needs, and both recognized growing interest in plant-based proteins among the student body. However, the absence of explicit goals to increase variability of PBPs, combined with a sustainability framework centered on procurement and waste rather than dietary change, resulted in a reliance on meat alternatives—particularly *Beyond* products—as the primary mechanism for offering plant-based options. While GWU Dining articulated a vision for more creative, integrated, and educationally grounded approaches to PBPs, implementation was shaped by contractual structures, operational constraints, and the ongoing development of the dining program itself. These findings highlight how institutional goals, contractual arrangements, and operational decision-making structures shape the ways plant-based proteins are prioritized and implemented on campus, leading directly to Research Question 4, which examines the governance processes, constraints, and facilitators influencing dining hall decision-making.

## 4. Governance structures, decision-making processes, and contextual barriers and facilitators shaping how dining halls promote plant-based eating

To understand how plant-based eating is promoted or constrained within university dining halls, it is imperative to examine the governance structures and decision-making processes that shape daily operations. Interviews with GWU Dining Administration and Chartwells representatives revealed that promotion of plant-based protein inclusive meal options is not governed by a single policy or directive but instead emerges through an ongoing negotiation among dining leadership, student feedback, institutional priorities, and operational realities. Participants described a governance context characterized by shared responsibility, diffuse authority, and limited formal mandates related specifically to plant-based eating. Within this environment, advancement of plant-based proteins and support for plant-based eating, was shaped by organizational culture, cost structures, staff capacity, and approaches to communication and education. The findings below outline how these dynamics were experienced by participants and how they functioned as both barriers and facilitators to plant-based menu.

### "Satisfaction is number one": contractual governance and student influence in dining decisions

As described by the participants, from a governance perspective, the partnership between GWU Dining and Chartwells is structured as such that GWU functions as the client, while Chartwells serves as the contracted food service operator responsible for the dining execution. GWU Dining discussed their roles and responsibilities in overseeing the contract, conducting audits operations, and ensuring that Chartwells can deliver dining services as promised. Within this structure, GWU Dining has been requesting changes,

while Chartwells is expected to be a subject matter expert - provide technical expertise, advise on feasibility, outline constraints, and operationalize approved changes.

Decision-making around dining—particularly menu development—is highly responsive to student input. A Student Advisory Board composed of GWU students meets monthly with GWU Dining and Chartwells representatives to discuss dining-related issues. Both entities emphasized the centrality of student feedback in shaping dining offerings, underscoring that governance in this context is not purely top-down but mediated through student preferences and reactions. As one GWU Dining administrator noted:

*"Yeah, I think it's the biggest influence. They're the ones that are eating it right. They're the ones that are paying the salary of the staff, right? So, they're, they're the ones that are eating the food. So, it has a big impact on what we serve, the types of meals, anyway, that we serve." (GWU Dining participant 1)*

Together, the decision-making process involves a triadic interaction among student feedback, GWU Dining oversight and requests, and Chartwells' operational implementation.

**"It's a blank canvas, and you have to paint this masterpiece": culture, capacity, and shared vision**

One of the most salient barriers discussed by GWU Dining administrators was the absence of an established dining culture, particularly given the relative newness of the dining program. Participants emphasized that plant-based eating had not yet been fully integrated into a shared vision across GWU Dining and Chartwells. As one administrator explained:

*"You have to build a culture, right? And I don't think anyone knew that they had to come in and build a culture. It's different when you take an account from one of your competitors versus there is nothing. It's a blank canvas, and you have to go and paint this masterpiece. And not everyone has that artistic ability to do that, right?" (GWU Dining participant 1)*

Participants discussed the lack of shared culture, institutional buy-in, and alignment around plant-based dining creating friction in execution. While GWU Dining articulated a vision centered on sustainability, education, and healthier dining patterns through educational activations and creative plant-based meals, that vision was not yet fully embedded across daily operations. GWU Dining administrators noted that cultural change cannot occur solely through menu adjustments or contractual expectations; rather, it requires sustained internal education, staff engagement, and leadership that reinforces plant-based values. Within this context, education emerged as a foundational mechanism for culture-building – particularly education directed at dining staff. One administrator explicitly linked the success of plant-based dining to educational activations in dining halls and structured training for kitchen staff, framing these efforts as essential to achieving buy-in and translating vision into practice:

*"I think that educational activations in the dining halls are our only way forward, by creating engaging opportunities for students to learn that there are many ways to eat chickpeas and that they provide you all these benefits. It goes back to getting the buy in from the cooks… our dietitian training all the cooks explaining the importance of these, why we're serving them that, and why it's good. And here are some basics for you to share with the students should they ask any questions." (GWU Dining participant 2).*

This perspective underscores that culture-building around plant-based dining is not limited to student-facing messaging, but is deeply tied to internal capacity, training structures, and shared understanding among staff. Without equipping cooks and frontline employees with both knowledge, skills, and rational behind plant-based offerings, efforts to promote these foods risk remaining superficial. Participants further noted that effective cultural change would require identifiable champions – particularly "boots on the ground" leaders – to model, reinforce, and sustain plant-based oriented practices through daily decision-making, mentorship, and visible leadership, rather than relying solely on top-down directives or contractual expectations.

**"I think for us, it becomes a numbers game": cost constraints and procurement dynamics**

Cost was another frequently cited barrier, particularly by Chartwells representatives. Budgetary constraints were discussed primarily in relation to meat alternatives such as *Beyond Meat*, rather than whole-food plant-based proteins like beans or lentils. Chartwells representatives noted that while beef is often cheaper to procure than *Beyond Meat*, both products are sold to students at the same price point, creating financial strain. One Chartwells representative described this tension in detail:

*"I think one of the challenges in general with this type of a focus [integrating lower environmental impact products] is the cost. The food industry in general runs pretty tight margins, right? … For instance, we offer a Beyond Meat, it is more expensive than just beef, but we offer it at the same price. So, while we're trying to do what's right and give that opportunity, we almost don't want to sell it from a cost perspective. So, I think the*

*challenge is, how do we get the industry to catch up to where the consumers are." (Chartwells representative participant 2)*

Providers discussed that this challenge is compounded by Chartwells' national procurement contracts with meat suppliers, which secure lower prices for animal-based products, while meat alternatives are sourced from fewer suppliers under less favorable terms.

From the GWU Dining perspective, cost considerations were more complex. Some administrators suggested that increasing plant-based proteins could lower costs overall, as one of the GWU Dining administrators noted speaking about whole food plant-based proteins:

*"I think it would bring down costs. I think it would help bring down our ingredient costs." (GWU Dining participant 2)*

While others emphasized that students still expect animal protein—or its alternative—to serve as the centerpiece of meals, driving reliance on higher-cost meat alternatives like *Beyond Meat*, and, therefore, remaining to be a high expense.

**"I'm still waiting for the creativity": recipes and staff capacity**

Another major barrier concerned kitchen staff capacity and operational rigidity. As part of Compass Group, Chartwells is required to use standardized recipes from a centralized recipe database. These recipes have been pre-approved by dietitians and include nutritional and allergen information, enabling efficient scaling. However, this structure limits flexibility and responsiveness to evolving student demand.

Chartwells representatives acknowledged that many recipes are outdated and reflect preferences from a decade ago. At the same time, some kitchen staff do not

consistently follow recipes, creating challenges for quality control and communication with students. GWU Dining echoed these concerns, noting that deviations from recipes often stem from discomfort or lack of training rather than informed creativity. In this context, *Beyond Meat* products were perceived as a workaround—requiring minimal preparation and no new recipe development. While *Beyond* chefs visited campus to demonstrate culinary applications, both providers and administrators noted that these products had not yet been used in the creative ways envisioned.

Participants repeatedly emphasized creativity as both a challenge and an opportunity. While Chartwells and GWU Dining acknowledged the presence of skilled chefs, limitations related to cost, training, and recipe compliance constrained innovation. As one administrator described the integration of *Beyond* products into dining menu:

*"Yeah, the reaction [to bringing Beyond products to campus] was fine. They [cooks] didn't have an issue with it. The creativity still isn't where it needs to be, but to put the product and have the product available, that wasn't an issue. I'm still waiting for the creativity. I'm still waiting for the chicken pot pies and the, you know, the chili and all the things that we can do with plant-based product." (GWU Dining participant 1)*

**"We need to do a better job of meeting students where they are": communication, education, and storytelling**

Beyond operational barriers, providers described persistent challenges in communicating with students about dining options and educating them about healthy dietary habits, plant-based eating, and available food options and services on campus. Despite leveraging multiple communication channels – including newsletters, social media, signage, and dining hall monitors, students were consistently described as

disengaged from institutional messaging. This disconnect might suggest, that availability of communication infrastructure alone is not sufficient to ensure students are well-equipped to make informed dietary decisions. Additionally, current communication is not designed to shift dietary norms and does not integrate strategies that align with students' interests, habits, and attention patterns. As one administrator reflected:

*"We have all these ways and social media. They aren't reading anything that we send to them. So, we need to do a better job of finding them and meeting them where they are, so we can communicate the things that are going on and educate the students on diet. Without education, it's going to come across as a failure we have had." (GWU Dining participant 1)*

Participants emphasized that encouraging movement away from meat-centered meals requires more than information dissemination; it necessitates a broader cultural shift reinforced through experimental learning and visible cues within the dining spaces. From this perspective, education is not an auxiliary activity but a core mechanism through which plant-based eating can be normalized. Chartwells representatives acknowledged the importance of stronger storytelling around plant-based proteins as a means of capturing student attention and emphasizing environmental benefits, at least for meat alternatives. Simultaneously, GWU Dining administrators highlighted the need for kitchen staff to re-envision their culinary philosophy, positioning plant-based foods as centerpiece of meals rather than as a side dish. This alignment between presentation and educational messaging was viewed as essential to reinforcing learning through everyday dining experiences.

Education was also framed as likely the most viable pathway forward – in the absence of policies or institutional guidance related to plant-based proteins and menu

restrictions, GWU Dining participants emphasized the need for engaging educational activations embedded directly in dining halls. These activations were seen as opportunities to reframe plant-based proteins as versatile, nutritious, and appealing, while simultaneously building staff confidence and competence.

These findings suggest that governance related to plant-based eating at GWU operates through a fragmented yet independent system rather than through centralized authority or formalized policy. Decision-making was described as highly responsive to student feedback, but filtered through contractual boundaries, financial considerations, and operational constraints. While GWU Dining articulated a vision grounded in sustainability, education, and student well-being, the translation of this vision into practice depended heavily on Chartwell's capacity to operationalize change within existing procurement systems, standardized recipes, and staffing characteristics.

# Chapter 5: Discussion

## Plant-based diets in the context of public health and sustainability

High consumption of animal-based foods, particularly red and processed meats, is linked to increased risks of cardiovascular disease, hypercholesterolemia, certain cancers, and type 2 diabetes. Additionally, industrial livestock production contributes significantly to greenhouse gas emissions, deforestation, land degradation, water use, and environmental pollution, placing increasing strain on global food systems as meat consumption rises. Transitioning toward plant-based protein sources can help improve population health and environmental sustainability, but achieving this shift requires both individual dietary changes and supportive food environments that make plant-based options accessible, appealing, and socially accepted. University settings therefore present a strategic opportunity to educate and engage the broader student body in sustainable dietary practices and the integration of diverse plant-based proteins into everyday meals. Within this context, university dining systems represent a critical setting to examine how plant-based proteins are perceived, made available, and integrated into everyday food practices.

This qualitative study examined how students, university dining administrators, and food service providers understand and experience plant-based diets—and plant-based proteins in particular—both in students' everyday lives and within the university dining environment. Drawing on multiple qualitative data sources, particularly semi-structured interviews with key stakeholder groups, the study explored perspectives on the availability, acceptance, and implementation of plant-based protein options.

The findings illustrate how PBPs are perceived, valued, and operationalized across multiple levels of the campus food system, revealing points of alignment as well as tension between individual motivations, institutional practices, and organizational capacity.

**Student motivations, knowledge, and cultural influences**

Consistent with existing literature, students frequently articulated motivations for plant-based eating grounded in environmental values, health considerations, and ethical concerns. These motivations were particularly prominent among female participants and among students already oriented toward sustainability. Prior research has identified individual-level factors—such as knowledge, values, norms, gender, self-efficacy, and perceived outcomes—as important predictors of pro-environmental dietary behaviors, and students' narratives in this study closely reflected these patterns. Many participants described learning about the environmental impacts of food systems through school curricula, documentaries, or social media, suggesting that early exposure and familiarity play an important role in shaping dietary worldviews.

An additional facilitator of plant-based eating that emerged across interviews was environmental and cultural context. Participants who grew up or currently lived in diverse, multicultural settings—such as large U.S. cities or international contexts—often described greater familiarity with plant-based meals and framed these foods as "just food" rather than as a dietary alternative. This normalization appeared to support openness toward PBPs and sustained motivation to pursue plant-based eating.

Health considerations also featured prominently in students' narratives. Participants emphasized the importance of making informed dietary decisions when pursuing plant-based diets, including attention to nutritional adequacy, protein quality, and

overall balance of the meal. Awareness of the importance of combining multiple protein sources with other nutrients, as well as the need for dietary diversity, reflected relatively high levels of nutritional literacy among many students, particularly those with backgrounds in public health or nutrition-related fields.

**Dining environment, expectations, and behavioral influences**

At the same time, students' accounts revealed a recurring tension between intentions and lived dining experiences. While many participants expressed confidence in their ability to prepare or purchase meals with PBPs outside of the dining halls, they described feeling constrained by limited variety of meals with PBPs and an overreliance on meat alternatives within campus dining. These findings align with prior research indicating that knowledge, motivation, and self-efficacy alone are often insufficient to support dietary behavior change when food environments do not align with individual preferences (Jurado-Gonzalez et al., 2025; Menezes et al., 2018; Sogari et al., 2018).

Students' expectations regarding taste, satisfaction, and nutritional adequacy appeared were shaped not only by knowledge but also by repeated encounters with how plant-based proteins were prepared and presented in institutional settings. Participants did not explicitly compare dining hall offerings to food content encountered elsewhere; however, many described using social media as a source of culinary inspiration and recipes for cooking with whole-food plant-based proteins in their own lives. As an analytic interpretation, sustained exposure to visually appealing and creative plant-based meals through social media, coupled with hands-on cooking experience, may have contributed to students' sense of self-efficacy and familiarity with plant-based preparation. This familiarity may, in turn, have shaped implicit expectations regarding the quality, variety,

and execution of plant-based meals in professional dining settings. Importantly, this reflects a potential transfer of skills and expectations rather than a direct comparison articulated by participants.

Students consistently expressed a preference for descriptive yet creative labeling of meals containing plant-based proteins, rather than labeling foods with dietary identifiers such as “vegan” or “vegetarian.” Across interviews, participants described these labels as stigmatizing or exclusionary, noting that they often discouraged students who did not identify with those diets from trying the food. Instead, students emphasized that framing dishes around cuisine, flavor, or preparation style (e.g., “Asian-style stir-fry”) felt more inviting than ingredient-forward labels alone (e.g., “tofu with vegetables). While participants valued transparency about ingredients, they noted that listing components without an appealing frame was unlikely to generate interest.

Students also discussed food placement within dining halls and the presence of plant-based options alongside meat-based dishes as factors shaping how approachable these meals felt. Together, preferences for creative labeling, strategic placement, and the normalization of plant-based options align with a growing body of literature on nudging and choice architecture in public dining (Berghuis et al., 2018; Weijers et al., 2024). However, students did not describe these practices as deliberate behavior-change strategies. Rather, they framed them as ways to reduce perceived barriers to trying plant-based foods and to broaden the appeal of these meals to a wider student population.

Students’ environmental motivations for consuming PBPs reflect key constructs from both the Social Cognitive Theory and the Social Ecological Model. Exposure to documentaries, school-based education, and social media functioned as forms of

observational learning, shaping outcome expectations related to environmental and ethical consequences of food choices. These influences operated across multiple SEM levels, including intrapersonal (values and beliefs), interpersonal (family discussions and meal requests), and broader sociocultural contexts.

**Institutional perspectives and operational constraints**

The need for a comprehensive approach to promoting plant-based eating - one that integrates education, experiential learning, culinary quality, and environmental design within dining spaces - emerged across all participants as a consistent theme. Participants emphasized that educational content alone while being critical is insufficient without corresponding changes to food preparation, menu structure, and dining culture. Responsibility for developing and delivering educational activations, however, emerged as somewhat ambiguous. While Chartwells did not articulate a definitive stance on ownership of education-related initiatives, GWU Dining administrators consistently framed education as a contractual and ethical responsibility of the food service provider. In their view, Chartwells' access to dietitians, culinary expertise, and engagement tools positioned the company as the primary actor responsible for integrating education into dining operations, even if effective implementation would require collaboration.

A key contribution of this study is its inclusion of food service providers and dining administrators, perspectives that are often absent from research on plant-based dietary transitions. By examining plant-based dietary eating through multiple institutional actors within the campus food system, this study highlights ho dietary transitions are shaped not only but students' motivations but also by organizational structures, operational constraints, and governance dynamics. Interviews with GWU Dining and Chartwells

representatives revealed broad conceptual support for inclusivity, sustainability, and student satisfaction, alongside significant structural and operational constraints. Providers tended to conceptualize sustainability primarily in terms of procurement practices, waste management, and institutional compliance, rather than dietary composition. This framing helps explain why whole-food PBPs were not positioned as a central sustainability strategy, despite student interest.

Provider narratives echoed concerns documented in industry-focused literature, including financial risk, supply–demand uncertainty, staffing capacity, and recipe standardization. The reliance on meat alternatives—particularly *Beyond Meat* products—emerged as a pragmatic response to these constraints, allowing providers to meet perceived student demand for protein-centered meals without extensive retraining or recipe development. However, this approach also revealed a misalignment between students' preferences for nutritionally complete, whole-food plant-based meals and institutional implementation strategies.

The relative newness of the GWU dining program further contextualizes these dynamics. Participants from GWU Dining Administration described the absence of an established dining culture and shared vision with the food service provider as a barrier to fully integrating PBPs into everyday operations. In this context, plant-based initiatives were often framed as supplementary rather than foundational. This finding underscores how organizational culture and governance shape not only what foods are served, but how responsibility for dietary change is distributed across institutional actors.

By foregrounding the perspectives of students, dining administrators, and food service providers, this study offers a multi-level understanding of how plant-based dietary

transitions unfold within university food systems. The findings demonstrate that dietary change within institutional settings is shaped not only by individual attitudes and motivations but also by governance structures, operational constraints, and the alignment—or misalignment—of priorities among campus stakeholders.

**Implications for university dining**

The findings of this study carry several implications for the university seeking to support plant-based dietary practices among students. First, universities play an important role not only as food providers but also as educational institutions that shape students' knowledge, attitudes, and long-term habits. Participants frequently described learning about plant-based eating through coursework, documentaries, and exposure to environmental issues, indicating that educational experiences contribute to shaping dietary worldviews. However, participants also emphasized the importance of practical skills, such as cooking with plant-based proteins and planning balanced meals. These findings suggest that integrating food systems education and skill-building opportunities across academic programs may help students translate knowledge into everyday dietary practices.

Second, the findings highlight the role of campus dining environments in shaping students' perceptions of plant-based foods. Students frequently described limited variety of whole-food plant-based options and an overreliance on meat imitation products. While plant-based meat may provide operational convenience for food service providers, this approach may not fully align with students' expectations for nutritionally balanced and culturally diverse plant-based meals.

**Recommendations for operationalizing plant-based initiatives**

Based on these findings, several practical strategies may support the advancement of plant-based dining initiatives within university settings.

**1. Strengthen formal education on plant-based nutrition across academic courses**

GWU could expand curricular opportunities that connect nutrition, sustainability, and food systems education while incorporating practical skill-building components that enable students to translate knowledge into everyday dietary practices.

Existing programs at GWU already provide a strong foundation for integrating these topics. For example, the University's Food Leadership Minor offers interdisciplinary coursework for undergraduate students interested in food systems and food policy. The curriculum within this program already incorporates content on plant-based proteins and sustainable dietary transitions, highlighting the environmental and health implications of dietary choices. However, because this program primarily reaches students who intentionally pursue food-related coursework, opportunities may exist to embed similar content within other interdisciplinary courses and first-year experiences in order to reach a broader student population.

Participants also highlighted the effectiveness of courses that combine conceptual learning with practical skill-building. Courses such as Culinary Medicine were described as particularly valuable because they integrate nutrition education with hands-on cooking experience. Similar models could be adapted for courses in nutrition, public health, sustainability, and environmental studies to reach students across multiple academic programs within the schools of medicine, public health, and related disciplines.

Medical education represents another important opportunity. Physicians are widely perceived as trusted sources of health information, yet they rarely discuss dietary changes

such as reducing meat consumption or incorporating plant-based proteins, even when addressing health conditions associated with high meat intake. Some participants who were enrolled in medical programs or considering careers in healthcare also described limited exposure to nutrition education on plant-based diets and expressed hesitancy discussing diet with patients unless explicitly asked. Participants whose parents were physicians also described perceptions among some medical professionals that plant-based diets may lead to nutrient deficiencies. These findings suggest a potential gap in medical education and an opportunity to strengthen training on plant-based nutrition within health sciences programs.

Educational outreach may also be relevant for the athletic community. Participants frequently discussed concerns regarding protein intake and nutrient adequacy in relation to exercise and athletic performance. Integrating plant-based nutrition content into exercise science, sports nutrition, and athletic training coursework may help address misconceptions while providing evidence-based guidance for physically active populations.

**2. Expand informal learning opportunities and experiential programming**

Participants emphasized that informal learning environments play an important role in shaping students' knowledge of plant-based eating while also building practical cooking skills.

GWU is well positioned to host guest lectures, workshops, and professional events featuring chefs, food entrepreneurs, sustainability experts, and advocacy organizations. These events may help normalize plant-based foods while expanding awareness of alternative protein innovations and sustainable food systems.

Cooking demonstrations and hands-on workshops represent particularly promising strategies for strengthening students' confidence in preparing plant-based meals. Self-efficacy emerged as an important factor influencing dietary behavior, as participants who felt more confident preparing meals with plant-based ingredients were more likely to incorporate them into their diets. Students with limited cooking knowledge often expressed hesitation about preparing plant-based meals. Providing opportunities to learn practical cooking techniques—particularly for quick, affordable meals using accessible plant-based proteins—may therefore support greater adoption of plant-based eating.

Programming could also highlight diverse culinary traditions that naturally incorporate plant-based proteins. Given the cultural diversity of the GWU student body, cooking demonstrations featuring cuisines from different regions may help increase interest in plant-based foods while reflecting students' cultural backgrounds.

**3. Improve meal presentation, communication, and behavioral nudges in dining spaces**

Relatively small changes in how meals are presented and communicated within dining environments could significantly influence students' food choices.

Participants frequently discussed the importance of clear and appealing meal descriptions. Revising meal labels to use more descriptive language and avoiding potentially stigmatizing labels such as "vegan" may help make plant-based meals more appealing to a broader range of students.

Students also highlighted the importance of receiving information at the point of decision-making. Several participants noted that the Beyond station and accompanying informational display in the dining hall were difficult to notice unless students were already

aware of them. Improving signage and highlighting key attributes of plant-based meals—such as environmental or health benefits—may help guide students' decision-making.

Dining halls may also function as spaces for educational engagement. Activations such as themed menu nights, tasting events, or ingredient-focused campaigns could help introduce students to new foods while increasing awareness of plant-based protein options available on campus.

**4. Strengthen culinary capacity and engagement among dining staff**

Because GWU dining services are operated by Chartwells, as an external provider, the university has limited direct control over internal operational processes such as procurement, menu design, and standardized recipes. However, several opportunities exist to strengthen culinary creativity and staff engagement in preparing plant-based meals.

One promising strategy involves expanding the use of existing professional development opportunities such as weekly chef pop-up events. These pop-ups allow cooks to temporarily take over a station and prepare dishes outside of standard corporate recipes. Such events support chefs' professional development by allowing them to experiment with new ingredients and cooking techniques while strengthening culinary creativity and confidence in preparing plant-based meals.

Participants also highlighted positive experiences with cooking demonstrations conducted by visiting chefs from Beyond Meat. Engagement with external partners such as Beyond chefs may help dining staff gain experience preparing meals featuring plant-based products while improving students' satisfaction with these offerings.

More broadly, fostering chef buy-in may be an important component of expanding plant-based dining options. Chartwells already maintains sustainability-related goals and

key performance indicators; however, participants noted that plant-based proteins are not emphasized within these internal goals. Development-focused programming, educational events, and training opportunities may help strengthen staff knowledge of plant-based cooking techniques while fostering a shared sense of purpose around sustainability goals.

**5. Develop collaborative programming between GWU Dining and Chartwells**

Strengthening collaboration between university stakeholders and dining providers may help align institutional sustainability goals with dining operations.

Participants suggested that co-designed programming could help build a shared culture around plant-based eating on campus. Conducting an assessment of the campus dining system may help identify strengths, weaknesses, and opportunities related to plant-based dining initiatives. The results of such an assessment could inform the development of collaborative initiatives aimed at strengthening plant-based dining culture.

Campus dietitians can play a particularly important role in these efforts. Participants described dietitians as trusted sources of health information and suggested that their involvement in dining communications—such as social media messaging highlighting nutritious campus meals—could help improve student awareness of healthy plant-based options.

Cooking demonstrations hosted in dining halls may also provide opportunities for collaboration between dining staff, dietitians, students, and academic programs.

**6. Support student-led initiatives and innovation**

Student organizations and peer networks were frequently described as important drivers of interest in plant-based eating. Supporting student-led initiatives may therefore represent an effective strategy for expanding engagement with sustainable food systems.

Students expressed interest in participating in recipe development, cooking demonstrations, and collaborative dining programming. Initiatives such as "ingredient of the month" campaigns or themed cooking events focused on international cuisines could provide opportunities for students to contribute ideas while strengthening engagement with dining services.

Universities can also consider supporting interdisciplinary student initiatives focused on alternative proteins and sustainable food innovation. One example is the Alt Protein Project, supported by the Good Food Institute, which helps universities establish student-led groups focused on research, education, and professional development in alternative proteins. Several regional universities, including Johns Hopkins University, Howard University, and Virginia Tech, have already implemented such programs. Establishing a similar initiative at GWU could create opportunities for courses, panel discussions, research collaborations, and industry engagement while fostering interdisciplinary dialogue around sustainable food systems.

**Conclusion**

University food environments play an increasingly important role in shaping dietary behaviors among emerging adult populations. As concerns about climate change, public health, and food system sustainability intensify, universities are uniquely positioned to support dietary transitions that promote both human and planetary health.

This study contributes to the growing body of research on sustainable diets by examining how plant-based proteins are understood and implemented across multiple actors within a university food system. By incorporating the perspectives of students, dining administrators, and food service providers, the findings highlight how plant-based

dietary transitions are shaped not only by individual motivations but also by institutional priorities, operational constraints, and organizational relationships within campus dining systems.

The results suggest that advancing plant-based initiatives in university settings requires more than expanding menu options. Effective strategies are likely to involve coordinated efforts across educational programming, culinary innovation, dining environments, and institutional partnerships. Approaches that engage students, educators, dining administrators, and food service providers as collaborative stakeholders may be particularly well positioned to support sustainable and satisfying dietary practices within higher education settings.

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# Appendices

## Appendix A: Student Recruitment Flyer

The George Washington University is conducting a research study to explore student knowledge, attitudes, and behaviors around plant-based protein consumption and its role in environmental sustainability. We're also examining how university institutions and dining environments support or influence these choices.

We are inviting currently enrolled university students to participate in a one-time interview with our research team.

- **Duration**: Approximately 60 minutes
- **Format**: In-person (on campus) or virtual (Zoom)
- **Date**: Flexible, based on your availability (preferable December'25 – January'26)
- **Confidentiality**: Your responses will be confidential and used only for research purposes

**Who Can Participate?**

- Undergraduate or graduate students (18 years or older) familiar with GWU dining halls
- From any major or field of study
- No special diet required.

**Why Participate?**

Share your perspective to help improve sustainable dining initiatives on campus

Contribute to important research on food systems and environmental behavior

**Interested in Participating?**

Please contact Daria Faulkner to learn more or enroll in the study:

Email: dfaulkner29@gwu.edu

Thank you for supporting research on sustainability and student well-being!

## Appendix B: Consent Forms

### George Washington University (GWU) Informed Consent Form

**Title of Study**: Exploring Perceptions of Plant-Based Dining Among University Students and Food Service Providers

**Principal Investigator:** Ndiaye, Khadidiatou, PhD

**Co-Investigator**: Daria Faulkner, MPH

You are invited to participate in a research study conducted by researchers at George Washington University (GWU). This study explores the perceptions, challenges, and motivators related to plant-based dining on GWU campus. Your participation is voluntary, and you may withdraw at any time without any consequences.

**Purpose of the Study**

The purpose of this study is to understand the perspectives of students and food service providers regarding plant-based dining, including factors influencing dietary choices, menu development, and procurement. Findings will help inform institutional practices that support sustainable dining and public health improvements.

**Procedures**

If you agree to participate, you will:

- Take part in a 60–75-minute interview about your experiences, preferences, and views on plant-based dining.
- Allow the interview to be audio-recorded for accuracy.

**Potential Risks**

The risks associated with this study are minimal. However, potential risks include:

Loss of confidentiality: Steps will be taken to protect your identity, including de-identifying data and securely storing information.

**Confidentiality Protections**

- Your responses will be kept confidential and used only for research purposes.
- Data will be de-identified, meaning your name or identifying details will not be linked to your responses. All personal identifiable information will be retracted from the data.
- Audio recordings will be securely stored and deleted after completion of the study.
- Only authorized research personnel will have access to the data.
- Findings will be reported in a way that does not identify individual participants.

**Potential Benefits**

You will contribute to research that may improve sustainable dining options at GWU, and your input could influence institutional policies that promote plant-based diets and public health.

**Compensation**

There is no monetary compensation for participation in this study.

**Voluntary Participation & Right to Withdraw**

Your participation is completely voluntary. You may refuse to participate or withdraw at any time without penalty or loss of benefits.

**Questions & Contact Information**

If you have any questions about this study, you may contact:

Daria Faulkner (Co- Investigator) – dfaulkner29@gwu.edu

If you have concerns about your rights as a participant, you may contact the **GWU Institutional Review Board (IRB)** at ohrirb@gwu.edu

**Consent Statement**

By signing below, you confirm that you:

- Have read and understood this consent form.
- Have had your questions answered.
- Voluntarily agree to participate in this study.

**Participant Name (Printed):** _____

**Participant Signature:** _____

**Date:** _____

**Researcher Signature:** _____

**Date:** _____

☐ I agree to be audio-recorded.

☐ I do not agree to be audio-recorded.

## Appendix C: Student Interview Guide

### Demographics

1. How old are you?
2. How do you identify your sex/gender?
3. How would you describe your race and ethnicity?
4. Where are you from?

### Introduction

5. Can you tell me a bit about yourself—what you study, your year in school, and your general food habits?
6. How would you describe a food culture you grew up in? (Prompt: what was your family cooking? Family cooking traditions? What was the relationship between health and food?)
7. How do you think about food – what is important to you when you choose certain food items? (What has been influencing/guiding your food choices?)
8. * (if they are not currently vegan/vegetarian) Have you ever tried to follow a plant-based or vegetarian diet? If so, what helped or challenged you?
9. How often do you think about the environmental impact of your food choices?

### Food Journey

10. What do you know about plant-based proteins? Can you name some common plant-based protein sources? (Prompt: lentils, beans, mushrooms...)
11. How do you feel about eating plant-based protein instead of animal-based protein? (Prompt: taste, nutritional value, cost, access)
12. How often do you currently eat meals with plant-based protein?

13. What influences your decision when choosing plant vs. animal protein? Duplicate of guiding?
14. What do your family, friends or peers think about eating food with plant-based protein?
15. How would you describe social support or any social influence around eating plant-based protein on campus? (Prompt: is it trendy? Common? Weird?)
16. How would you describe your confidence in influencing dietary choices of those around you? Have you ever encouraged someone else to try plant-based meals? If so, what was your experience like?

**GWU**

17. Now let's pivot a little bit and talk about food on GWU campus. How would you assess the GWU dining options? how are health concerns incorporated in the menu? How often do you buy meals with plant-based proteins in the dining halls? How would you describe the ease or difficulty of finding plant-based protein options on GWU campus (e.g., dining halls, cafes)?
18. How do you feel about the plant-based proteins available on campus? (Prompt: appeal, nutritional value).
19. What could make plant-based protein options more appealing or accessible on campus and dining halls specifically?
20. What do you think about the role of policies in what food options are available or encouraged? (Prompt: Are you aware of any policies (local, state, or federal) that support plant-based eating or environmental sustainability in food systems? Follow-up: university policies to support and promote plant-based proteins)

21. What do you think about GWU's support or promotion of plant-based eating? What do you think university's role is supporting and promoting plant-based eating?
22. What changes do you think the university could make to encourage more sustainable food choices?
23. Now as we talked about different factors that play in your dietary behavior, how confident are you in your ability to increase plant-based protein sources in your diet? (How would you describe your confidence in choosing or preparing meals with plant-based proteins?)
24. What benefits or drawbacks do you expect from consuming more plant-based proteins? (prompt: health, environmental?)
25. What would make you more likely to eat plant-based protein regularly? (Prompt: Think of what situations make it easier or harder for you to choose plant-based options? How does being on GWU campus facilitate or impede uptake of plant-based meals?)
26. Is there anything else you'd like to share about plant-based eating or environmental protection?

**Appendix D: Chartwells Representative Interview Guide**

**Demographics:**

1. How old are you?
2. How do you identify your sex/gender?
3. What is your education or/and professional training (prompt: culinary arts, hospitality?)
4. How long have you been in a food business?

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5. Can you tell me a bit about your job, describe your day-to-day duties and the type of food service you provide on the GWU campus?
6. Who is your primary customer base (e.g., students, staff, faculty)?
7. Could you describe the decision-making behind food procurement and menu development? What are the driving factors? (How do you go about deciding what is going to be on the menu, when and how to change it?
8. Now I would be curious to hear your thoughts on sustainability in relation to food and Chartwell's operations. (Sustainability is generally described as "meeting the needs of the present without compromising the ability of future generations to meet their own" and is often discussed in the context of environmental, social, and economic areas). What does sustainability mean in your context?
9. How would you describe your business's commitment to sustainability? (prompt: decreasing negative impact from food systems such as food production, packaging, distribution, on the environment?)

10. This research is specifically focused on sustainable diets – diets that minimize environmental impact. What does sustainable diet mean to you? What is your understanding of plant-based proteins and their role in sustainable diets? (Prompt: plant-based proteins are protein sources derived from plants rather than animal such as beans and including soybean, lentils, some grain and seeds).
11. How do you think about sustainable diets in the food business context?
12. What are your personal thoughts or attitudes toward offering plant-based protein options on GWU campus?
13. How do you see your role in promoting sustainable eating on campus?
14. Could you discuss what plant-based proteins are currently being used in Chartwells menus? How the decisions to integrate these proteins were made? Are there any considerations about expanding these options by integration legumes such as lentils?
15. How would you describe students' interest and university culture regarding offering more plant-based protein options? (Prompt: Are you aware about customers asking for vegetarian or vegan options?)
16. How would you describe your confidence in procuring plant-based proteins OR preparing dishes with them?
17. What challenges, if any, do you face when incorporating plant-based proteins into your menu? (Prompt: How easy is it to source high-quality, affordable plant-based protein?

Are there any operational or budgetary constraints that limit your ability to serve more meals with plant-based proteins? Are there logistical or supplier-related barriers?)

18. What do you believe are the benefits or risks (financial, operational) of offering more plant-based proteins?
19. Have you received any guidance or support from the university related to sustainability or plant-based dining initiatives? (ex. integration of more plant-based protein options in dishes). Are there any campus policies, incentives, or vendor guidelines that impact what you can offer?
20. What policy or program changes could support your efforts to serve more meals with plant-based proteins?
21. What would help you include more plant-based protein options (training, cost support, awareness, customer demand, university policies)?
22. Is there anything else you'd like to share about your experience or perspective?

**Appendix E: GWU Dining Services Interview Guide**

**Demographics:**

1. How old are you?
2. How do you identify your sex/gender?
3. What is your education or/and professional training?

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4. Can you describe your role in campus dining services?
5. What is the role/scope of the GWU dining services?
6. Could you describe the GWU partnership with the food vendors – what drives decision- making in selecting a vendor? What are the roles and responsibilities of each party? What kind of influence does dining services administration have on food vendors?
7. Now let's pivot to the focus of this research – plant-based proteins. This research is specifically focused on sustainable diets – diets that minimize environmental impact. What does sustainable diet mean to you? What is your understanding of plant-based proteins (Plant-based proteins are proteins derived from plant sources like legumes, grains, nuts, seeds, and soy products) and its environmental significance?
8. What is the dining services position on availability of meals with plant-based proteins on campus?
9. How do you personally view the importance of integration of plant-based proteins in campus food menus?

10. Now I would be curious to hear your thoughts on sustainability in relation to food and dining services operations. (Sustainability is generally described as "meeting the needs of the present without compromising the ability of future generations to meet their own" and is often discussed in the context of environmental, social, and economic areas). Are there any formal sustainability goals or procurement policies GWU, and dining services specifically, have in place?
11. How does the dining system influence broader university sustainability initiatives?
12. Does your team have the expertise to collaborate with vendors in creating appealing plant-based meals?
13. Now let's talk about your customers. Does dining team collect any feedback from students regarding the available food options? What influence do your customers have on what food GWU offers? (Prompt: What role does student feedback play in your dining planning? How does the dining team respond to student preferences and dietary trends?)
14. Do you see a role for university-wide policy in shifting toward more plant-based food offerings? (What opportunities do you think are available for GWU dining services to support more plant-based protein options available on campus?)
15. What policy changes or institutional investments would help most to support more plan-based protein options? (Prompt: What additional resources, training, or incentives would support increased plant-based options?)
16. What outcomes do you anticipate from increasing meals with plant-based proteins (student satisfaction, cost, sustainability)?

17. What are your biggest challenges and benefits in offering or scaling up plant-based protein options?
18. Is there anything else you'd like to share about your dining operation's role in sustainability or student health?

**Appendix F: Coding Matrix / Codebook**

| Top-Level Code | Description | RQ | Framework and Constructs |
|---|---|---|---|
| Demographics | Students and providers discussing demographic characteristics, including age, sex/gender, race/ethnicity, education level (all participants), and occupation (non-students). | RQ1, RQ3 | SEM: Intrapersonal |
| Students - Knowledge and Perceptions of Plant-Based Proteins | Students discussing their knowledge of plant-based proteins (PBP), comparisons among different types of PBP, perceived benefits and drawbacks, taste and appeal, and their accessibility and affordability. | RQ1 | SEM: Intrapersonal, Interpersonal<br><br>SCT: Cognitive (knowledge, self-efficacy, outcomes expectations); Behavioral (skills, intentions); Environmental (barriers and opportunities, social support, normative beliefs) |
| Students – Facilitators of Eating Plant-Based Proteins | Students discussing factors that facilitate consumption of PBP, including knowledge, skills, PBP characteristics, enabling infrastructure, meal preparation, social/community support, and health-related needs. | RQ1 | SEM: Intrapersonal, Interpersonal, Community, Institutional<br><br>SCT: Cognitive (outcomes expectations); Behavioral (skills, intentions); Environmental (perceived facilitators) |
| Students – Barriers to Plant-Based Proteins | Students discussing factors that impede intake of PBP, such as economic constraints, health conditions or allergies, infrastructure limitations, lack of knowledge or skills, meal preparation challenges, PBP characteristics, and limited social support. | RQ1 | SCT: Cognitive (outcomes expectations); Behavioral (skills, intentions); Environmental (perceived facilitators)<br><br>SEM: Intrapersonal, Interpersonal, Community, Institutional |
| | Students discussing their general food habits and | RQ1 | |

| | | | |
|---|---|---|---|
| Students – Social and Environmental Contexts (related to PBP) | cultural food norms, family cooking traditions, context-driven dietary decision-making, social context, infrastructure, and perception of GWU dining. | | SEM: Interpersonal, Community, Institutional<br><br>SCT: Environmental (observational learning, social support, normative beliefs). |
| Students – Expectations of University Role (Related to PBP) | Students discussing perceptions of the university's responsibility as an educational institution to shape dietary knowledge, values, and food environments through education, food availability, and normative influence. | RQ2 | SEM: Institutional<br><br>SCT: Cognitive (outcomes expectations); Environmental (observational learning) |
| Providers – Perspectives and Strategies for Expansion of Plant-Based Proteins on Campus | Providers discussing their understanding of PBP; existing and planned strategies related to PBP availability; culinary philosophy; educational programming; engagement with students; and anticipated outcomes of increasing plant-based options on campus. | RQ3 | SEM: Institutional, Community, Policy<br><br>SCT: Cognitive (outcomes expectations) |
| Providers – Decision-Making Context, Capacity, Constraints, and Facilitators | Providers discussing operational capacity (e.g., staffing, skills, space), organizational and structural constraints (e.g., business model, costs, recipe use), and facilitators (e.g., leadership support, student demand, provider motivation) influencing PBP availability and quality. | RQ4 | SEM: Institutional, Community<br><br>SCT: Behavioral (behavioral skills); Environmental (barriers/opportunities) |
| Commitment to Sustainability | Representatives of GWU Dining Services and | RQ3, RQ4 | SEM: Institutional, Policy |

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|---|---|---|---|
| (GWU, Chartwells) | Chartwells discussing sustainability commitments, initiatives, goals, and institutional priorities related to food systems and dining operations. | | |
| Environmental Concerns (Related to Food Systems) | Participants discussing environmental concerns related to food systems, including climate impact, sustainability, and sources of knowledge about environmental consequences of dietary behavior. | RQ1, RQ3 | SEM: Intrapersonal, Community<br><br>SCT: Cognitive (knowledge, outcome expectations) |
| Healthy Eating Definition & Perceptions of Sustainable Diets | Participants discussing their definitions of healthy eating (sometimes framed as "balanced meals" or "balanced diets"); providers discussing interpretations of sustainable diets within institutional food service contexts. | RQ1,<br><br>RQ3 | SEM: Intrapersonal, Institutional<br><br>SCT: Cognitive (knowledge, outcome expectations) |