

University of British Columbia

Social Ecological Economic Development Studies (SEEDS) Sustainability Program

Student Research Report

Food Skills, Habits, and Preferences at UBC

An exploratory survey to inform the creation of an Online Food Hub and promote a nourishing, sustainable, and equitable food system on the UBC Vancouver campus

Prepared by: Caroline Sutton, Vicky Kim, Crystal Yu, Rachel Chan, Akhila Varghese, Lynn Tung, Rajdeep Dhaliwal, Egon Shin, Cara LeGault, Kristen McLester, Karin Gonchar Lead: Verena Rossa-Roccor

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Food Hub
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**Prepared for the University of British Columbia
SEEDS Sustainability Program**

by

**Caroline Sutton, Vicky Kim, Crystal Yu, Rachel Chan, Akhila Varghese, Lynn Tung,
Rajdeep Dhaliwal, Egon Shin, Cara LeGault, Kristen McLester, Karin Gonchar
Lead: Verena Rossa-Roccor**

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Executive Summary

In order to improve student health and wellbeing while reducing carbon emissions and being a leader in sustainability, UBC should support and promote plant-based foods and diets. The objectives of this study were to explore food skills, habits, and preferences at UBC, including gauging perceptions on and barriers to plant-based diets, and what types of tools and resources UBC community members would look for in an Online Food Hub.

A survey (available upon request) was distributed over social media and by email using Qualtrics, and descriptive statistical analysis was conducted. A total of 368 participants completed the survey, with a majority of the population consisting of domestic undergraduate students at the UBC Vancouver campus. Most students self-prepared most meals, ate some take-out meals on campus weekly, and were limited in budget and time. Most students were open to the idea of switching to a plant-based diet and were interested in resources on how to eat healthy on a budget, budgeting tools and nutritional information, and learning new food preparation skills. The biggest barriers to eating more plant-based foods on campus were fears about nutritional and protein deficiencies, cost (plant-based options that are cheaper than meat options are greatly desired), and lack of variety. Students want to see cheaper and a greater diversity of plant-based food options on campus.

There are a variety of initiatives that UBC stakeholders can support through communication and collaboration with existing on-campus groups in order to promote plant-based diets, including the creation of an Online Food Hub that addresses the need for resources to help students eat more healthy, plant-based, low-cost, and delicious food.

Recommendations

Based on the survey findings and a comprehensive literature review, UBC Plant Forward has the following key recommendations for stakeholders:

1. **Diversify and increase plant-based food options on campus:** Advocate for and support initiatives that will increase the amount and diversity of plant-based food options on campus. Make sure they are nourishing, affordable, and delicious. Consider branching out and having plant-based options from a wider variety of cuisines to make them more culturally appropriate for the diverse student body. A bold plan of action to help UBC address the climate crisis and become more sustainable while improving the health and wellbeing of the UBC community would be to advocate for offering mostly or only plant-based foods on campus and endowment lands by 2030.
2. **Increase low-cost and free plant-based meal options on campus:** Subsidizing plant-based meals on campus by making meat and dairy products add-ons at increased prices would help food-insecure and low-budget students. With smart education campaigns, it would make students aware of the increased real cost (environmental and human health cost) of consuming animal products.
3. **Create clear and informative food and menu labels:** Creating labels that highlight the beneficial health and environmental impacts of plant-based foods, or that qualify or quantify their environmental footprint, would help incentivise students to choose healthier or more sustainable foods when deciding what take-out to buy on campus.
4. **Create an Online Food Hub:** Create an online food hub that has different content for different kinds of users (such as cooking skills, meal prep, and recipe videos for students who want tips and ideas, meal plans and grocery shopping lists that are pre-made and have an approximate cost already calculated, and budgeting tools and food insecurity resources already compiled). The online food hub should also have information or videos on how to cook different types of food and ingredients, irrespective and unrelated to how the ingredients combine to make up a larger recipe (which is not typically how food skills are promoted, online through UBC resources or elsewhere). The online food hub needs to address both nutritional concerns and budgeting concerns/food insecurity of students, while keeping in mind the cultural diversity of the student body and the amount of time students typically are willing to devote to meal planning and preparation. Decision fatigue is a significant challenge, and students who are already pressed for time will be more likely to use a resource that is well designed and organized, with essential information that is distilled, accessible, and relevant.

5. **Increase the number of kitchenettes with microwaves and food-safe sinks on-campus:** Adding more essential facilities across campus that allow students to do basic food preparation (cutting, washing, warming) would make it easier for students to bring self-prepared meals to campus.

Based on evidence presented in this report, discussions with key food system stakeholders at UBC, and on the interpretations of UBC Plant Forward members, UBC Plant Forward recommends the following:

6. **Collaboration and engagement with students and community:** Continue to collaborate with UBC staff and faculty groups, committees, but especially collaborate and engage with student groups and members of the greater UBC community to inform future projects and initiatives. Understanding the unmet needs and wants of the student and greater UBC community will increase chances of project success. Communicating with other on-campus groups that share similar goals can help limit redundancy and fragmented efforts, and instead pool resources and manpower. Consulting with experts that research behaviour and sustainability may yield insights about how to ‘nudge’ behavior change and increase the adoption of certain practices on campus.
7. **Make the food system central to UBC strategic plans and policies:** Behaviour change is both shaped by and shapes policies and norms. By integrating and prioritizing the food system in existing and future strategic plans and by developing a stand-alone campus-wide food policy which presets the food environment (including menu offerings and procurement guidelines), we can achieve a transformation in perceived norms of food production, consumption, and disposal.
8. **Consider food justice:** Work with food sovereignty and food justice groups on campus to improve reconciliation efforts and support food security for Indigenous communities in BC and Indigenous students at UBC, as well as other student populations that are at an elevated food insecurity risk.
9. **Increase education and awareness around plant-based foods:** It is essential that the UBC community becomes aware of both the human health and planetary health impacts of consuming animal products, and the importance and benefits of consuming healthy, seasonal, and local plant-based foods. Increased education around this issue will help students embrace and demand plant-based food options and support policies or practices that attempt to increase plant-based foods on-campus.

Who we are

UBC Plant Forward is a student-led group (formed 2019-2020) working to address these recommended areas of action in bold and innovative ways. The group was created to bridge the gap between students' voices and the mostly staff-led food system action happening on campus within disparate committees and working groups. We take a justice-centred approach and are evidence-based. We do so by working primarily with a diversity of student populations, and by using UBC data and relevant literature to highlight the co-benefits of a plant-forward diet for human and planetary health with a justice lens. We aim to increase the acceptability of and demand for plant-forward foods at UBC. Whenever possible, we do this work in collaboration with existing initiatives and aim to connect everyone in this space.

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1. Introduction

1-1. Background information: Food at UBC

1-1-1. The food system at UBC

Currently, the food system at the UBC Campus consists mainly of UBC Food Services, the AMS, and independently operating businesses who all procure, process, distribute, and dispose of food.

There are various stakeholders and resources available to the UBC community that play a role in the institution's food system, including but not limited to the on-campus food bank, the Cooking Club, Dietitians in Residences, and community gardens. Numerous initiatives have been created by students, faculty, and staff with the aim to tackle food insecurity issues and improve food literacy for populations on campus. However, despite some central entities such as the Food System Project or the Food and Nutrition Council, the cohesion between these various stakeholders continues to be challenging as several communities on campus are pursuing similar initiatives in silos, as opposed to a collaborative front. UBC Plant Forward, a student committee part of the UBC's Plant Friendly Food Initiative, suggests that the University utilize the planned Online Food Hub (OFH) to increase communication between food system stakeholders on campus, and promote and support food skills development, food literacy, and food justice. The goal of the OFH should be for it to be accessible and usable for all people, regardless of age, prior experience or knowledge of food, nutrition, health, and cooking, as well as other factors.

In order to ensure that the resources and the information on the OFH will be relevant and helpful to the UBC community, the knowledge gap must be filled. Presently, there is a lack of knowledge about the diet habits, levels of food literacy, and information regarding the degree of access to kitchens, cooking tools and supplies, groceries, and food options that the community members have. The needs and wants of the community members could vary widely with regards to food access, nutritional information, healthy recipes to make meals on a budget, and food skill instruction. With the challenges that community members face being heavily varied depending on their living/housing and financial situations, age, and sociodemographic factors, there has been a challenge for the stakeholders to determine the exact demands that community members may have. The voice of students in particular has been underrepresented in these endeavours.

The survey created by UBC Plant Forward provided a chance for the community members, particularly to undergraduate students, to voice their needs and wants for food-related resources at UBC. In order to evaluate the responses from the survey takers from both

individual and group levels, the survey focused around four key topics: Food Skills and Literacy, Diet Habits, Online Food Hub, and Sociodemographic Information. The questions asked in the survey were intended for the stakeholders to gain a deeper understanding of the strengths that the UBC community currently has, and the ways that UBC's resources could be helpful towards specific issues and concerns for individuals. Furthermore, the data that the survey has collected could be used to evaluate the strengths and weaknesses in the current UBC food system. This project therefore fulfills multiple duties in the realms of community engagement and knowledge creation, which will help UBC food-system stakeholders better understand the UBC student population's relationship to food.

1-1-2. Food at UBC in the context of the climate crisis

On December 5th, 2019, the University of British Columbia Office of the President published a Declaration on the Climate Emergency (1). This formal recognition came after a year of an unprecedented amount of student-led activism both locally and globally, with support from UBC faculty and staff. A pivotal moment of action occurred on September 27th 2019, when over 5,000 students, faculty, and staff rallied at the UBC Climate Strike and then biked, bused, and walked into downtown to join forces with over 100,000 Vancouverites taking part in the Global Climate Strike (2). The Declaration on the Climate Emergency responded to the UBC Climate Strike Open Letter and announced several key motions to move UBC forward in the realms of sustainability and climate justice (3). Included in these motions are:

Implementing the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), and align its policies, actions, and investments with the UNDRIP (UN Declaration on the Rights of Indigenous Peoples).

Forming a new UBC Board of Governors' Sustainability Committee to oversee the commitment to full divestment from fossil fuels to sustainable investment (4).

A climate emergency community engagement process led by the President's Office to inform UBC's response, with an emphasis on upholding dignity justice, and equity of marginalized communities during the process.

Included in this climate emergency community engagement process was the establishment of the Climate Emergency Advisory Committee, which is actively working to consolidate feedback from community consultations and produce a report that "defines the pillars of the climate emergency and outlines recommended actions". Several recommended action areas are both novel and critical for attaining UBC's emissions targets and sustainability goals, including:

1. Reducing greenhouse gas emissions related to food systems

2. Incorporating climate justice into UBC policies that currently lack a climate justice lens, such as health and wellbeing initiatives and investments
3. Creating climate solutions that uphold the human rights of Indigenous Peoples and marginalized communities
4. Supporting UBC communities with resources and funding to address the climate emergency

We recognize that promoting a diet rich in plant-based foods while upholding and ensuring food sovereignty will benefit human and ecological health while supporting ethical practices, and provide climate-resilient, nourishing, and culturally appropriate food for the UBC community. There is substantial evidence, discussed later in the introduction, that supporting food justice through plant-based foods aligns with the areas of recommended action UBC has pledged to take. Producing plant-based foods is associated with significantly lower negative environmental impacts than producing animal product foods (5). While the environmental impacts related specifically to food transportation is a small proportion of the total environmental impacts considered in a life cycle analysis of food products, eating seasonally and locally can help promote sustainability by reducing food miles and supporting local economies (6). In southwest BC, consuming local produce in places of imported produce was associated with lower carbon emissions (6). Supporting small grocers and markets has been recommended to the city of Vancouver to help maintain culturally appropriate food accessibility and foster a sense of community and belonging (7).

1-2. The role of plant-based diets

UBC's mission to reduce greenhouse gas emissions and take bold action against climate change goes hand and hand with UBC's mission to have the community live well to learn well, with a promotion of healthy plant-based foods as the synergistic link. UBC has immense potential and is well-positioned to be a world leader in a great food transition, where students, faculty, and staff enjoy a campus that has maximized a sustainable food system, with an abundance of culturally-diverse, affordable, nutritious, and delicious climate-friendly food options. This is possible if UBC promotes and offers primarily healthy plant-based foods. Not only do plant-based foods have a much smaller carbon and energy footprint than animal-based foods, they generally require less water, support biodiverse ecosystems, and eliminate the toxic risks that manure lagoons pose to human and ecological health (8,9). Additionally, decades of high quality research show that eating a healthy, plant-based diet and reducing consumption of animal-based foods improve overall wellbeing and promote low risk of major chronic diseases, and in some cases, even reverses symptoms of chronic disease (9–12).

1-2-1. Defining a ‘plant-based diet’

The term ‘plant-based’ has been used to describe a wide variety of diets throughout academic literature on dietary nutrition, on a spectrum from an omnivore diet that is predominantly animal-based (with a high consumption of meats, eggs, and dairy products) to a diet that is entirely vegan (only plant-based, with no consumption of meat, eggs, or dairy products). Common types of plant-based diets include ‘pesco-vegetarian’ and ‘ovo-lacto-vegetarian’, but these diet types focus on the exclusion of certain animal products. In general, the term ‘plant-based’ focuses on the inclusion of plant products in the diet as the predominant food source (13).

It is worth noting that ‘plant-based’ does not automatically equate with ‘healthy’. While prior research attempted to distinguish more standard (animal-product heavy) Western diets from vegetarian and vegan diets, recent research has investigated the more intricate effects of diet quality on human health. In these studies, diets containing higher amounts of healthy plant-based foods (such as whole grains, fruits, vegetables, legumes, nuts and oils, and beverages low in sugar) were distinguished from diets containing higher amounts of unhealthy-plant based foods (such as refined grains in white bread and pasta, potatoes/fries, and foods and beverages high in fat and added sugar) (10–12). In a recent literature review the authors broadly concluded that “a healthy, plant-based diet aims to maximize consumption of nutrient-dense plant foods while minimizing processed foods, oils, and animal foods (including dairy products and eggs). It encourages lots of vegetables (cooked or raw), fruits, beans, peas, lentils, soybeans, seeds, and nuts (in smaller amounts) and is generally low in fat”(11).

For the purpose of this report, we will use the term ‘plant-based’ to mean whole, plant-derived foods that are minimally refined and processed, and the term ‘plant-based diet’ as a diet “defined by appropriate calorie intake, an abundance of diverse plant-based foods, low amounts of animal-based foods (especially red meat [and ruminant products]), unsaturated fats in place of saturated fats, and limited refined grains, processed foods, and added sugars” (9). This is the definition the EAT Lancet Commission, a working group of leading nutrition and environmental scientists, uses for a ‘Planetary Health Diet’ which, if adopted worldwide, could prevent millions of deaths annually and help to mitigate climate change and other environmental crises (8,9).

1-2-2. Some environmental benefits of plant-based diets

Eating a plant-based diet can bring about substantial environmental benefits by reducing greenhouse gas emissions, deforestation and biodiversity loss, and freshwater usage.

1. Eating plant-based foods in place of animal products reduces greenhouse gas emissions:

An increased consumption of plant-based diets could reduce greenhouse gas emissions by at least 56%, thereby having high potential in mitigating climate change and limiting

global warming to a less than 2°C increase (9,14). In a systematic review, it was revealed that meat and dairy production contribute up to 24% of total greenhouse gas emissions, and 80% of greenhouse gas emissions in the food sector (15).

2. Eating plant-based foods in place of animal products reduces deforestation and biodiversity:

A reduction in meat production could alleviate the pressure of deforestation and biodiversity loss (9). Deforestation is performed to create pasture and cropland to grow animal feeds (8). As of the year 2019, almost two thirds of soybeans, maize, and barley, and almost a third of all grains, were used to feed animals instead of humans (9). It was suggested that if all meat and dairy products are replaced by plant-based foods, land use would be reduced by 50% (15). However, high-yielding plant varieties should be used to reduce the amount of croplands needed to produce sufficient amounts of food (9).

3. Eating plant-based foods in place of animal products reduces freshwater use:

A reduction in meat consumption could reduce water usage, by reducing the use of global green water (rainwater attached to soil particles and accessible by roots) by up to 21% and the use of blue water (rainwater that enters rivers and aquifers) by up to 14%. Specifically, a diet with no animal products (except fish) reduced the total water footprints by 30% compared to a world average diet where animal products contribute to a third of dietary protein intake. A larger reduction in animal product consumption resulted in a larger reduction in blue and green water use. The largest relative water savings were achieved in water scarce regions like the Middle East and Africa, which could ease water scarcity in these regions (16).

1-2-3. Health benefits of plant-based diets

“Evidence from controlled feeding studies with intermediate-risk factors as outcomes, long-term observational studies relating individual dietary components and overall dietary patterns to major disease endpoints and quality of life, and randomized clinical trials supports the conclusion, with a high level of certainty, that dietary patterns with the following characteristics promote low risk of major chronic disease and overall wellbeing:

- (1) protein sources primarily from plants, including soy foods, other legumes, and nuts, fish or alternative sources of omega-3 fatty acids several times per week with optional modest consumption of poultry and eggs, and low intakes of red meat, if any, especially processed meat;
- (2) fat mostly from unsaturated plant sources, with low intakes of saturated fats, and no partly hydrogenated oils;
- (3) carbohydrates primarily from whole grains with low intake of refined grains and less than 5% of energy from sugar;
- (4) at least five servings of fruits and vegetables per day, not including potatoes; and

(5) moderate dairy consumption as an option.” (9)

High quality plant-based foods are nutrient dense and provide direct health benefits. Studies show that vegetarians consume more magnesium, potassium, iron, thiamin, riboflavin, folate, and vitamins and less total fat than meat-eating counterparts. Additionally, plant-based diets may increase satiety and resting energy expenditure by virtue of being low in energy density and high in complex carbohydrates, fiber, and water (11). It is also likely that eating healthy plant-based foods supports good mental health. Although a causal relationship between plant-based diets and cognition and mental wellbeing has yet to be demonstrated, based on research in other fields, it seems possible that a diet rich in healthy plant-based foods could influence brain function via altered gut microbial communities and altered systemic metabolic actions (13).

Furthermore, eating more plant-based foods in place of animal products comes with a wide variety of health benefits.

1. Lowered risk of chronic disease:

Short- to medium-term benefits of switching to a plant-based diet from conventional diet include improved weight status, energy metabolism, and systemic inflammation both healthy people and people with chronic diseases such as obesity and type-2 diabetes (13). A plethora of research using various study designs and methodologies have associated plant-based diets with a regression in atherosclerosis, a decrease in coronary events, reductions in systolic and diastolic blood pressure, in ischemic heart disease deaths, in cardiovascular disease, and all-cause mortality (11). In contrast, vegetarian populations generally have lower rates of heart disease, high blood pressure, diabetes, and obesity. Doctors and researchers believe that this may be mostly due to a lack of consumption of red meat (11).

2. Lowered risk of lifetime cancer:

Experts globally also recommend limiting consumption of red and processed meats in order to reduce lifetime cancer risk (17). Processed meats are considered a type 1 carcinogen, while red meat is considered a type 2a carcinogen (18). Even small amounts of processed meat (50g), consumed daily, are associated with an 18% increased risk of colorectal cancer. Red meat consumption is associated with an increased risk of colorectal, pancreatic, and prostate cancer (17). Additionally, there is a body of evidence that supports the association between plant-based foods and a decrease in cancer risk. Some studies show that an increase in consumption of soy products was accompanied by a significant reduced risk of breast cancer recurrence, and death due to breast cancer in women, and a reduction in prostate cancer risk in men (11).

3. Improved mental health:

In a survey study conducted at UBC that investigated self-reported student dietary patterns and depression and anxiety scores, a significant association was found between a diet high in processed foods and depression and anxiety after controlling for covariables (including social support) (19). Substituting healthy plant-based foods for processed foods including animal products will likely improve wellbeing.

Studies that have attempted to elucidate mechanisms of the health improvements associated with plant-based diets propose microbiome-related pathways that favor a greater diversity of bacterial species in the gut. However, these potential mechanisms are still unclear (13). What is clear is that we can prevent and reduce a host of chronic diseases by simply shifting dietary patterns. What is also increasingly clear is that diet quality matters more than diet category. Dietary patterns that included some animal products (such as dairy, eggs, and lean meat) were found to be associated with only a modest decrease in coronary heart disease risk compared to dietary patterns with little to no animal products. In comparison, dietary patterns with high levels of unhealthy plant-based foods (such as fried foods, refined grains, and products with added sugar) were associated with a higher risk in coronary heart disease. This suggests that even a moderate reduction in animal-based products and an increase in healthy plant-based foods can profoundly improve health (10).

1-2-4. Addressing health concerns about plant-based diets

Although many participants have health concerns about plant-based diets, particularly concerns about protein and micronutrient deficiency, it is important to note that many concerns are influenced by family values and marketing campaigns. The science shows that eating healthy plant-based foods and having access to nutritional information supports good health. In general, there are few concerns associated with consuming little to no animal products. Eating a balanced, well-planned, healthy plant-based diet can eliminate concerns relating to protein and essential fatty acids, and lessen concerns about obtaining micronutrients like iron, calcium, and vitamin D. Vitamin B12 is produced by soil microbes and therefore may need to be supplemented in a plant-based diet if not consuming animal products whatsoever (supplements are added to animal feed and thus can be obtained through consuming animal products). For an in-depth overview of common health concerns associated with plant-based diets, please see the “challenges” section of this report.

1-2-5. Cultural considerations of plant-based diets

“A plant-based diet is not an all-or nothing program, but a way of life that is tailored to each individual” (11).

There is unlimited creativity and diversity within the realm of plant-based diets. A wide variety of plant-based diets can be adequately nourishing and offer protection against chronic diseases, if they are balanced and include high-quality plant-based foods. Additionally, plant-based diets do not need to completely eliminate meat, dairy, and other animal products to confer some health benefits. For many people, a total elimination of animal products is unrealistic for cultural practices, convenience reasons, or budgeting concerns. However, large-scale adoption of the consumption of primarily plant-based foods and significant reduction in the consumption of animal-based foods will help mitigate threats to both human health and the planet (12). Furthermore, because plant-based diets can be customized to fit individual and cultural preferences, a shift towards eating more plant-based foods can be promoted in culturally appropriate ways. Western cooking styles of plant-based foods, such as tofu sandwiches and kale salads, are not desired by everyone. We believe that ‘culturally appropriate’ food means that for an individual of a specific cultural background, food is available for consumption that is consistent with the individual’s culture. This means that culturally-appropriate food shares qualities of a traditional cuisine (ingredients, methods of cooking, spicing, texture, taste, smell, appearance, etc.) or preserves aspects specific to cultural practices regarding food (availability of foods for different meals of the day, eating utensils, the setting and physical environment that influence how food is consumed).

For example, many traditional Chinese foods do not include meat and use various types of fermented plant proteins such as beans and soy, and some groups in China (such as Buddhist monks) eat plant-based diets (20). A Chinese person may prefer to use chopsticks instead of a fork and knife. A Chinese person may also prefer to share many small dishes with friends, and eat at a circular table that makes sharing multiple dishes easy, instead of eating a large dish of the same food type at a long, cafeteria style bench. All of these are practices that are relevant for culturally appropriate food practices which are not merely based on meat vs. no meat ingredients.

Depending on the geographical location and society an individual has lived in for the majority of their lives, they may prefer different ingredients and combinations of foods (21). For example, many Asian cultures put the focus of a dish not just on the meat as the stand alone ingredient but with a mix of vegetables and carbs such as noodles or rice. As dairy is not a main ingredient in Asian-based dishes tofu and soy products can replace meat as they have been the basic traditional Asian cuisines for thousands of years (22). Furthermore, Umami tastes which add a unique taste to Asian foods and are found in many plant-based origin foods such as fermented beans, grains, mushrooms, and teas could be added to foods to achieve more culturally appropriate flavours that many individuals would find in their country of origin (23).

From: Food in the Anthropocene - Panel 2: Feasibility of reference diet

“Although the reference diet, which is based on health considerations, is consistent with many traditional eating patterns, for some individuals or populations this diet might seem extreme or not feasible. However, from a global perspective the features of this diet, which could include strict vegetarian diets and consumption of modest amounts of animal source foods, have well established traditions in various regions. The best studied example is the Mediterranean diet, similar to the diet of Crete in the mid-20th century. This diet was low in red meat (average intake of red meat and poultry combined was 35 g/day) and largely plant-based, but high in total fat intake (about 40% of energy) consumed mainly as olive oil. Greeks had one of the longest life expectancies at the time. Many other traditional diets, such as those in Indonesia, Mexico, India, China, and West Africa, also include little red meat, which might be consumed only on special occasions or as minor ingredients of mixed dishes. Some of these cultures have also consumed few or no dairy foods, often corresponding with lactose intolerance and lower rates of bone fracture than have countries with high dairy consumption. High consumption of nuts is traditional in some West African populations (ie, about 100 g/day in Niger) and large amounts of soy foods are consumed in many Asian populations (ie, 46 g/day in Taiwan). Legume consumption has traditionally been high in many cultures, such as Mexico, India, and Rwanda. Thus, ample precedent exists for the ranges of food intakes represented by the reference diet, and the culinary experiences of different regions provide many opportunities to learn new ways of preparing diets that are healthy and enjoyable” (9).

2. Methods

2-1. Purpose

The Food Preferences and Online Food Hub Survey was developed by UBC Plant Forward in collaboration with UBC SEEDS and UBC Wellbeing, in winter term II of 2019-2020. The purpose of this study was to gain insights into the UBC community's food skills, their dietary habits and preferences and to thereby inform the creation of an Online Food Hub.

2-2. Study design and questionnaire

This cross-sectional study utilized a self-report questionnaire to assess food skills, dietary habits and preferences as well as preferences for an Online Food Hub among the UBC community. The questionnaire consisted of 37 questions with four sections including sociodemographics, food skills and food knowledge, dietary habits, and knowledge on current and future UBC-based online food resources. The survey was constructed with substantial input from several UBC stakeholder groups: UBC Wellbeing Food and Nutrition Committee, Plant-Forward Working Group, the Food Insecurity Initiative, and the UBC Climate Friendly Food System Working Group. The survey was tested for feasibility and comprehensibility prior to distribution and co-constructed. This pilot study took place during the Sustainable Development Goals Week with 24 participants that completed the survey. In the pilot study, the participants were asked to complete the survey and give any feedback or suggestions they have to improve the survey. Most participants found the survey too long but easy to complete and follow along. These considerations were incorporated in the final version of the survey.

2-3. Procedures and participants

The survey was distributed online via the UBC survey tool Qualtrics. Participants were recruited via Facebook posts and emails from April 2nd to April 17th using a digital flyer.

Recruited participants were members of the UBC community - undergraduate, graduate and visiting students as well as staff and faculty members.

2-4. Analysis

The final analytical sample consisted of n=367 respondents after incomplete surveys were excluded (n=64). Responses such as "I don't know", "not applicable", and "prefer not to say" were counted as missing data and were not included in the descriptive summary statistics. Statistical analysis was limited to descriptive statistics.

3. Results

3-1. Participant characteristics

A presentation containing an overview of the study results was presented to the UBC Food and Nutrition Committee.

The total sample consisted of n=367 participants, of which 81.7% identified as female (n=264), 14.6% as male (n=47), and 1.2% as non-binary (n=4). A large majority of participants were undergraduate students (n=246, 89.5%), while 6.5% were graduate students (n=18) and 2.9% identified as faculty or staff (n=8). Most participants were domestic students (n=246, 78.1%), while 20.3% were international students (n=64) and 0.6% were exchange students (n=2). Almost half of the participants came from the Faculty of Land and Food Systems (n=143, 44.4%), other participants came from a wide diversity of different faculties and schools.

67.3% reported living off-campus (n=210), 21.8% lived in Student Housing and Hospitality Services (SHHS) accommodations on-campus (n=68) and 8.3% reported living on-campus, but in non-SHHS housing accommodations (n=26); 12.3% of the participants reported living away from home for the first time (n=39); 78.5% of participants reported having access to a full kitchen (n=245), while 14.7% said they had access to a kitchenette (n=46) and 1.0% of participants said they have no kitchen access in their living situation at all (n=3).

Further details of the participant characteristics can be found in Table 3-1.

Table 3-1 - Participant Characteristics

Characteristic	Item categories	n	%
Gender identity¹	Female	264	81.7
	Male	47	14.6
	Non-binary	4	1.2
Association with UBC¹	Undergraduate Student	246	89.5
	Graduate Student	18	6.5
	Faculty/Staff	8	2.9
Student status¹	Domestic	246	78.1

Characteristic	Item categories	n	%
	International	64	20.3
	Exchange	2	0.6
Faculty¹	Land and Food Systems	143	44.4
	Arts	55	17.1
	Science	46	14.3
	Other	244	75.8
Living situation¹	Living off-campus	210	67.3
	Living on-campus, SHHS	68	21.8
	Living on-campus, non-SHHS	26	8.3
	Living away from home for the first time	39	12.3
	Access to full kitchen	245	78.5
	Access to kitchenette	46	14.7
	No access to kitchen	3	1.0

¹ n<367 due to missing data

3-2. Food Skills and Literacy

3-2-1. Information on healthy eating

When the participants were asked whether or not they knew where to find information on healthy eating, 79.1% reported that they somewhat or strongly agreed (n=287), 6.9% reported feeling neutral (n=25), and 14.1% reported that they somewhat or strongly disagreed (n=51).

As can be seen on Table 3-2, almost three-quarters of the participants reported that social media (Facebook, Instagram, YouTube, and/or blogs) was a source for their information on healthy eating (n=259, 70.6%). More than one-third of the participants reported asking friends and/or family about information on healthy eating (n=148, 40.3%) as well as using scientific literature as a source (n=146, 39.8%). Notably, the least used sources of information for participants were UBC websites such as UBC Food Services Nutrition,

Student Services Nutrition and Food, and the UBC Food Asset Map (n=41, 11.2%), as well as the UBC resources such as Dietitians in Residence and the Wellness Centre (n=24, 6.5%). Further details of the information on healthy eating can be found in Table 3-2.

Table 3-2 - Information on healthy eating

Variable	Item categories	n	%
Confidence in knowing Where to find information on healthy eating¹	Strongly disagree	9	2.5
	Somewhat disagree	42	11.6
	Neutral	25	6.9
	Somewhat agree	167	46.0
	Strongly agree	120	33.1
Sources of information on healthy eating¹	Social media (Facebook, Instagram, YouTube, blogs)	259	70.6
	Friends and/or family	148	40.3
	Scientific literature	146	39.8
	News/media (including TV, radio, and magazines)	118	32.2
	Medical professionals	115	31.3
	School resources, professors, and TAs	76	20.7
	UBC websites	41	11.2
	UBC resources	24	6.5

¹ n<367 due to missing data

3-2-2. Cooking skills

Participants were asked to rank their confidence in various cooking skills using a five-point scale. The five points and its attributed scores are as follows: score 0=not at all confident; score 1=not very confident; score 2=somewhat confident; score 3=confident; and score 4=extremely confident. The mean of the scores that the participants selected for each of

the cooking skills were calculated. The skill with the greatest mean was “following a simple recipe” (\bar{x} =3.48), while the skill with the smallest mean was “cooking animal protein sources (e.g. meat, fish, dairy, eggs)” (\bar{x} =2.34).

Over half of the participants reported that they wanted to learn how to make meals without a recipe (n=180, 55.2%), as well as make substitutions for items in a recipe (n=175, 53.7%). Moreover, there were high demands from the participants to learn to follow a complicated recipe (n=162, 49.7%), as well as to cook animal protein sources such as meat, fish, dairy, and eggs (n=152, 46.6%) and plant-based protein sources such as tofu and beans (n=146, 44.8%).

Details of all the cooking skills that the participants have and want to improve on can be found in Table 3-3.

Table 3-3 - Cooking skills

Variable	Item categories	mean (\bar{x})	n	%
Confidence in cooking skill¹	Cooking vegetables	3.16		
	Cooking grains (e.g. rice, pasta, couscous, quinoa)	3.08		
	Cooking animal protein sources (e.g. meat, fish, dairy, eggs)	2.34		
	Cooking plant-based protein sources (e.g. tofu, beans)	2.71		
	Following a simple recipe	3.48		
	Following a complicated recipe	2.50		
	Making meals without a recipe	2.56		
	Making substitutions for items in a recipe	2.38		
	Using a knife	3.16		
Cooking skills	Cooking vegetables		97	29.8

Variable	Item categories	mean (\bar{x})	n	%
participants want to improve ¹				
	Cooking grains (e.g. rice, pasta, couscous, quinoa)		88	27.0
	Cooking animal protein sources (e.g. meat, fish, dairy, eggs)		152	46.6
	Cooking plant-based protein sources (e.g. tofu, beans)		146	44.8
	Following a simple recipe		26	8.0
	Following a complicated recipe		162	49.7
	Making meals without a recipe		180	55.2
	Making substitutions for items in a recipe		175	53.7
	Using a knife		94	28.8

¹n<367 due to missing data

3-2-3. Cooking methods

When the participants were asked what their most used method(s) of cooking were, 74.4% reported that they used the oven to bake and/or roast their foods (n=262), while 58.0% reported that they boiled their food (n=204). Notably, only 3.1% of participants reported that they do not cook (n=11). Details of all the most used cooking method(s) that the participants reported can be found in Table 3-4.

Table 3-4 - Cooking methods

Variable	Item categories	n	%
Cooking methods ¹	Microwave	100	28.4
	Oven/baking/roasted	262	74.4
	Frying	155	44.0

Variable	Item categories	n	%
	Air fryer	21	6.0
	Boiling	204	58.0
	Steaming	105	29.8
	Eats raw (no cooking required)	29	8.2
	Do not cook	11	3.1

¹n<367 due to missing data

3-3. Dietary Habits

3-3-1. Information on meals

When the participants were asked about where the majority of their meals are from, more than half reported that they cook for themselves (n=201, 57.9%) while more than one-third reported that others cook for them (n=121, 34.9%). A small percentage gets take-out food or eat (n=22, 6.3%), and only a few depend on low cost/free meals (n=3, 0.9%).

Majority of the survey takers prepare breakfast (n=173, 85.2%), lunch (n=173, 85.2%), and dinner (n=169, 83.3%) for themselves. Dinner was identified as the meal that is most often prepared by others for the participants (n=207, 84.8%). The participants most often eat out or get take-out for dinner (n=188, 61.8%) or lunch (n=177, 58.2%). Further details of the information on meals reported by the participants can be found in Table 3-5.

Table 3-5 - Information on meals

Variable	Item categories	n	%
Source of meals¹	Cooked by themselves	201	57.9
	Cooked by others (e.g. partners, roommates, parents, friends)	121	34.9
	Take-out/eat out	22	6.3
	Dependent of low cost/free meals (e.g. food banks, community meals, free food at events)	3	0.9
Meals most often	Breakfast	173	85.2

Variable	Item categories	n	%
prepared by themselves¹	Lunch	173	85.2
	Dinner	169	83.3
	Snacks	120	59.1
Meals most often prepared by others¹	Breakfast	42	17.2
	Lunch	82	33.6
	Dinner	207	84.8
	Snacks	41	16.8
Meals most often taken-out/eaten out¹	Breakfast	23	7.6
	Lunch	177	58.2
	Dinner	188	61.8
	Snacks	88	29.0

¹n<367 due to missing data

3-3-2. Meals eaten on campus

79.2% of participants reported that they buy 0-5 meals on campus in an average week (n=267); this includes foods that were pre-packaged, store-bought, from fast food chains, and residence dining halls. 53.1% of participants indicated that, in an average week, they eat 0-5 meals on campus that they had prepared for themselves (n=179).

The greatest barrier to bringing food to campus was identified as participants not having time to prepare meals for themselves (n=204, 69.6%). Lack of facilities on campus—such as fridges, microwaves, sinks, hot water dispensers, and kitchens—were also identified as a barrier (n=140, 47.8%). 42.7% of the participants also reported that the amount of work it takes to prepare meals for themselves was another barrier they faced regarding bringing food to campus (n=125).

76.6% of the participants reported that they spend \$0-50 on an average week for on-campus food, including food from University Village and Wesbrook Village (n=236). Details of all the information regarding meals eaten on campus can be found in Table 3-6.

Table 3-6 - Meals eaten on campus

Variable	Item categories	n	%
Meals per week bought on campus (e.g. pre-packaged foods, store-bought foods, fast food, residence dining)¹	0-5	267	79.2
	6-10	45	13.4
	11-15	15	4.5
	16-20	7	2.1
	21+	3	0.9
Meals per week eaten on campus prepared by self¹	0-5	179	53.1
	6-10	87	25.8
	11-15	31	9.2
	16-20	27	8.0
	21+	13	3.9
Barriers to bringing food to campus¹	No time to prepare meals	204	69.6
	Lack of facilities on campus (e.g. fridges, microwaves, sinks, hot water dispensers, kitchens)	140	47.8
	Too much work preparing meals	125	42.7
	No time to eat	66	22.5
	Limited cooking experience	38	13.0
	Difficulties with transportation	22	7.5

Variable	Item categories	n	%
Estimated weekly food spending on campus (including University Village and Wesbrook Village)¹	\$0-50	236	76.6
	\$51-100	47	15.3
	\$101-150	16	5.2
	\$151-200	4	1.3
	\$200+	5	1.6

¹n<367 due to missing data

3-3-3. Groceries

Approximately two-thirds of the participants reported that they do their own groceries (n=222, 66.9%), while some reported that others do their groceries on their behalf (n=88, 26.5%). 6.6% reported that they have a UBC meal plan (n=22).

43.9% of the participants keep to a weekly grocery budget of \$51-100 (n=122) while 36.7% have a weekly grocery budget of \$0-50 (n=102). Further details of the information of groceries can be found in Table 3-7.

Table 3-7 - Groceries

Variable	Item categories	n	%
Grocery situation¹	Do their own groceries	222	66.9
	Others do groceries for me	88	26.5
	Have a UBC meal plan	22	6.6
Weekly grocery budget¹	\$0-50	102	36.7
	\$51-100	122	43.9
	\$101-150	38	13.7
	\$151-200	8	2.9
	\$200+	8	2.9

¹n<367 due to missing data

3-3-4. Willingness and perception towards plant-based diets

When the participants were asked what their diets look like on a regular basis, the majority reported that they consume little to almost no animal products (n=83, 26.0%). 17.9% of the participants indicated that they are mainly plant-based (n=57), which is less than the number of people that indicated that they consume animal products regularly (n=63, 19.8%) or have mostly animal product-based diets (n=62, 19.4%).

However, when the participants were asked if they would consider switching to a plant-based diet, 34.6% reported yes (n=114) while 18.8% reported no (n=62). 19.1% indicated that they were already plant-based (n=63). Some indicated that they have not considered switching to a plant-based diet before but were open to change (n=47, 14.2%), while others reported that they want to but have encountered difficulties (n=44, 13.3%).

Majority of the participants indicated that they perceive nutrient deficiency (e.g. of Vitamin B12), to be a major barrier of switching to a plant-based diet (n=126, 47.0%) Lack of options/variety (n=97, 36.2%), costliness (n=85, 31.7%), and fear of protein deficiency (n=82, 30.6%) were also identified as major barriers of switching to a plant-based diet. Further details of the willingness and perception that the participants have towards plant-based diets can be found in Table 3-8.

Table 3-8 - Willingness and perception towards plant-based diets

Variable	Item categories	n	%
Regular diet¹	Mainly plant-based	57	17.9
	Little to almost no animal product consumption	83	26.0
	Occasional animal product consumption	54	16.9
	Regular animal product consumption	63	19.8
	Mostly animal product-based	62	19.4
Consideration of switching to a plant-based diet¹	Yes	114	34.6
	No	62	18.8
	Want to but encounter difficulties	44	13.3

Variable	Item categories	n	%
Perceived barriers of switching to a plant-based diet¹	Have not considered before but open to change	47	14.2
	Already plant-based	63	19.1
	Fears of nutrient deficiency (e.g. Vitamin B12)	126	47.0
	Lack of options/variety	97	36.2
	Too expensive	85	31.7
	Fear of protein deficiency	82	30.6
	Not filling enough	70	26.1
	Too time consuming	56	20.9
	Does not taste good	56	20.9
	Don't know where to begin	56	20.9
	Enjoyment of eating meat	18	6.7
	Social exclusion and stigma	18	6.7
	No control over food choices	15	5.6
Lack of culturally appropriate foods	5	1.9	
Expensive	3	1.1	

¹n<367 due to missing data

3-3-5. Plant-based food preferences

Majority of the participants indicated that dairy milk alternatives—such as rice, oat, soy, almond, pea, and cashew milks—were plant-based food options that they have noticed and liked (n=257, 78.4%). Other plant-based food options/practices that the participants have enjoyed before include meat alternatives such as Beyond Meat (n=203, 61.9%), dairy alternatives such as Daiya cheese and non-dairy yogurt (n=105, 32.0%), and Meatless Mondays (n=101, 30.8%).

Over one-half of participants reported that plant-based protein, such as legumes, tofu, pulses, and tempeh, are their favourite ingredients in plant-based meals (n=151, 68.0%). 46.4% also reported that vegetables, such as kale, broccoli, mushrooms, and sweet potatoes, are favoured ingredients in plant-based food choices (n=103). Details of the participants' plant-based food preferences can be found in Table 3-9.

Table 3-9 - Plant-based food preferences

Variable	Item categories	n	%
Plant-based options/practices that participants have noticed and liked¹	Dairy milk alternatives (e.g. rice/oat/soy/almond/pea/cashew milk)	257	78.4
	Plant-based meat alternatives (e.g. Beyond Meat)	203	61.9
	Plant-based dairy alternatives (e.g. Daiya cheese, non-dairy yogurt)	105	32.0
	Meatless Mondays	101	30.8
	Raw vegan (eating only uncooked plant-based food)	49	14.9
	Traditional plant-based foods (e.g. falafels, tofu, bean curd skin, tempeh)	3	0.9
Favourite ingredients in plant-based meals¹	Plant-based protein (e.g. legumes, tofu, pulses, tempeh)	151	68.0
	Vegetables (e.g. kale, broccoli, mushrooms, sweet potatoes)	103	46.4
	Grains (e.g. quinoa, rice, oats, pasta, bread, tortilla, cereal)	33	14.9
	Spices and herbs (e.g. salt, nutritional yeast)	26	11.7
	Nuts and nut butters	23	10.4
	Dairy milk alternatives (e.g. rice/oat/soy/almond/pea/cashew)	20	9.0

Variable	Item categories	n	%
	milk)		
	Fruits (fresh and dried)	20	9.0
	Asian ingredients (e.g. seitan, miso)	19	8.6
	Sauces	9	4.1
	Processed plant-based meat alternatives (e.g. Beyond Meat)	9	4.1

¹n<367 due to missing data

3-3-6. Variable of specific interest to stakeholders

When participants were asked what they wished was available on campus to make the transition into a plant-based diet easier for them, almost one-third reported that they wish to have cheap or cheaper plant-based foods available at UBC (n=83, 32.6%). 26.3% also reported that they wish to have an increase in the availability of plant-based options and products across campus (n=67). Further details of the variable of specific interest to stakeholders can be found in Table 3-10.

Table 3-10 - Variable of specific interest to stakeholders

Variable	Item categories	n	%
Participant demands for on-campus foods/stakeholders for improved transition to a plant-based diet¹	Availability of cheap or cheaper plant-based foods	83	32.6
	Increased availability of plant-based options and products	67	26.3
	Availability of plant-based foods that are more affordable than meat/animal products	20	7.8
	More information on ingredients, nutrients, and clear labels on menus	18	7.1

Variable	Item categories	n	%
	Increased availability of nutritious meals	18	7.1
	Recipes and cooking videos/lessons	13	5.1
	Cooking equipment and stations	6	2.4
	Increased availability of culturally diverse food options	6	2.4
	Foods that look appetizing	5	2.0
	Foods with adequate protein	4	1.6
	Increased availability of fast food and comfort food	3	1.2
	Improved taste in foods	3	1.2
	Salad bars/smoothies	3	1.2
	Credit card payment option	1	0.4
	Foods that are more filling	1	0.4
	Improved quality of food	1	0.4
	Less plastic packaging	1	0.4

¹n<367 due to missing data

3-4. Online Food Hub

3-4-1. Engagement with food-related resources/services

When the participants were asked which types of food-related resources/services they accessed the most, more than one-half reported that they use recipes (n=136, 53.5%) and around one-third reported that they use cooking videos (n=85, 33.5%).

Within the past six months, 23.7% of participants accessed resources on healthy eating on a budget (n=71). Tools to help budget/manage money (n=68, 22.7%) and financial resources on campus, such as Enrolment Service Advisors, grants, and scholarships, (n=53, 17.7%) were accessed by several participants within the past six months. Notably, 51.2% of the

participants did not access any food-related resources/services within the past six months (n=153). When the 153 participants were asked their reasoning behind why they did not utilize resources/services recently, 58.8% reported that they did not need them (n=90) while 29.4% stated that they were not aware of any of the resources/services (n=45).

Over one-half of the participants reported that their curiosity and interest in an online resource/service is piqued when there are financial incentives, such as gift cards and discounts, available (n=190, 57.8%) as well as when there are answers to questions people may have (n=178, 54.1%). Details of all the reported information regarding the participants' engagement with food-related resources/services can be found in Table 3-11.

Table 3-11 - Engagement with food-related resources/services

Variable	Item categories	n	%
Food-related resources/services accessed most often¹	Recipes	136	53.5
	Cooking videos	85	33.5
	Articles/blogs	22	8.7
	Content created by professionals (i.e. professors, doctors, dietitians, etc.)	19	7.5
	Restaurant/food reviews	19	7.5
	Food art	10	3.9
	Content created by other students	6	2.4
	Food-related podcasts	4	1.6
	Food-related newsletters	2	0.8
	Social media (e.g. Instagram, Facebook)	1	0.4
	TV shows	1	0.4
	Nutrition tips and cooking advice from family/friends	1	0.4
Food-related	Resources on healthy eating on a	71	23.7

Variable	Item categories	n	%
resources/services accessed within the past six months¹	budget		
	Tools to help budget/manage money	68	22.7
	Financial resources on campus (e.g. Enrolment Service Advisors, grants, scholarships)	53	17.7
	Food Asset Map (e.g. of cultural and community food groups, places to grow food, facilities)	25	8.4
	Emergency food resources/support (e.g. food banks)	12	4.0
	Emergency financial resources	8	2.7
	Have not accessed resources/services	153	51.2
Reasons for not accessing food-related resources/services¹	Did not need them	90	58.8
	Was not aware of them	45	29.4
	Too much work/no time	15	9.8
	No proper information/help available and given	3	2.0
Factors that increase curiosity and interest in online food-related resources/services¹	Financial incentives (e.g. gift cards, discounts)	190	57.8
	An answer to a question people may have	178	54.1
	Appealing thumbnail/attractive visuals	150	45.6

Variable	Item categories	n	%
	Involvement opportunities	136	41.3
	Interesting title	130	39.5
	Entertainment value	128	38.9
	Informative and easy to read	5	1.5
	Easy access	4	1.2
	Guidance on budgeting food	1	0.3
	Information on building positive relationship with food/food security	1	0.3
	Information on food resources available on/off campus	1	0.3

¹n<367 due to missing data

3-4-2. Engagement with UBC-specific food resources/services

In terms of the participants' previous engagement with UBC-specific food resources/services, the UBC Food Services Nutrition Page (n=11, 19.6%) and the UBC Food Asset Map (n=8, 14.3%) were identified as the resources that were accessed by the greatest number of survey takers. Lack of awareness and information on where to find the resources/services was identified as the greatest challenge with accessing UBC-specific food resources/services by participants (n=75, 51.4%). Details on all information regarding the participants' engagement with UBC-specific food-related resources/services can be found in Table 3-12.

Table 3-12 - Engagement with UBC-specific food-related resources/services

Variable	Item categories	n	%
Previously accessed UBC-specific food-related resources/services¹	UBC Food Services Nutrition Page	11	19.6
	UBC Food Asset Map	8	14.3
	Residence menus and nutrition information	6	10.7

Variable	Item categories	n	%
	Nutrislice	3	5.4
	Student Services Nutrition Page	3	5.4
	UBC 'Places to Eat' Page	3	5.4
	UBC Thunderbirds Nutrition Website	3	5.4
	UBC Food Services 'Feed Me!' Page	2	3.6
	UBC Food Services Instagram Page	2	3.6
	Dietetics students' nutrition sessions	1	1.8
	Faculty of Land and Food Systems newsletters/events	1	1.8
	Farmers' markets/gardens	1	1.8
	AMS Food Bank	1	1.8
	UBC Dietetics Facebook Page	1	1.8
	UBC Food Services 'Contact the Dietitian'	1	1.8
	UBC Halal Food Guide by UBC Muslim Students Association (MSA)	1	1.8
	UBC Life Blog	1	1.8
	UBC Wellness Centre	1	1.8
Challenges with accessing UBC-specific food resources/services¹	Lack of awareness/information on where to find resources/services	75	51.4
	Lack of centralized location for all resources/services available	17	11.6
	Not short and easy to read	15	10.3

Variable	Item categories	n	%
	Lack of appealing advertisement	15	10.3
	Unhelpful information	7	4.8
	No time to access resources/services	6	4.1
	Outdated (e.g. UBC Food Asset Map)	4	2.7
	No prices/menu available	1	0.7

¹n<367 due to missing data

3-4-3. Demands for the Online Food Hub

When participants were asked about the types of content they would like to see most on the Online Food Hub, 95.4% reported that they wanted content regarding nutrition and health (n=206). Moreover, 83.3% identified that they would like to see content on food skills (n=180), while 72.2% identified that they would like information on where to buy cheap food (n=156). Details of the participants' demands for the Online Food Hub can be found in Table 3-13.

Table 3-13 - Demands for the Online Food Hub

Variable	Item categories	n	%
Types of content wanted on the Online Food Hub¹	Nutrition and health	206	95.4
	Food skills	180	83.3
	Where to buy cheap food	156	72.2
	Resources on healthy eating on a budget	112	51.9
	Opportunities to get involved	108	50.0
	Tools to help budget/manage money	73	33.8
	UBC Food Asset Map (e.g. of cultural and community food groups, places to grow food,	62	28.7

Variable	Item categories	n	%
	facilities)		
	Financial resources on campus (e.g. Enrolment Service Advisors, grants, scholarships, etc.)	30	13.9
	Emergency food	14	6.5
	Ethical food information	1	0.5
	Student recipe submissions	1	0.5
	Would not use Online Food Hub	6	2.8

¹n<367 due to missing data

4. Discussion

4-1. Participant characteristics

There is a significant female bias in the participant sample due to convenience sampling used for participant recruitment. While 82% of our sample was female and 15% was male, 56% of all undergraduates at UBC identify as female while 44% identify as male (24). However, it is not uncommon for surveys to have a female response bias, and it is unclear whether this may affect the applicability of the survey results to the broader UBC population (25). It may be interesting to consider the gendered role that women have regarding meal-preparation and food in many traditional household settings. Due to the overrepresentation of females in the survey, the levels of skill and knowledge reported by participants may be an overestimation and not generalisable to the greater UBC student population. It is also possible that there is an underrepresentation of people with lower levels of nutritional information and food skills in this survey, as it is likely that people who are interested in food intrinsically had more incentive to take the survey.

Due to convenience sampling, graduate students (and faculty/staff who participated in negligible numbers) were underrepresented in the participant pool. 90% of the survey sample was undergraduate, while 81% of the Vancouver campus students (excluding exchange students) are undergraduate while 19% are graduate students (compared to 6.5% in the survey sample).

There is a significant Faculty of Land and Food Systems (LFS) bias in the participant sample. While 44% of our sample was in LFS, a small percentage of all undergraduates at UBC are in LFS (4% of the 2019 AMS Academic Experience Survey participants were in LFS (26). This bias might affect how aware of food practices students are and how willing students are to try plant-based foods, presumably due to the fact that their education is focused on food systems.

This survey is representative of the overall UBC Vancouver domestic and international student percentages. 78% of the survey participants were domestic (compared to the 76% registered domestic students at UBC Vancouver) and 20% of survey participants were international (compared to the 24% registered domestic students at UBC Vancouver).

4-2. Food skills and literacy

A large proportion of participants report that they get information on healthy eating from academic and professional sources. It is probable that social desirability bias affected the results of the survey, particularly around where participants access their information on healthy eating. It seems unlikely that participants consult scientific literature and journals (although 40% of participants report that they do) and medical professionals (although 31% of participants report that they do). It may be considered undesirable or embarrassing for

participants to report where they actually get their information from if they perceive the source to be less reputable (e.g., youtube).

A large proportion of participants expressed the desire to develop skills for making meals without recipes and making ingredient substitutions in recipes. Interestingly, it seems that participants are interested in learning how to cook different types of foods and ingredients, irrespective and unrelated to how the foods combine to make up a larger recipe, which is not typically how food skills are promoted online, on social media, and through UBC food resources.

4-3. Dietary habits

Most participants report cooking their own meals and most frequently preparing breakfast, lunch, and dinner. This would indicate that participants most often have someone else prepare snacks or they buy take-out food for snacks, or do not snack at all. However, participants report that the most frequent take-out meals they buy are dinner and lunch, followed by snacks.

A vast majority of participants seem to avoid bringing self-prepared meals to campus, as participants report eating and buying few meals on campus each week. This seems to be primarily due to a lack of time and inconvenience (a lack of facilities for meal preparation on campus) as well as too much effort to plan and transport.

A shocking result of the survey is how low participants' budgets are for weekly grocery shopping and eating out. Between 37%-45% of UBC students have been reported to experience food insecurity and it is clear that students are pressured to buy cheap food which may result in students consuming large amounts of low-quality food (27). This was also a trend found in a previous study done on student nutrition on the UBC campus (19). Many students also report that affordable food is a big concern, and are interested in resources about how to prepare nutritious food on a budget. Yet, a surprisingly small number of students reports assessing food-insecurity resources on campus, such as the food bank.

Most participants report consuming animal products on a daily basis, but a significant (and potentially growing) portion of participants say that they are plant-based. Moreover, many participants report that they have considered going plant-based or that they want to consider it but that they encountered difficulties. This population would be a key target group when designing interventions and programs to support students in eating more plant-based foods. This could be done by specifically targeting barriers that students identified as preventing them from switching to a plant-based diet, especially fears about nutrient deficiencies, a lack of food options and variety (luckily participants report liking plant-based milk and meat alternatives), and expensive food. The number one thing participants identified as being needed on campus regarding plant-based food was cheaper food.

4-4. Online Food Hub

When asked about the Online Food Hub, participants reported wanting health and nutrition information content and food skills the most, followed closely by wanting resources for healthy eating on a budget and tips of where to buy cheap food. Many participants reported having recently accessed UBC informational resources to help them eat healthy on a budget and budgeting tools, underscoring the importance and stress of money and food expenses in participants' lives.

A vast majority of participants reported that financial incentives would make them curious about an online food hub, highlighting the importance of the food hub including or focusing on helping participants save money on food and increasing access to low-cost food.

When the Online Food Hub is designed, the needs and desires that have been identified in this survey study should be taken into account. The Online Food Hub should include information about health and nutrition (for example, basic information about healthy eating and plant-based foods, information addressing common nutritional myths, dietary fads, and other popular misinformation associated with plant-based foods and meat such as fears of nutrition deficiencies) and focus on cheap and budget-friendly nutritious and culturally-diverse meal ideas and plans (ideally plant-based, with animal-product substitute options). Meal preparation tips and tricks for students looking to bring meals to school or cook fast dinners would be helpful. Finally, the Online Food Hub should include students contributions in its development and content.

4-5. Limitations and strengths

In general, a major limitation of this study is the bias towards undergraduate, domestic student survey respondents in the Faculty of Land and Food Systems (LFS) (44% of participants reported being in LFS). The types of programs offered in LFS are those that generally focus on food systems, health, the environment, and sustainability. Thus, it is likely that the participants of the survey were on average more knowledgeable and passionate about plant-based foods and cooking, and are more willing to switch to a plant-based diet. However, it is less clear what other groups of populations it represents well (such as international, and thus wealthier, student communities, and students in disciplines where sustainability and health is discussed less frequently and not necessarily in an academic context). Another consideration is the self-reported data, which allows for the introduction of biases due to false reporting.

The main strength of this study is that for the population of interest (members of the UBC community that care about nutrition, food quality, and have or would like to develop food skills), the findings of this study are likely very applicable. Additionally, the survey questionnaire was developed in collaboration between UBC stakeholders and UBC students, allowing student experiences and voices to actively shape the research in an on-going way. This made it possible to gather data that was considered most important from a student

perspective, which increases the usefulness of the data for informing future initiatives (such as the Online Food Hub) that target student populations.

5. Conclusion

In conclusion, for survey participant populations experiencing common but serious stresses, most commonly time stress, financial stress (a well-documented problem in Vancouver due to high living costs), learning how to eat healthy on a budget is a priority. Many participants see that a plant-based diet may help them eat healthy, but are worried about it being too expensive, lacking variety, and not nutritious enough. This is perhaps due to both misinformation, but also due to how foods with and without meat are priced on campus. A greater variety of cheap and healthy plant-based foods on campus is desired, as many take-out food locations are extremely limited when it comes to options without animal products, and food locations that do offer meat and milk-substitutes may do it at an increased cost to participants, making it more expensive than the normal meal option. Tools that help students learn where and how to buy cheaper groceries, and cook easy, delicious, and nutritious plant-based meals and snacks are desired on the online food hub. Due to the time pressure and information overload that students face, making an online food hub that is well organized and compiles other existing but perhaps under-utilized resources may be helpful, as fewer students report accessing resources even after identifying a need for resources. For instance, students may find pre-planned grocery shopping lists (with approximate costs for different budgets) and a complimentary meal prep sheet extremely useful but are unaware of existing sheets that show a budget breakdown for different plant based foods, and individual recipes on different UBC blogs and websites. Overall, plant-based food skills, recipes, budgeting tips, nutritional information, and entertaining content is desired by survey participants and will help meet the needs of those under financial and time pressures.

The key findings of the Food Preferences and Online Food Hub Survey indicate that most participants have food concerns about nutrition and budgeting and are generally interested in eating more plant-based foods as long it is relatively inexpensive and healthy.

Participants are interested in improving their food preparation skills and do self-prepare most meals, however, only about half of the participants report eating meals on campus, largely due to a lack of time to prepare meals and a lack of facilities on campus to prepare and heat food. A large majority of participants do buy at least some take-out meals weekly on campus, but their budget for take out is low (under \$50). Participants also report a very low weekly grocery budget. A majority of participants are either already plant-based, would consider switching to a plant-based diet, or would like to switch but have encountered difficulties. The biggest barriers to eating more plant-based foods include fears of nutrient and protein deficiencies, lack of variety of food options, and high costs of eating plant-based foods compared to other foods. Needs for plant-based foods on campus include cheaper options (especially cheaper than meat) and a

greater variety of options. The top picks for desired content on an Online Food Hub were nutrition and health topics, food skills, and where to buy cheap food, which complements the UBC resources participants had accessed in the recent past, which included resources on eating healthy on a budget, budgeting tools, and other financial resources.

Decades of sound nutritional science has made clear that plant-based diets that emphasize healthy plant-based foods are better for human health and protect against a variety of chronic lifestyle diseases. It is also increasingly clear that in reducing the consumption of animal products, especially red meat, can significantly reduce greenhouse gas emissions, helping to mitigate the effects of climate change, and reduce negative environmental impacts due to fresh water use and land-use.

Clearly, the UBC community could benefit from a variety of on-campus food system interventions, discussed in the Recommendations section of the report. In brief, these recommendations include: collaborating with the UBC community to better-utilize existing resources and increase awareness and impact, improving food sovereignty and food justice and reducing food insecurity, improve education surrounding nutrition and plant-based foods, creating an Online Food Hub to centralize and increase accessibility to information, increasing and diversifying plant-based food options on campus, increasing the number of small food preparation facilities on campus, creating clear food labelling and messaging, and increasing the amount of low-cost healthy meal options on campus. Many of these initiatives can be done in collaboration with existing groups and partners on campus and potentially offer co-benefits to the UBC community.

Further contributions from a student perspective

There are many challenges to promoting more plant-based foods on campus and supporting students in switching to plant-based diets. Students are generally time-poor, stressed, and have small budgets for living expenses, and these factors likely influence their ability to invest time, effort, and money into changing their dietary habits. If plant-based foods and diets are to be promoted and supported on campus, it must be done in a way that makes delicious, nutritious, and diverse food affordable, convenient, and accessible to students. Below are some specific thoughts put forward by UBC Plant Forward to help make an Online Food Hub that will be useful for the UBC community.

Recent events, such as the COVID19 pandemic and the economic recession that it has triggered will likely considerably alter UBC students' lives and their relationship with and access to food. More students than before the pandemic are likely to be concerned about financial stress, budgeting concerns, and access to affordable and low-cost foods, and emergency food sources such as food banks.

Lack of time, overload of information

There are a multitude of different documents, reports, blogs, tip sheets, and other forms of information about food, nutrition, wellbeing, and budgeting scattered across various UBC websites and platforms, including the UBC Farm, the UBC Wellness Centre, UBC Sustainability, and many others. In addition, there are many existing resources that aim to directly help students struggling with food insecurity on campus, such as the AMS Food Bank, Sprouts, and Seedlings (closed permanently as of April 10th 2020 due to the Graduate Student Society choosing not to renew their lease. However, students are likely not aware of these resources or feel that they cannot or should not access them. With so much information, and so many resources, organizing it and making it easy for students to find is key. Compiling information into shorter and more accessible formats, categorizing it to make it more relevant to students, centralizing it on an Online Food Hub, and catering to specific needs such as improving food skills and budgeting is key to gaining student interest and support. Students will keep using tools that make their lives easier, so the Online Food Hub should aim to do just that.

Food insecurity

Food insecurity is an issue for a small but significant number of students at UBC, and participants frequently reported throughout the survey that they had low budgets for meals and would be interested in information and support services for eating healthy and nutritious food on a budget. Students may prioritize studies over meal preparation and nutrition, and then feel increasingly stressed and see negative health impacts when they spend money on

food and end up buying cheap, low-quality take-out meals. Even students that do meal prep and buy very little take-out may be eating cheap and low-quality food, as processed and less nutritious groceries are often cheaper than fresh and nutritious plant-based foods. This may exacerbate student experiences with food insecurity as eating and buying nutritious food may become more irregular and sporadic. The Online Food Hub should attempt to give students tools to mitigate food insecurity within the UBC community.

According to the SEEDS report *Literature and Best Practices Review: Measuring Food Insecurity at the University of British Columbia* by Sara Kozicky (Measuring Food Insecurity at the University of British Columbia):

“The prevalence of food insecurity amongst the University student population is currently not measured nationally in Canada. However, although not extensive, some research has been conducted at some Canadian institutions, including a multi-site measure conducted by the non-profit organization Meal Exchange. The prevalence of food insecurity in Canadian Universities from the work of Meal Exchange is approximately 40%, which is four times as high of than in the general Canadian population (approximately 10%)...The University of British Columbia (Point Grey Campus) is situated in Vancouver, where the cost of living is very high. Rental properties are in high demand, with 1% vacancy rate in 2018 and the highest monthly rental cost in Canada for a two bedroom unit, at \$1649 (5.5% increase from 2017). Additionally, the cost of healthy eating has been rising, where in 2015 and 2017, respectively, it cost a single male or female 19-30 years old \$234-302 and \$246-316 per month to eat healthy. The monthly cost for a single student for food and rent alone (not including other expenses like tuition, books, utilities etc) is approximately \$1,125. In British Columbia for the 2018/19 academic year, the maximum weekly combined loan and grant funding for a full-time student without dependents with financial need is \$320 (4 weeks per month \$1,280), which is close to covering the basic expenses of food and rent, however not much else. It is important to note that students are not guaranteed to receive the maximum funding.”(27)

“The 2018 AMS Academic Experience Survey, undergraduate and graduate students were asked if in the past year they were concerned about having sufficient food. **Graduate and undergraduate student groups experienced concern at some frequency throughout the year of 37-42%**, which is similar to food insecurity estimates at institutions across Canada conducted by Meal Exchange...As part of a UBC SEEDS project in 2016, Land and Food Systems undergraduate students were surveyed using the 9-item Household Food Insecurity Access Scale. **From this measure, 45% of participants were deemed food insecure.**” (27)

Cultural considerations

Family traditions, cultural practices, and living situations can greatly impact what types of food and how frequently students consume them. Providing information to combat untrue stereotypes and false claims about plant-based diets. Ensuring there is a wide variety of plant-based food options available for all cuisine types will help students feel that there are culturally appropriate and inclusive options for them, regardless of their ethnicity and family background, and prevent students from feeling limited to a couple options of food on each menu. Additionally, various types of cuisines and cultural foods should be included on the Online Food Hub to suit the needs of the culturally diverse UBC community.

Health concerns

Many participants reported concern over the negative health perceptions they associate with a plant-based diet. This misinformation could be combated with the dual benefits of improving student health and encouraging sustainable behavior. In general, there are few concerns associated with consuming little to no animal products, and eating large amounts of processed animal foods and red meat in place of plant foods is known to be detrimental to human health. The Online Food Hub could specifically work to address this misinformation. The main concerns brought up regarding plant-based diets are addressed below.

1. Protein:

Generally, patients on a plant-based diet are not at risk for protein deficiency. Proteins are made up of amino acids, some of which, called essential amino acids, cannot be synthesized by the body and must be obtained from food, such as many plant-based foods, such as quinoa. Essential amino acids can also be obtained by eating certain combinations of plant-based foods. Examples include brown rice with beans, and hummus with whole wheat pita. Well-balanced, plant-based diet will provide adequate amounts of essential amino acids and prevent protein deficiency. (11)

2. Iron deficiency:

All in all, organizations such as the Academy of Nutrition and Dietetics and the German Nutrition Society do not judge iron as a major risk factor for plant-based dieters. Iron deficiency is not only dependent on iron intake as such but also on complimentary dietary factors influencing its bioavailability. (13)

3. VitB12:

Vitamin B12 is needed for blood formation and cell division. Vitamin B12 deficiency is a serious problem and can lead to macrocytic anemia and irreversible nerve damage. Vitamin B12 is produced by soil bacteria, not plants or animals. Individuals

- who follow a plant-based diet that includes no animal products (that have been supplemented with B12) may be vulnerable to B12 deficiency and need to supplement their diet with vitamin B12 or foods fortified with vitamin B12. (11)
4. Calcium:
Calcium intake can be adequate in a well-balanced, carefully planned, plant-based diet. Some significant sources of calcium include tofu, mustard and turnip greens, bok choy, and kale. (11)
 5. Vitamin D:
Vitamin D deficiency is common in the general population. Plant-based products such as soy milk and cereal grains may be fortified to provide an adequate source of Vitamin D. Supplements are recommended for those who are at risk for low bone mineral density and for those found to be deficient in vitamin D. (11)
 2. Fatty Acids:
Essential fatty acids are fatty acids that humans must ingest for good health because our bodies do not synthesize them. Only two are known: linoleic acid (an omega-6 fatty acid) and alpha-linolenic acid (an omega-3 fatty acid). Consumptions of the plant version of omega-3 fats, alpha-linolenic acid, are low in vegans. This may put vegans at increased risk for stroke (28). Adequate intake of n-3 fats is associated with a reduced incidence of heart disease and stroke. Foods that are good sources of n-3 fats should be emphasized. They include ground flax seeds, flax oil, walnuts, and canola oil. (11)
 3. Soy:
Soybeans and foods made from soybeans are good sources of protein and may help lower levels of low-density lipoprotein in the blood and reduce the risk of hip fractures and some cancers – breast and prostate. Because of concerns over the estrogenic nature of soy products, women with a history of breast cancer should discuss soy foods with their oncologists. Overly processed, soy-based meat substitutes are often high in isolated soy proteins – less healthy than less processed soy products (ie, tofu, tempeh, and soy milk). (11)

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