

The UBC Food System Project: Summary 2010

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SUMMARY REPORT 2010

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- Synthesize the findings of 2010 LFS 450 students;
- Work with UBCFSP partners and collaborators to plan and ideally implement food system related initiatives;
- Conduct meetings with UBCFSP partners to gather input for the next iteration of the UBCFSP
- Draft scenarios for the 2010-2011 year;

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INTRODUCTION:

The University of British Columbia Food System Project (UBCFSP) is a collaborative, community-based action research project initiated jointly in 2001 between the UBC Faculty of Land and Food Systems and the Campus Sustainability Office's Social Ecological Economic Development Studies Program (SEEDS). The Project involves multiple partners and collaborators, including: UBC Food Services (UBCFS), AMS Food and Beverage Department (AMSFBD), UBC Waste Management (UBCWM), Centre for Sustainable Food Systems at UBC Farm, UBC Campus and Community Planning (C&CP), Sauder School of Business classes, UBC Building Operations, Alma Mater Society (AMS), Sprouts, Agora Café, LFS Orchard Garden, LFS Undergraduate Society (AgUS), UBC Campus Sustainability Office (CSO), and the Faculty of Land and Food Systems students and teaching team.

The UBCFSP is part of a faculty of Land and Food Systems (LFS) 450 Land, Food and Community (LFC) III course, a mandatory capstone course required for most 4th year Faculty of Land and Food System students. The project commenced nine years ago and has involved ten generations of LFS 450 students, with 1,550 students (214 LFS 450 groups, four Sauder School of Business groups, and one Global Resource Systems group) to date.

Main Goals of the UBCFSP:

- To conduct a campus wide UBC food system sustainability assessment
- To create a shared vision and a model among project partners of a sustainable food system
- To identify barriers in the transitions towards food system sustainability
- To develop opportunities and recommendations to UBCFSP partners and collaborators
- To implement measures to make transitions towards UBC food system sustainability
- To give students opportunities to apply all learning from their program specialization and the Land, Food and Community (LFC) series in a trans-disciplinary real life project

METHODOLOGY AND PROCEDURES:

METHODOLOGICAL PERSPECTIVE:

Community Based Action Research (CBAR) serves as the methodological perspective in the UBCFSP. CBAR can be defined as an "inquiry or investigation that provides people with the means to take systematic action to resolve specific problems"; it enables "people (a) to investigate systematically their problems and issues, (b) to formulate powerful and sophisticated accounts of their situations, and (c) to devise plans to deal with the problems at hand" (Stringer, 1999). The tasks of CBAR are to capture participants' pluralistic voices and to situate their experiences within larger contexts. The goals of CBAR are to produce knowledge through open discourse; produce action and change, and to give research back to the community in which it originated. The process of CBAR is an iterative one, whereby research is conducted through a "look, think, act" routine, which involves a "constant process of observation, reflection and action" (Stringer, 1999).

The significance of CBAR in the UBCFSP is manifold. The Project and Program Coordinator apply basic principles of CBAR such as consensus building, and inclusiveness when meeting with partners to identify challenges in various areas of operations, and develop corresponding tasks needed to address them in drafting project scenarios. Integral to this process, every effort is made to build consensus among project partners in identifying challenges and next steps of action, as well as collaboratively implementing solutions. Students and members of the teaching team are then able to participate in an already established collaborative process, where they

can work with project partners to assist them in issues that affect them, and ultimately develop tools that will help address challenges identified by participants.

METHODS OF DATA COLLECTION:

Methods of data collection that have been used by LFS 450 students throughout the project's duration have ranged from conducting reviews of literature, secondary sources, interviews and focus groups, to administering questionnaires and engaging in participant observation methods.

Methods of data collection varied amongst groups and scenarios. All groups were given the opportunity to obtain information from invited class speakers, who gave presentations and spent class time discussing and answering questions. Guest speakers throughout the term included representatives from UBC Food Services, AMS Food and Beverage Department, UBC Campus Sustainability Office, UBC Centre for Sustainable Food Systems at UBC Farm, Sprouts, and the Alma Mater Society. All students were required to review a selection of previous related LFS 450 group papers, required course readings (resources selected on an ongoing basis throughout the term and posted on the course website (Vista), and review summaries of project findings from previous years. Other methods of data collection included questionnaires, focus groups, interviews, participant observation, secondary data analysis, and literature reviews. Questionnaires were administered either face-to-face or electronically, with sample sizes ranging from 38 to 167 participants. Interviews and focus groups were held with various UBCFSP partners and collaborators, students, faculty, and staff, as well as a selection of off-campus participants – ranging from food distributors, producers, retailers, chefs, to staff and faculty from campuses across Canada.

PROJECT DESIGN:

In the UBCFSP, LFS 450 students are assigned in groups between 6-8 people depending upon size of the class and are primarily responsible for designing, conducting research and planning initiatives. The LFS 450 teaching team primarily acts as resource persons, and as facilitators to help groups with their work. The Project Coordinator works with the SEEDS Program Coordinator, principal investigator and co-investigators in planning the entire project based upon previous work, and meetings she held with stakeholders. Coordinators are also responsible for project follow up activities namely meeting with all project partners to share student report findings and discuss and assist with the implementation of recommendations. Other UBCFSP partners are involved namely as acting as resource persons, reviewing and giving input on student work and in implementing proposed findings and action plans.

SUMMARY REPORT OBJECTIVE:

The purpose of this paper is to provide a summary of the 2010 iteration of the project. Specifically, this paper consists of an overview of central group tasks, findings and recommendations, as well as some central outcomes that emerged from group work and meetings with stakeholders.

OVERVIEW OF 2010:

2010 marked the 9th year and 10th iteration of the UBCFSP. The class consisted of 150 students who were divided into 24 groups to work on one of 8 scenarios (listed below in Table 1). The Project Coordinators worked closely with project partners and other food system actors to develop a series of scenarios that met the needs of staff working in our food system, fulfilled the learning objectives of the class and were manageable workloads for students in a three credit course. Each scenario contained a background and problem statement, a set of recommended tasks needed to address the problem, recommended resources and people to help groups begin their work.

Table 1: 2010 List of Scenarios	
Scenario	Title
1.	Campus Greenscaping- Designing the First Rooftop Garden at the University of British Columbia-Vancouver
2.	Conducting a Sustainability Assessment of the UBC Food Services' Meat and Meat Alternative Food Products
3.	Creating a "Meet your Farmer Event" at UBC Food Services' Place Vanier Residence Cafeteria
4.	Creating Sustainable Food Procurement Guidelines with UBC's Main Food Providers- AMS Food and Beverage Department and UBC Food Services
5.	Exploring ways to Lighten the AMS Food and Beverage Department's Ecological Footprint
6.	The LFS Cropedia- Creating an UBC Urban Agricultural Educational Resource
7.	Identifying a Direction of Food Systems Education Outreach at Sprouts
8.	Developing and Interactive Web-Based Resource of UBC-Vancouver Sustainable Food System Initiatives

Based upon groups' assigned scenario, student groups were required to produce a 30 page report and a 15 minute PowerPoint presentation sharing their findings. All groups were asked to complete the following tasks:

- 1) Provide reflections on the project Vision Statement which outlines collectively agreed upon principles that should guide our transition towards a sustainable UBC food system;
- 2) Provide reflections and expand if necessary on the problem statement assigned to them;
- 3) Develop new and/or refine proposed research designs, campaigns, and action plans from previous years;
- 4) Engage in data collection and develop action plans for implementation in 2010 and 2011, and
- 5) Provide recommendations for the next steps to appropriate project partners and collaborators, as well as other relevant food system actors.

2010 CENTRAL OBJECTIVES, FINDINGS AND RECOMMENDATIONS

In the following section, specific scenario objectives are identified, and key findings and recommendations are summarized from 24 group reports. For more information on specific findings please see the original student papers that can be found on the UBC Campus Sustainability Office's online SEEDS Library: <http://www.sustain.ubc.ca/seeds-library>.

SCENARIO 1:

CAMPUS GREENSCAPING- DESIGNING THE FIRST ROOFTOP GARDEN AT THE UNIVERSITY OF BRITISH COLUMBIA (UBC)- VANCOUVER

Community Partner: UBC Alma Mater Society (AMS) New Student Union Building (SUB) Committee

LFS 450 Groups: Groups 8, 19

BACKGROUND:

The Alma Mater Society (AMS) is the UBC student government and is in charge of guiding the design and management of the new Student Union Building (SUB). They have been tasked with the goal of guiding the creation of a SUB that will be an icon of sustainable design and responsible operation that will inspire future projects on UBC campuses and around the world. The AMS has opened the challenge to the UBC student community to provide innovative and creative solutions that will improve the performance of the building.

SPECIFIC OBJECTIVES:

AMS representatives requested the LFS 450 groups to inform the development of a rooftop garden on the New SUB where a total of 22,000 square feet of roof space is designated as green space. Groups were asked to write a business proposal for the garden.

CENTRAL FINDINGS:

The following is a summary of the students' research to be drawn on in the development of the AMS Rooftop Garden.

Examples of Urban Agriculture:

- Will Allen's Growing Power garden is a showcase garden for efficiency. Southlands Farm in Vancouver uses a production method perma-culture herb spiral that maximizes space (Allen, 2008) [Group 19, 2010].
- McGill University has an 'Edible Garden' Rooftop Garden that has contributed significantly to the local community as well as urban ecology (The Rooftop Garden Project, 2006) [Group 8, 2010].
- On the UBC campus, the UBC Farm and the LFS Orchard Garden are other successful models for urban agriculture [Group 8, 2010].

SPECIFIC FINDINGS:

The purpose of AMS rooftop garden is to grow fresh, organic and seasonally appropriate fruits and vegetables for the UBC community [Group 8, 2010].

Benefits of Rooftop Gardens:

The following is a list of the benefits of rooftop gardens as described in Group 8 and 19's "Business Proposal for a New SUB Rooftop Garden" [Groups 8 & 19, 2010].

- Rooftop gardens can reduce storm water runoff (BCIT, 2005)
- Rooftop gardens can increase insulation thus helping to decrease the need to heat and cool a building. In the long term this can save money and reduce GHG emissions (BCIT, 2005)
- Gardens have the ability to increase the amount of water in the air through evaporation and transpiration. This can help decrease the typical 3-5 C increase that many cities experience compared to surrounding areas (BCIT, 2005)

- Gardens enhance biodiversity by providing habitat for animals and insects (BCIT, 2005)
- The BCIT Green Roof (2005) report states that green roofs can double the life of rooftop water membranes compared to conventional rooftops.
- A study at the University of McGill found that the transportation of raw and processed foods accounts for 1.4 quadrillion BTU/year of energy, this translates to about 14% of the total energy that is used in food production (Ayalon, 2006). Urban gardening can help reduce these transportation miles [Group 8, 2010].

PROJECT OUTCOME

Groups 8 and 19 prepared a jointly developed business plan proposal. The plan was designed with input from the main stakeholders' including the AMS Food and Beverage Department, the AMS New SUB Committee, Sprouts, the UBC Farm, students, and faculty. The plan also considers the effects of the garden on the surrounding community [Group 19, 2010].

The business plan proposal is put forward as a platform for discussion about the future garden.

Business Proposal:

The guiding principles of the garden design are as follows [Group 8 & 19, 2010]:

1. To create a financially sustainable rooftop garden;
2. To provide students, faculty, and community members a place to relax, study, enjoy, and eat;
3. To provide a space that promotes sustainability and general health and wellness;
4. To provide a space that allows for educational opportunities;
5. To provide food that is ethnically diverse, affordable, safe, and nutritious;
6. To provide food that not only nourishes but also enhances the community; and
7. To raise awareness on consuming responsibly.

Assumptions:

- Stakeholders expressed that it is very important that the rooftop garden be 'green' and a functional model for sustainability [Group 19, 2010].
- The garden will be run by organic agricultural practices to meet organic industry standards even if it does not undergo the organic certification process.

Garden Layout:

- The proposed garden will feature: indoor and outdoor student lounge areas, small food outlet, community kitchen, greenhouse, water reservoir system, composting system, garden research area, indoor and outdoor green walls, 2 beehives, and crop areas [Groups 8 & 19, 2010].
- The proposed 4000 square foot tiered outdoor lounge area includes a community kitchen, food outlet, restrooms, elevator, and indoor lounge space with an aesthetic functional greenwall air filtration system. The remaining 6500 square feet of rooftop is designated for crop production and is closed the public. This space includes a greenhouse, water reservoir system, composting system, research area, and 2 beehives [Groups 8 & 19, 2010].
- Stakeholder consultations revealed a strong interest in having art incorporated into the garden, which can be done through greenwalls, sculpture and more [Group 19, 2010].

Recommended Growing Methods:

- The groups explored several types of rooftop gardens and recommend container gardening which allows for portability, ease of maintenance, catering soil to different crop conditions and easy vertical gardening. Wood, plastic or metal containers last best through winter [Groups 8 & 19, 2010].
- Mobile Polytunnels can be used during harsh weather to protect crops and maintain an optimal climate. They can be removed during good weather and can be transport from plot to plot [Groups 8 & 19, 2010].
- Drip Irrigation can save water, allow for optimal control over the water distribution and delivery of fertilizer solution. Drip irrigation system can be installed with container gardening. Moisture levels should be monitored for each container as hot weather and the smaller soil volume can cause the soil to dry-out. Daily watering is likely necessary. A mulch cover like straw, wood

chips or a sub-soil layer of newspapers and compost can help slow evaporation and shade soil [Groups 8 & 19, 2010].

- Vermicomposting, using worms to digest organic waste, can be done small scale in a rooftop garden setting. It works at moderate temperatures, has a quick through-put time and uniquely allows for the maintenance of an optimal bacterial balance, ideal crop growth and disease minimization (Santa Cruz County, n.d.) [Groups 8 & 19, 2010].
- Treated greywater can be used for irrigation in the garden to help reduce strain on the sewage system. This system installed and allow for good filtration to reduce undesirable health and environmental effects from contaminated water (Lindstrom, 2000) [Groups 8 & 19, 2010].

Crop Selection:

- In choosing the crops, ecological, economic and social sustainability were considered by looking at what is already being produced on campus and what crops have the highest demand. Visitor's enjoyment was considered as well [Group 8, 2010].
- Nancy Toogood, the AMS Food and Beverage Manager, (personal communication, 2010) suggested growing unique crops like multi-coloured carrots, golden and candy-cane beets, daikon radish, chayote, heirloom tomatoes, mushrooms and unique varieties of potatoes like purple potatoes [Groups 8 & 19, 2010].
- The following crop list was developed by comparing crops that are currently purchased by the AMS and requested by stakeholders with those currently grown successfully at the UBC Farm to ensure that they are ideal for our climate, produce high revenues on campus, are in high demand by AMS outlets, and fill prospective niche markets [Group 8, 2010].
 - Top crops recommended: basil, Italian parsley, sage, mint, thyme, cilantro, cherry tomatoes, heirloom tomatoes, patty pan squash, baby carrots, multicolored carrots, daikon, chayote, broccoli, lettuce (romaine and salad mixed greens), nugget potatoes, russet potatoes, purple potatoes, leeks, asparagus, artichokes, red pepper, green onion, cauliflower, green pepper, zucchini, eggplant, green cabbage, jalapeño, onions, cucumber, spinach, garlic, yams, raspberries, blueberries, fennel, strawberries, teas, kale, chard, honey and ornamentals.
 - Other crops could include: red onion, red cabbage, bok choy, celery, beets, rosemary, oregano, savory, radish, pumpkin, peas, and beans (green, pole, bush).
- Using vertical gardening makes vine crops like cucumbers, watermelons and pumpkins a possibility and can be used for heirloom tomatoes and peas [Groups 8 & 19, 2010].
- Pollination is a key component of successful crop production. Bee hives can provide this service and can yield honey which can be a valuable addition to production. This also benefits bee populations which have been declining (World Focus, 2009) [Groups 8 & 19, 2010]. Beekeeping is low maintenance requiring a beehive, veils, a smoker, a hive tool and a trained professional (Gruszka, 1998). The hives should be facing south in an area which is dry, sheltered from strong winds, and has a small amount of shade. Allen Garr, the UBC Farm bee keeper, (personal communication, 2010) has expressed interest in caring for the bees in UBC SUB rooftop garden [Group 8, 2010].
- When planting, "companion" plants should be planted together. These plants have symbiotic relationships and allelopathies with weeds. For example, asparagus plants are known to produce a chemical which kills nematodes which attack tomato plant roots while tomato plants protect asparagus from the asparagus beetle. Additionally, asparagus requires high sodium in soil which is not a problem for tomatoes (Odum, 2007) [Group 8, 2010].
- Antagonistic plant combinations should be avoided. For example, tomatoes with Brassicas (broccoli, cauliflower, kale, etc.), corn, apricots or potatoes will have growth problems (Odum, 2007) [Group 8, 2010].
- During the winter, cover crops can help maintain soil health by preserving and adding back nutrients and organic matter and they can suppress weed growth (Frick and Johnson, 2006) [Group 8, 2010].
- Debra Hanberg, a research assistant at the UBC hospital, (personal communication, 2010) expressed interest in having a medicinal plant bed in the garden [Group 8, 2010].

Management Plan:

- It is estimated that the management team will require 1 part-time experienced gardener plus volunteers (Gambrill, personal communication, 2010). Depending on the types of crops, size of crop space, growing method, number of volunteers and the volunteer's level of skill, and time of the year, this requirement may vary. When garden plans are solidified, it is recommended that the management requirements be re-looked at in consultation with the UBC Farm and other similar projects [Group 19, 2010]. The AMSFBD Manager, Nancy Toogood, (personal communication) plans on opening a position for a staff person to maintain the rooftop garden [Group 8 & 19, 2010].
- The AMS FBD and Sprouts plan to partner in the management of the rooftop garden with the AMS FBD having a larger role in the summer and Sprouts having a larger role in the winter [Groups 8 & 19, 2010]. Sprouts plans to designate a volunteer coordinator (Doward and Toogood, personal communication, 2010). These will be semester or year long positions that will be trusted to individuals who will ensure the safety of the crops [Group 19, 2010].
- The general student population should not have access to the crop producing portion of the garden (Mc Neil, personal communication, 2010) [Group 19, 2010].
- Workshops offered in the garden and use of the community kitchen will be scheduled through AMS room bookings and the garden manager [Group 19, 2010].

Distribution Plan:

- The primary destinations for crops are the AMS Food and Beverage Department's food outlets located within the new SUB [Groups 8 & 19, 2010].
- Other potential points of sale could include an AMS run 'Rooftop Garden Kiosk,' which would be located in the new SUB. This location could help with marketing and promotions for the garden, Sprouts programs, Community Eats and student cooking programs [Group 8, 2010].
- Most food production will occur in the summer and can be stored, preserved, or sold at a later date [Groups 8 & 19, 2010].

Educational Opportunities:

- Contacted professors and the SEEDS initiative have interest in integrating the new SUB rooftop garden into their research, directed studies, and case studies for particular courses. Some potential academic connection include [Group 8, 2010]:
 - Dr. Roehr (personal communication, 2010), a professor in the Faculty of Landscape Architecture.
 - Dr. Riseman, a professor in the Faculty of Land and Food Systems, is interested in overseeing directed studies projects in the garden.
 - Allen Garr (personal communication, 2010), an experienced urban bee keeper, would like to hold bee keeping seminars for students.
 - The coordinator for the Urban Aboriginal Community Kitchen Garden Project, Sandra Bodenhamer (personal communication, 2010), sees potential for expansion from the UBC Farm to the new rooftop garden.
 - John Terezaki (personal communication, 2010), the District Main building and garden manager, would like to give seminars for students about how to grow their own food, compost organic waste, and keep a healthy garden.
 - Dr. Vercammen (personal communication, 2010), a professor in both the Faculty of Land and Food Systems and Commerce, is interested in introducing real life situations from the garden as case studies in his classes.
 - Debra Hanberg (personal communication, 2010), would like to connect her studies in medicinal plants at UBC Hospital with the new SUB rooftop garden.
- For management of academic involvement at the garden, the SUB Renewal plan calls for a Professional Advisory Component (PAC) (AMS, 2010). It is proposed that professors and groups who have already expressed interest in studying the roof-top be involved [Group 19, 2010].
- It is proposed that SEEDS could work with Dr. Vercammen and Debra Hanberg in further development of their projects.

Funding and Budget:

- Capitol costs will be covered by the New SUB construction budget (Rooftop Garden meeting, personal communication, 2010).
- A firm budget can not be determined before specific design components are chosen. Please refer to the Garden Business Plan for additional information on estimating costs associated with rooftop garden installations.
- One possibility is that AMSFBD will be able to regain the cost of production through food sales in the AMS outlets and to Sprouts. The feasibility of this will have to be further explored [Group 19, 2010].

Opportunities:

- Friends of the Farm and UBC Veggies Club are interested in having a strong presence in the AMS Rooftop garden [Group 19, 2010].

KEY RECOMMENDATIONS

To The AMS New SUB Committee:

- Consider the recommendations for the rooftop garden put forward in the 'Business Proposal for the New SUB Rooftop Garden' [Group 8 and 19, 2010].
- Hire a part-time garden manager [Group 19, 2010].

To Sprouts:

- To ensure that Sprouts participates in the planning process, it is recommended they request to join the Sustainability Advisory Committee (SAC) who is "responsible for developing and administering overall sustainability objectives for the new SUB which will be derived from user input, functional requirements, and a generic strategic planning process (AMS, 2010)." This can be done by contacting the New SUB Coordinator. The new Sprouts rooftop liaison would be required to attend regular meetings [Groups 8 & 19, 2010].

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SCENARIO 2:

CONDUCTING A SUSTAINABILITY ASSESSMENT OF UBC FOOD SERVICES' MEAT AND MEAT ALTERNATIVE FOOD PRODUCTS

Community Partner: UBC Food Services (UBCFSP)

LFS 450 Groups: Groups 5, 6, 9, 17

BACKGROUND:

UBC Food Services has implemented many food related sustainability initiative over the years. Recent consultations with UBC Food Service representatives have revealed an interest in better understanding the sustainability issues surrounding protein choices offered in UBCFS student residence cafeterias.

SPECIFIC OBJECTIVES:

LFS 450 students were asked to do Life Cycle Assessments with a climate focus on a selection of raw or processed protein ingredients used by UBCFS including: beef, chicken, pork and vegetarian protein sources. The students were asked to recommend a product or series of products from each category that are the most sustainable option assuming that the given meat or vegetarian product will not be eliminated from the menu.

CENTRAL FINDINGS:

UBCFSP Vision Statement for a Sustainable UBC Food System

Each group was asked to reflect on the UBCFSP Vision Statement for a Sustainable UBC Food System. Group 5 has recommended adding the following principle: All animals participating in the food system are handled with humane animal practices [Group 5, 2010].

Literature Review

All groups performed a literature review. The following are their findings regarding meat and the food system:

Meat Consumptions and Green House Gas Emissions

- Methane (CH₄), carbon dioxide (CO₂) and nitrous oxide (N₂O) are three major greenhouses gases (GHGs) in the Earth's atmosphere that help maintain the Earth's temperature. Human activity has increased the levels of these gasses in the atmosphere leading to considerable changes in climate and warming of the Earth (Sutton, 2002). Some consequences of global warming that have been proposed include the rising of the sea levels, melting of glaciers, possible reduction in global food production, and higher flood risks due to extreme precipitation (LiveSmart BC, 2007a) [Group 5, 2010].
- In Canada, the agriculture sector is the 3rd major source of GHG emissions, behind the transport and electricity sectors. The livestock industry generates 42% of the total agricultural

GHG emissions in Canada (Langue, 2003). This is approximately 0.13% of the global GHG emissions from human activities (Langue, 2003) [Group 5, 2010].

- Pimentel & Pimentel (1996) state and Garnett (2008) confirms that an estimated 20-30% of global GHG emissions can be attributed to the food system [Group 6, 2010].
- The high emissions associated with animal agriculture result from: deforestation, feed production, processing and transport of livestock feed and meat, and gas production from animal manure and enteric fermentation (Steinfeld et al., 2006) [Group 6, 2010].
- According to Eshel & Martin (2006) person who consumes a 30% animal based diet compared to a person who consumes a 100% plant based diet will have a 1.5 metric tonne increase of CO₂ production per year while Collins and Fairchild (2007) report that an individual's diet is responsible for 25% of their overall emissions [Group 6, 2010].

Other Environmental Impacts of Meat Based Diets

- Per-capita consumption of meat in the industrialized world is 80 kg per year (Halweil, 2008) yielding significant negative impacts on environmental health (Zhu & van Ierland, 2004) due to increased reliance on industrial farming and the use of concentrated animal feeding operations (Halweil, 2008) [Group 5, 2010].
- It is common for animals to be raised in crowded pens with little access to sunlight or pasture. Antibiotics are incorporated into animal feed to prevent the spread of diseases between animals which can result in an increase in antibiotic resistant bacteria (Salvi & Hatz, 2004) [Group 5, 2010].
- The manure generated from factory farms pollutes rivers and streams with negative impacts on environmental and human health (Salvi & Hatz, 2004) [Group 5, 2010].
- The production of 1 gram of animal protein takes about 10 times more fossil fuel than the production of 1 gram of plant based protein (Pimentel et al. 2004). This is because about 90% of an organism's energy is used for respiration and digestion and is not transferable in the food chain (Arcytech, 2000). It is estimated by Koneswaran and Nierenberg (2008) that 80% of the world's soybean crop is used for livestock feed [Group 6, 2010].

Place Vanier & Totem Park

Students reviewed what is happening at the UBC Food Service's student residence dining halls Place Vanier and Totem Park. The following is a list of their results:

- 1900 students are served food daily [Group 6, 2010].
- Meals are provided 3 times a day, 7 days a week for eat-in or take-out and include [Group 6, 2010]:
 - Breakfast: baked goods, hot & cold cereal, traditional breakfast and beverages
 - Lunch & Dinner: hot entrees, vegetarian options, daily specials, full salad bar, homemade soups, pasta bar, made to order salads and sandwiches, grilled items, Chinese food and oven baked pizza [Group 6, 2010].

Sustainability Initiatives

- Local foods are used when they are affordable and meet quality standards [Group 6, 2010].
- Bulk orders are made to decrease numbers of deliveries and waste [Group 6, 2010].
- Purchases from UBC Farm have been steadily increasing (S. Golob, personal communication, 2010) [Group 6, 2010].
- At Place Vanier, an EatBC menu is featured that includes at least 50% of ingredients from BC [Group 6, 2010].
- Vancouver Aquarium's Ocean Wise fish recommendations are used [Group 6, 2010].
- The cafeteria offers ceramic plates and metal forks, knives and spoons for dining in. All take-out paper plates and boxes are charged a \$0.10 green-tax and Dixie's reusable containers can be purchased for \$0.50 each [Group 5, 2010].
- Compost, recycling, and garbage bins are located in convenient spots with signage explaining what is compostable. Group 6 noted that food scraps, biodegradable cutlery and recyclable cans were observed in the garbage bins indicating poor disposal practices by students [Group 5, 2010].

- UBCFS started composting and recycling in 2004 as the result of a UBC Waste Management and AGSC 450 student initiative. In UBCFS' Request for Bid Form (RFB), it states "UBC Food Services appreciates the potential for environmentally sound products and reducing solid waste packaging" [Group 5, 2010].

Opportunities

- The customer base is young and progressive leaving greater possibility to creatively influence demand for vegetarian options [Group 6, 2010].
- Executive Chef at Place Vanier, Steve Golob, is committed to improving the sustainability of Place Vanier's food system and reducing the associated GHG emissions [Group 6, 2010].

SPECIFIC FINDINGS:

The following are the results for the Life Cycle Assessments (LCAs) performed for tofu, chicken, pork and beef.

Description of the Life Cycle Assessment

Each group was asked to conduct a Life Cycle Assessment (LCA) on one of chicken, pork, beef or meat alternatives. The following is a description of the LCA methodology derived from the groups' reports.

- A Life Cycle Assessment (LCA) is a method for analyzing the environmental impacts that occur throughout the life cycle of a process, product or service from raw materials to waste (Kim et al., 2008) while detailing the inputs and outputs along the process chain (Zhu & van Ierland, 2004). The impacts on the environment are quantified at each stage of the cycle making identification of high impact components more possible (Kim et al, 2008). The results from the LCA of different food products can be compared allowing consumers to select the food products with less environmental impact (Kim et al., 2008) [Group 5, 2010].
- According to the US Environmental Protection Agency (2006) a LCA has the following 4 stages [Group 9, 2010]:
 - Definition of goal and scope- This section defines of the purpose of the assessment and the system boundaries and details what information will be included in the assessment (Kim et al., 2008). A functional unit of the product must be established to be able to describe the impact results (Kim et al., 2004) [Group 5, 2010].
 - Inventory analysis- In this section the environmental impacts from inputs and outputs are calculated (Zhu & van Ierland, 2004) [Group 5, 2010].
 - Impact assessment- In this section the assessment results are analysed. These can be grouped into categories such as global warming, acidification and eutrophication (Kim et al., 2004). Greenhouse gases such as carbon dioxide, methane and nitrous oxide are expressed as carbon dioxide equivalents to yield one overall indicator of global warming potential (GWP) (Kim et al., 2004) [Group 5, 2010].
 - Interpretation- In this section recommendations aimed at decreasing the impact of the assessed life cycle are put forward (Kim et al., 2008) [Group 5, 2010].

Meat Alternative- Tofu

- Group 6 reports that tofu is a very versatile meat alternative.
- The reported health benefits of consuming soy include: reduced risk of heart disease with daily consumption of 25 g of soy protein; prevention of some types of cancer; reduced effects of osteoporosis; and menopause symptom relief (Schryver & Smith, 2005) [Group 6, 2010].

Current Practices at Place Vanier- Tofu

- The weekly tofu sales are 60-120 kg extra firm and 17-21 kg smoked (S. Golob, personal communication, 2010) [Group 6, 2010].
- Sunrise Soya Foods, Vancouver, BC provides the extra-firm tofu which is made from non-GMO conventional soybeans. The tofu is packaged in recyclable plastic tubs and is shipped in recyclable cardboard boxes. The price is \$22.10 per 4.2 kg case (K. Lee, personal communication, 2010) [Group 6, 2010].

- Dayspring Soycraft, Victoria, BC, provides the smoked tofu which is made from certified organic soybeans. The tofu is packaged in recyclable plastic bags and is shipped in reusable plastic crates. The price is \$52.20 per case (R. Ashton, personal communication, 2010) [Group 6, 2010].
- According to head chef Steve Golob (personal communication, 2010), the plastic bags used for packaging the smoked tofu are not currently recycled [Group 6, 2010].

LCA- Boundary Definition

- Working unit: 1 kilogram (kg) of tofu [Group 6, 2010].
- The LCA focuses on CO₂ equivalent emissions for both organic and conventional production methods. Emission factors are based on secondary source information [Group 6, 2010].

Findings- Soybean Cultivation

- LCA-Boundaries- Soybean agricultural inputs: fertilizers, fuel and pest control chemicals. [Group 6, 2010].
- Per working unit (1kg tofu), 0.36 kg of soybeans is required. When produced conventionally, this contributes 6,416g CO_{2e}, of which 2170 g CO_{2e} is associated with nitrogen production and application of nitrogen fertilizers and 4220 g CO_{2e} due to N₂O emissions. Fuel accounts for only 20.6 g CO_{2e}, though these figures may be lower than actual values due to limited availability of information [Group 6, 2010].
- Insufficient data was available to perform an equivalent LCA for organic soybean production. Pimentel (2006) reports that organic soybean production uses equivalent fuel as conventional production. Group 6 also notes that synthetic nitrogen used in conventional agriculture releases emissions during its production and accelerates loss of soil nitrogen when used as a fertilizer (Huo et al, 2009). It also has been shown to reduce soil microbial populations which are necessary for nutrient cycling (Bulluck, Brosius, Evanylo, & Ristaino, 2002). Organic soybean production does not need to use synthetic nitrogen as soybeans are able to fix their own nitrogen with the help of healthy soil microbial populations (Kuepper, 2003) and as such nitrogen production emissions are eliminated and soil nitrogen emissions are significantly reduced [Group 6, 2010].
- In 2008, the US had over 75 million acres planted with soybeans (USDA ERS, 2009), while Canada had over 2.5 million acres (Statistics Canada, 2009). In 2008, 92% of US soybeans were genetically modified (GM) (Organic and Non-GMO Report, 2009). In 2007, Canada reported that 67.5% of its soybeans were GM (GMO Compass, 2010). In 2005, organic soybeans were planted on 122,000 acres in the US and 20,000 acres in Canada, representing a small portion of total soybean production (Hansen, 2010) [Group 6, 2010].
- Total CO_{2e} emissions for conventional soybean cultivation phase is estimated to be 6,416g CO_{2e} per 1 kg of tofu.

Findings- Transport to Distributor, Tofu Production & Tofu Packaging

- The transportation by train of 1 kg of soybeans from Ontario to Vancouver (4700 km) contributes 0.19 g CO_{2e} according to the Railway Association of Canada's GHG emission calculator [Group 6, 2010].
- Tofu production inputs: water, energy, and soybeans.
- Sunrise Soycraft uses 219.13 kg tofu/GJ natural gas and 2.51 kg tofu/kWh electricity. Dayspring makes 259.9 kg tofu/GJ natural gas and 4.5 kg tofu/kWh electricity. The energy use is more efficient at Dayspring due to significantly larger production volume. This was calculated using primary data including monthly natural gas, electricity and soybean use from Dayspring Tofu in Victoria, B.C. and Sunrise Soycraft in Vancouver, B.C. [Group 6, 2010].
- Tofu production was calculated to produce 284 g CO_{2e} per 1 kg tofu [Group 6, 2010].
- 1 kg of tofu was shown to use 0.36 kg of soybeans and 0.64 kg of water as ingredients. Other uses of water in production were not accounted for [Group 6, 2010].
- Of note, waste water in production is emptied into the municipal sewage system and other left over soy bi-products are used in dairy cow feed [Group 6, 2010].
- Plastic packaging for 1 kg of tofu is estimated to contribute about 0.11 grams CO_{2e}. Land filled plastic carbon is not considered in assessments by the International Panel on Climate Change (IPCC) since it is being returned to the Earth. Also not counted are emissions created from

incinerated plastics when the produced energy is captured as this would offset the use of fossil fuels (Freed et al., 1999) [Group 6, 2010].

- Total CO_{2e} emissions for transportation, production and tofu packaging are estimated to be about 284.11g CO_{2e} per kg of tofu.

Findings- Transportation, UBC Storage & Waste

- Transportation emissions from the factory to UBC are estimated to be only 0.014 g CO_{2e} and emissions for removing plastic waste from UBC to the landfill emit only 0.007 g CO_{2e} [Group 6, 2010].
- Storage of 1 kg of Tofu at UBC contributes an estimated 0.16 g CO_{2e} per week in a walk-in cooler that has an annual energy use of 16,200 kWh (Natural Resources Canada, 2009) and holding capacity for 2000 kg of produce [Group 6, 2010].
- Total CO_{2e} emissions for transportation to UBC and product storage are estimated to be 0.17g CO_{2e} per kg of tofu per week.

Summary of LCA Findings

- Overall, 1 kg of conventional tofu is estimated to account for about 6.7 kg of CO_{2e}. This is substantially lower than the 22 kg CO_{2e} per 1 kg beef reported by Avery and Avery (2008).

Findings- Alternative Sources for Tofu

- Dayspring Soycoft sells organic extra-firm tofu for \$18.69 per 4.2 kg case (R. Ashton, personal communication, 2010). This is less expensive than the non-organic tofu provided to Place Vanier from Sunrise Soya Foods [Group 6, 2010].

Chicken

General Findings:

- The Canadian supply of chicken is under regional supply management to help assure a fair price to farmers. In BC this is managed by the BC Chicken Marketing Board which helps by setting the price of chicken. The system works using quotas which farmers must purchase to be able to supply broiler chickens to the market (BC Chicken Marketing Board, 2009) [Group 9, 2010].

LCA- Definition and Scope of Analysis:

- This analysis compares organic and conventional chicken with a focus on the rearing phase as it is the most distinct component between the two types of chicken. Transportation, slaughtering, processing and distribution were not factored in as they are the same for the two types of chicken [Group 9, 2010].

LCA- Inventory Analysis: Current Procurement Practices at UBC FS

- J&K Poultry is the main supplier of fresh chicken to UBCFS. Place Vanier orders the following amounts each week: 150-300 pieces each of breast (split skin on, bone in), whole fryer, thighs, drumsticks and wings and 140-160 kg of chicken tenders (Lui, 2010) [Group 9, 2010].
- J&K sources all their fresh meat from within B.C. and from about 5 main farms in the B.C.'s Lower Main Land [Group 9, 2010].
- J&K's does not use Styrofoam and offers re-usable plastic totes for some products (personal communication, 2010) [Group 9, 2010].
- Centennial Foodservices also supplies Place Vanier with 32-80 kg of boneless chicken breast per week (Lui, 2010). This fresh chicken is also sourced from B.C.'s Lower Main Land (Centinnal Foodservice, 2007) [Group 9, 2010].

LCA- Impact Assessment of the Rearing Phase:

- Major outputs: nitrogen and phosphorus from feces. 1,000 birds at 4 pounds each will produce 2700 lbs. of dry manure over a 9 week period (Scanes, 2004) [Group 9, 2010].

Conventional Fresh Chicken

- Most conventional broiler chicken production in Canada is vertically integrated where a single company owns two or more stages in the supply chain (Scanes et al., 2004). Most chickens are grown by a contract that is planned by poultry processors and feed manufacturers (Proudfoot & Hamilton, 1991) [Group 9, 2010].

- Birds are raised for 5-6 weeks and all chickens grown in Canada for meat purposes are 'free run' which means they are not confined in cages and are able to move freely in a barn (BC Chicken Marketing Board, 2009) [Group 9, 2010].
- The average Canadian farm has about 29,500 birds at any one time and raises 192,000 a year (Laidlaw, 2003). Each barn houses 10,000 to 30,000 birds with a density of approximately 16-18 birds/m² (Proudfoot & Hamilton, 1991) [Group 9, 2010].
- Feed composition is: 46-66% ground corn/maize, 12-33% solvent-extracted soybeans, 10% ground wheat, 5% fishmeal and ~3% poultry grease (Proudfoot & Hamilton, 1991). Antibiotics for disease-controlling purposes can be added at 100-400g per ton of feed (Scanes, 2004) and general antibiotics can be added to the feed and range from 5-50g per tonne of feed. Hormones use in feed is prohibited in Canada (BC Chicken Marketing Board, 2009).
- At 6 weeks, a male broiler chicken consumes 296mL of water and 183g of feed per day. The feed efficiency ratio (FER) of Canadian a broiler chicken at 6 weeks in 1988 was an average of 1.85kg (Proudfoot & Hamilton, 1991) [Group 9, 2010].

Organic Fresh Chicken

- There are no organic hatcheries in B.C. Conventional chicks supplied to organic farms but are not given any vaccinations or medicines (BC Ministry of Agriculture and Lands, 2007) [Group 9, 2010].
- The production of organic chickens is not typically done under contract. Farmers instead sell to specialty distributors, restaurants and directly to customers (BC Ministry of Agriculture and Lands, 2007) [Group 9, 2010].
- Each organic rearing barn houses about 9,600 birds with an indoor density of 9.6 birds (Boggia et al., 2010) [Group 9, 2010].
- 80% of the feed must be certified organic. The composition of the feed is similar to that of conventional birds (Chicken Farmers of Canada, n.d.) [Group 9, 2010].
- Antibiotic use in animal rearing has a high risk of leading to infectious microorganisms developing resistance to antibiotics (Bokkers & Boer, 2009) which can lead to a pandemic (WHO, 2010). Antibiotic and hormone use are not permitted in organic chicken feed [Group 9, 2010].
- A feed conversion of 2.8 is considered acceptable for organic poultry with a final weight of 3.5 kg (Boggia et al., 2010) [Group 9, 2010].
- All organic chickens are free range. The Certified Organics Association of BC requires that birds access to pesticide-free pasture for a minimum of 6 hours a day, weather permitting with an approximate outdoor bird density of 4 birds/m² (BC Chicken Marketing Board, 2009). Bedding must be certified organic (MOSES, 2007) [Group 9, 2010].
- There are additional guidelines imposed on organic poultry production that is regulated by ECOA Animal Welfare Task force (AWTF, 2009). The practice of de-beaking is not permitted in organic chicken farming (Eco Friendly Planet, 2008) [Group 9, 2010].

LCA-Packaging & Transportation:

- Plastic is the most common packaging material used for chicken. It was found that organic chickens are often sold whole which may reduce packaging (Sams, 2000) [Group 9, 2010].

Animal Welfare Practices:

- All farms are required by provincial and federal legislation to provide farm animals' basic needs. The rearing of chickens is subject to the Health of Animals Act and the Prevention of Cruelty to Animals Act which regulates animal care practices (BC Ministry of Agriculture, Food & Fisheries, 2004) [Group 9, 2010].
- The Recommended Code of Practice for the Care and Handling of Farm Animals– Chicken, Turkeys, and Breeders from Hatchery to Processing Plant (Canadian Agri-Food Council, 2003) has been adopted as the industry standard. These codes guide the provision of feed and water, housing, sanitation and dictate best handling, catching and loading, and transportation of the animals [Group 9, 2010].
- The overcrowding conditions in conventional systems commonly result in cannibalism which has resulted in the practice of de-beaking. In contrast, organic chickens have a much lower bird density, thus lower levels of cannibalism and little need for de-beaking [Group 9, 2010].

- According to Bokkers and Boer (2009), the following are indicators for animal welfare: time spent walking, footpad lesions, and heart abnormalities. Bokkers and Boer (2009) found that the fast growing broilers, typical of the conventional system, spent less time walking than that of organic broilers. The prevalence of footpad lesions is higher in conventional systems due to chemical irritants used as bedding preservatives (Bokkers & Boer, 2009). Mortality rates of fast growing birds due to cardiovascular disorders were higher (Bokkers & Boer, 2009) [Group 9, 2010].
- From an animal welfare perspective, organic chicken rearing systems are far superior to conventional system [Group 9, 2010].

Alternative Chicken Procurement Options:

- Polderside Farms is located in Chilliwack, BC sells organic, humanely raised chicken for \$7.40/kg (Polderside Farms Ltd, n.d.) [Group 9, 2010].
- According to Jerry Dawson (personal communication, 2010), general manager of J&K Poultry, both organic and non-medicated chicken is available at \$9.00/kg and \$5.99/kg respectively. Non-medicated birds are not fed organic feed but do have increased access to the outdoors.

Energy Use and GHG Emission in Conventional vs. Organic Systems:

- According to Boggia et al. (2010)'s stud in Italy, the feed production phase has greater environmental impacts than the animal rearing phase. It was found that the organic system had lesser environmental impact in the areas of climate change and fossil fuel use due to not using synthetic fertilizers and less energy and emission intensive agricultural methods [Group 9, 2010].
- Organic poultry has a higher feed efficiency ratio and a longer growing period resulting in an increase in energy requirement for organic poultry meat production. Many certifiers require high levels of light and may require windows in the house to encourage bird activity. In contrast, the conventional industry usually keeps lights low for broilers to reduce activity (Fanatico, 2008) [Group 9, 2010].
- A study by Bokkers and Boer (2009) conducted in Finland, found that primary energy use for the organic system is 25% higher than the conventional system which yields a 30-59% higher energy use per kg organic meat. Another study done by the British Department of Environment, Food and Rural Affairs (2006) found that for every tonne of poultry meat produced, organic systems used about 15,800MJ of primary energy compared to that of 12,000MJ for conventional (Williams, 2006) [Group 9, 2010].
- Land use is always higher in organic systems, with lower yields and overheads for fertility building and cover crops (Varies and Boer, 2010) [Group 9, 2010].
- Bokkers and Boer (2009) estimate that manure from organic broilers emits 51% more nitrous oxide, a GHG 300 times more powerful than CO₂, than organic systems. This is due to the longer life of organic chickens (11 weeks) compared to conventional chickens (6 weeks). Also, the use of modified amino acids in conventional poultry feed has shown a reduction of nitrogen excretion. A study by Boggia et al. (2010) supports the findings that organic systems produce more nitrous oxide than conventional [Group 9, 2010].

PORK

General Finding:

The following is a list of the general findings surrounding pork production and consumption:

- Pork is consumed in the greatest quantity worldwide (Zhu & van Ierland, 2004). China is currently the largest producer of pigs (Halweil, 2008) [Group 5, 2010].
- The pork production chain has many harmful effects on the environment, especially in the release of GHGs (Zhu & van Ierland, 2004). Intensive pork production results in acidification and eutrophication of soils and increased fertilizer, pesticide, land and water usage (Zhu & van Ierland, 2004) [Group 5, 2010].

LCA- System boundaries

- The functional unit for pork is 53 kg or the yield from an average pig (Zhu & van Ierland, 2004) [Group 5, 2010].

- The LCA focuses on GHG emissions and defines sustainable as "actions that lower GHG emissions and promote animal welfare." [Group 5, 2010].

LCA Findings- Feed Cultivation & Production

- Soybean meal is the main component of pig feed and is the focus of the analysis. Inputs include: land use, fertilizer, water and energy (Dalgaard, Schmidt, Halberg, Christensen, Thrane, & Pengue, 2008, 2008). Outputs include: GHG methane (CH₄), nitrous oxide (N₂O), and carbon dioxide (CO₂) [Group 5, 2010].
- A pig eats approximately 290 kg of soybean meal in its 5 month life (Zhu & van Ierland, 2010). This requires 1305 m² of land to produce 350.90 kg of soybeans (Dalgaard et al., 2008). Fertilizer use contributes the most to the GHG emissions in this stage. To produce this amount of soybeans, 5.97 kg of phosphorus fertilizer emitting 5.90 kg of CO_{2e} and 8.77 kg of potassium fertilizer 6.87 kg of CO_{2e} are required (The Pennsylvania State University, 2010) [Group 5, 2010].
- Soybean processing requires 4.14 kW of electricity to produce the soybean meal (290 kg) that a pig will consume over its life time (Dalgaard et al., 2008). This will emit a total of about 2 kg of CO_{2e} [Group 5, 2010].
- The total estimated CO_{2e} for the feed stage is 14.77 kg of CO_{2e} per animal (Wood & Cowie, 2004) [Group 5, 2010].

LCA Findings- Pig Housing

- Inputs include: energy, water and land use. Outputs include: manure, NH₃, CH₄, N₂O, CO₂, NO_x, SO₂ (Zhu & van Ierland, 2004). The majority of the carbon dioxide emission in swine production systems is derived from animal respiration. In addition, the aerobic and anaerobic decomposition of organic matter such as feed material and manure by microbes produces CO₂. Methane (CH₄) is released as a result of the fermentation of feed materials in the pig's intestine as well as from the manure management system in pig production. The nitrous oxide (N₂O) is also released from microbial decomposition of manure and is produced when the manure is applied to the land for crop production (Lague, 2003) [Group 5, 2010].
- According to Lague (2001), each year an individual pig produces 22.50 g CH₄, 405.2 g CO₂ and 0.6779 g N₂O per kg living weight (Lague, 2001). By assuming that each pig is slaughtered at a life-time of 5 months, weighing about 112.2 kg (Zhu & van Ierland, 2004), a pig will emit 1.0 kg, 19.0 kg, and 0.03 kg of CH₄, CO₂ and N₂O respectively or a total estimate of 50.7 kg CO_{2e} per animal [Group 5, 2010].
- Assuming that the average pig produces 2.7 kg of manure per day (Agriculture and Agri-Food Canada, 1998) and using the GHG emission estimates offered by Lague (2001), the storage of pig manure in deep litter manure system produces an estimated total of 12.1 kg CO₂ equivalent per animal lifetime [Group 5, 2010].
- The total estimated CO_{2e} for the pig housing stage is 62.8 kg CO₂ equivalent per animal [Group 5, 2010].

LCA Findings- Slaughterhouse

- Inputs include: energy and water (Zhu & van Ierland, 2004). Outputs include: CO₂, NO_x, SO₂, CH₄, ferric chloride, and waste materials (Zhu & van Ierland, 2004) [Group 5, 2010].
- Slaughterhouse waste water causes deoxygenation of rivers and contamination of ground water. The severity of these impacts depends on the slaughterhouse's use of water and how well blood is captured during processing (Masse & Masse, 2000) [Group 5, 2010].
- Thanee et al. (2009) show that at pig slaughterhouses in Thailand, the release of CH₄ and CO₂ is due to the enteric fermentation and respiration of feces and wastewater. This results in a total of 60 kg CO_{2e} over the entire lifetime of a pig. In this stage, electricity emits 7.5 kg of CO_{2e}, transportation emits 1.50 kg of CO_{2e}, and wood and paddy husk emits 342 kg of CO_{2e} (Thanee et al., 2009) [Group 5, 2010].
- Currently, Canada uses aerobic digestion treatment for waste water (Masse & Masse, 2000) [Group 5, 2010].
- The total estimated CO_{2e} for the slaughterhouse stage is 411 kg CO₂ equivalent per animal lifetime [Group 5, 2010].

LCA Findings- Transportation of Fresh Pork

- Centennial Foodservice is the main supplier of pork to UBC FS. T. Lui (personal communication, 2010), the sales representative for Centennial, stated that all their fresh pork products come from farms located in the B.C. lower mainland. The slaughterhouse is located in Langley and the distributor Centennial Foodservice is located in Richmond. The pork sausages come from Chile [Group 5, 2010].
- Inputs include: energy and fuel. Outputs include: methane (CH₄), nitrous oxide (N₂O), and carbon dioxide (CO₂) [Group 5, 2010].
- Refrigeration trucks running on diesel with an assumed fuel efficiency of 7 miles per gallon were used for the following calculations. The total CO_{2e} emission from transporting one pig from the slaughter house to UBC Food Service via distributor is 59 kg of CO_{2e} per animal [Group 5, 2010].
- When B.C. pork is unavailable meat is brought in by cargo planes from Chile via Toronto and then is transported to Richmond via cargo plane. This results in an estimated 2537.18 kg of CO_{2e} per animal (National Energy Foundation, 2009 & Travel Math, 2010) [Group 5, 2010].

LCA Findings- Packaging & Waste Disposal at UBC

- Types of packaging for pork products from Centennial include: plastics, wax paper, and cardboard boxes (S. Golob, personal communication, April 9, 2010) [Group 5, 2010].
- At Place Vanier, cardboard boxes are compacted and composted, wax paper is washed and recycled and plastics are land filled (S. Golob, personal communication, April 9, 2010) [Group 5, 2010].

Findings- Animal Welfare Standards

- The British Columbia Farm Animal Care Council (1993) reports that Agriculture Canada established a code of practice in the humane handling and care of pigs to promote the well-being of the animal [Group 5, 2010].
- The SPCA has a certification process for the humane handling of animals which includes an annual, random inspection by a professional third party (BC SPCA) [Group 5, 2010].

Alternative Organic Pork Sources

- Hills Food Ltd is a distributor of certified organic meats located in Coquitlam, BC and sources ethical pork such as the organic, heritage, SPCA certified varieties from farms like First Nature Farms (2005) located in Goodfare, Alberta. A price comparison follows [Group 5, 2010]:

	Hills Food- Certified Organic (\$/kg)	Centennial-Conventional (\$/kg)
Pork - Chop	35.71	7.55
Pork – Loin	31.61	6.79
Pork – Butt	11.64	4.95

- Farms that replace artificial fertilizer with pig slurry can help to reduce their GHG emissions ("Danes reduce," 2009) [Group 5, 2010].
- Slaughterhouses that turn waste into biodiesel may also have lower energy use than others that do not ("Danes reduce," 2009) [Group 5, 2010].

Summary of Findings

- Annually, UBCFS spends about \$70,000 on 10,026.41 kg of fresh pork products. This gives an estimate of total carbon dioxide equivalents to be 101,255 kg CO_{2e} [Group 5, 2010].

BEEF

- Conventionally raised meat cow's are fed mostly corn as it fattens cow's quickly and is inexpensive. In both Canada and the US, both antibiotics and hormones are allowed to be administered to the cows (Shah, 2010) [Group 17, 2010].
- Organically raised, grass fed cows are fed on organically raised pasture or grass up to the time of slaughter (Fernandez & Woodward, 1999) [Group 17, 2010].
- Beef is the least environmentally efficient of the meats because it has a high feed conversion ratio (calculated as mass of the feed consumed divided by the gain of body mass), which results in higher emission from feed production [Group 17, 2010].

Survey of Place Vanier and Totem Residents

- Qualitative interviews of Place Vanier and Totem residence regarding perspectives and attitudes toward organic beef and alternatives were performed. Students were approached in the cafeterias. New participants were recruited until no new answers or ideas surface in the interviews which occurred with 10 student participants [Group 17, 2010].
- The interview participants were asked a series of questions and were presented with information prepared by the interview team [Group 17, 2010].
- The common drivers for food choice among the interviewees were: taste, texture, health concerns, and cost [Group 17, 2010].
- Health Consideration: Participants were concerned about antibiotic and hormone content of beef but not so much that they were willing to spend more money to purchase organic beef.
- Cost: The large price difference between organic and conventional beef was a consistent factor for not choosing organic beef among the participants [Group 17, 2010].
- Environmental Considerations: Only one participant mentioned the environmental benefits of eating organic beef. After participants reviewed the GHG emissions data surrounding beef consumption, several participants said they would decrease the amount of beef they eat rather than switch to organic [Group 17, 2010].
- A difference in knowledge of organic beef was noted based on what students were studying. The student from Land and Food Systems was very knowledgeable but students from arts and commerce were less so [Group 17, 2010].

KEY RECOMMENDATIONS

To UBC Food Services:

- Include in the UBC Food Services (UBCFS) Request for Bid forms (RFB) sustainability focused conditions such as:
 - Providing product options with reduced packaging materials;
 - Providing increased access to affordable meat products that have less negative environmental impacts;
 - Providing products with rigorous animal welfare standards where UBCFS asks potential suppliers to follow the 'Code of Practice for the Care and Handling of Farm Animals' that was created by the British Columbia Farm Animal Care Council (Agriculture and Agri-Food Canada, 1993) [Group 5, 2010]
- The Raincity Grill homepage features a list and a description of the local and/or organic food suppliers from which the restaurant obtains their food ingredients. This helps to increase awareness and support to local farmers that are carrying out sustainable practices. UBC Food Services may also help to promote sustainability awareness and the importance of local and organic foods through featuring their local and/or organic suppliers on the UBC Food Services homepage [Group 5, 2010]
- Incorporate organic pork into pilot dishes at Place Vanier and gauge student response to it. The dish may be a mixed dish with a smaller ratio of meat to vegetables to help decrease the cost that students have to pay for the dish [Group 5, 2010].
- Source pork from alternative suppliers when Centennial can not provide B.C. pork. This may be an opportunity to use pasture-raised or organic pork products [Group 5, 2010]
- Source pork sausages locally, replacing current product procurement from Chile.
- Source medication free chicken from J&K Poultry in all food venues [Group 9, 2010].
- Further investigate the feasibility of sourcing organic, humanely raised chicken from Polderside Farms [Group 9, 2010].
- Host an 'organic week' at the residence cafeterias to raise knowledge about organic foods [Group 17, 2010].
- Begin to source extra-firm organic tofu from Dayspring Soycraft [Group 6, 2010].
- Use less beef in meat dishes rather than switching to a more expensive organic beef option [Group 17, 2010].

TO STEVE GOLOB, EXECUTIVE CHEF OF PLACE VANIER:

- Recycle the plastic bags used to package the smoked tofu [Group 6, 2010].
- Due to the lighter-footprint of tofu and other vegetarian alternatives to meat, continue to expand the selection of vegetarian items offered at Place Vanier [Group 6, 2010]

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SCENARIO 3:

CREATING A “MEET YOUR FARMER EVENT” AT UBC FOOD SERVICE’S PLACE VANIER RESIDENCE CAFETERIA

Community Partners: UBC Food Services & Center for Sustainable Food Systems at UBC Farm
LFS 450 Groups: Groups 11, 22

BACKGROUND:

In light of this movement to a more localized and food secure food system, UBC Food Services (UBCFS) has been implementing many eco-friendly changes to their menu options including purchasing more produce from UBC Farm and other BC producers, procuring only organic local whole apples at all residences, providing healthier food choices, composting at all food outlets and using cage-free shell eggs at all outlets. One of UBC Food Services' largest successes has been at their residence Place Vanier where they have prepared over 500 recipes utilizing local, seasonal ingredients that are sold throughout the year in the student cafeteria. The Center for Sustainable Food Systems (CSFS) at the UBC Farm now supplies UBCFS with a large variety of produce annually. Despite the strong connection, there is little advertisement of the changes that have been made at Place Vanier to the student body itself. Particularly, there is little engagement of the students in the issues surrounding their food choices.

SPECIFIC OBJECTIVES:

LFS 450 students were asked to design and implement a 'Meet Your Farmer' event at Place Vanier residence dining hall to help increase education, awareness and support for the UBC Farm and local food systems among student residents and staff.

CENTRAL FINDINGS:

- Research has concluded that food, home energy, and transportation together contribute to the majority of a person's carbon footprint (Weber and Matthews, 2008) [Group 22, 2010].
- Today food travels between 2,500 and 4000 km before reaching consumer plates, with increased use of transport such as airfreight and trucks (Halweil, 2003). This has extreme negative impacts for the environment [Group 22, 2010].
- Locally produced foods accrue fewer food miles and are often more nutritious as there is less time from harvest to consumption (Feenstra, 2009) [Group 22, 2010].

PROJECT RESULTS:

PLANNING & PREPARATION:

- The reservation of Shrum lounge in Place Vanier was arranged through Kate Ferguson. The facilities allowed 6 tables and 30 chairs. Promotional flyers and posters were not allowed. In person promotion was allowed the day before the event only [Group 11 & 22, 2010].
- The food budget was set with help from Executive Chef Steve Golob of Place Vanier. Donations were arranged by students [Group 11 & 22, 2010].
- Decorations and promotional materials were prepared by students [Group 11 & 22, 2010].

THE EVENT:

- Target audience: First year Place Vanier residents [Group 11 & 22, 2010].

- The goal of the event was to showcase the local choices available to the student population at the Vanier Cafeteria and to raise awareness and educate students about local and organic food choices. The activities were designed to increase students self-efficacy in making eco-friendly choices by choosing these menu items. The groups also aimed to inform students of food centered volunteer activities on campus [Group 11 & 22, 2010].
- The event was held from 5-7pm on March 24, 2010 in the Shrum Lounge in Place Vanier. Local food items were prepared by the Place Vanier cooking staff and some items were donated. Please see report for a full menu and amounts [Group 11 & 22, 2010].
- The following organizations set up booths at the event to inform students of their activities and ways for students to get involved: UBC Farm, the LFS Orchard Garden, Agora Café, and Sprouting Chefs [Group 11 & 22, 2010].
- The event consisted of a mingling period for enjoying food and talking to organization representatives at the booths. Then there were three 15 minute presentations from UBC Farm, Place Vanier and Sprouting Chefs representatives. The remaining time was free time for networking and enjoying food [Group 11 & 22, 2010].
- More than 50 students participated in the event [Group 11 & 22, 2010].

FEEDBACK:

Student Participant Survey

- A feedback survey was administered to 46 student participants as they were leaving the event [Group 11 & 22, 2010].
- 91% participants reported that they had heard of UBC Farm before they attended the "Meet Your Farmer" event [Group 11 & 22, 2010].
- 87% of respondents felt that the event provided a good idea of the UBC Farm's mandate and values [Group 11 & 22, 2010].
- 87% of respondents also felt that the event helped increase their interest in the UBC Farm.
- 54% of respondents expressed interest in at least one of the volunteer opportunities that was featured at the event [Group 11 & 22, 2010].
- 63% felt the information they learned would influence their food choices [Group 11 & 22, 2010].
- Word-of-mouth among peers and the act of passing by Shrum Lounge during the event were mainly responsible for attracting people to the event [Group 11 & 22, 2010].
- 20% offered opinions on other types of information they would have liked to see at this event. Suggestions included: UBC Farm history, other means of accessing food from the farm, nutrition information/recipes, community food initiatives, food security and volunteering opportunities [Group 11 & 22, 2010].
- 26 respondents reported learning about the event by walking by, 15 were informed by their friends and 7 obtained the information directly from the event poster. This shows that event promotion could be improved in the future [Group 11 & 22, 2010].
- It was felt that the following biases may have influenced the survey results [Group 22, 2010]:
 - It was sustainability week at Place Vanier and many of the event attendees were student organizers of the week's activities.
 - The food may have increased people's positive response to all aspects of the event.

Feedback from stakeholders

- Amy Frye of UBC Farm gave the following event feedback: the event was well organized and moderately achieved its purpose. She felt that the length of presentations was suitable, the venue selected did not attract many students because relatively few students passed by, and that the displays for this event were appropriate (e.g. the campus food system map). She recommended the following: hold the event in the fall as the UBC farm could provide more produce and that the speakers should be invited to speak about the specific topic only [Group 11, 2010].
- Chef Steve Golob gave the following feedback: The event was organized well, and the communications were clear, the work load for the event was suitable, but the working time was longer than expected and the amount of food was sufficient. His recommendations

include: students should receive more information. The best days to hold the event are Tuesdays, Wednesdays and Thursdays [Group 11, 2010].

PROJECT OUTCOME: MEET THE FARMER TEMPLATE

- The template provides information on how the event can be reconstructed in future years. Information includes: at planning timeline, contact information, funding information, promotions information, guest invitations, and event evaluation information [Group 11, 2010].
- The event template was provided to the UBC Farm staff and Executive Chef Steve Golob at Place Vanier [Group 11, 2010].

KEY RECOMMENDATIONS

TO FUTURE ORGANIZERS OF MEET YOUR FARMER EVENT:

- Host a "Meet Your Farmer" event at Totem Park Residence. This will allow more students to be involved in the UBC food system and will increase support for sustainable agriculture by influencing students to make environmental friendly food choices [Group 11, 2010].
- Host the event at the beginning of the school year, preferably in September when the UBC Farm can provide more produce and students are more actively looking for ways to get involved at school [Group 11, 2010].
- Have the UBC Farm showcase its local/organic produce at the event and incorporate some into the food sample selection [Group 11, 2010].
- Increase promotional efforts and carefully consider the choice of venue [Group 11, 2010].
- As an information event, invite guest speakers who can provide relevant information and increase the number of displays [Group 11, 2010].

TO PLACE VANIER STUDENT CAFETERIA:

- Place a UBC Farm logo next to all menu items that contain UBC Farm produce. A similar logo could be used for other menu items containing B.C. produce [Group 22, 2010].

TO UBC FARM:

- Increase communication with the Residence Advisors (RAs) at Totem and Place Vanier. Inform RAs of volunteer opportunities, Saturday markets, and other events at the UBC Farm.

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SCENARIO 4:

CREATING SUSTAINABLE FOOD PROCUREMENT GUIDELINES WITH UBC'S MAIN FOOD PROVIDERS- AMS FOOD AND BEVERAGE DEPARTMENT (AMS FBD) AND UBC FOOD SERVICES (UBC FS)

Community Partners: UBC Food Services (UBC FS) and Alma Mater Society Food and Beverage Department (AMS FBD)

LFS 450 Groups: Groups 1, 4, 13

BACKGROUND:

Both the AMSFBD and UBCFS have current procurement guidelines which include values outside of the traditional economically driven model. The "AMS Ethical and Sustainable Purchasing Policy" focuses on social ethics and sustainability of food procurement (AMS Website, 2009). The UBCFS procurement guidelines focus on choosing "local manufacturers who demand environmental and/or reusable packaging, and limit truck traffic on campus by reducing the number of deliveries per week and the number of contracted vendors" (UBCFS Website, 2009). The major barrier to continued improvement of the selection of sustainable food products these food providers can offer stems from the lack of an integrated purchasing approach with an ecological focus.

SPECIFIC OBJECTIVES:

UBCFSP and AMSFBD requested the LFS 450 students to help in sorting through the complicated issues surrounding food procurement and to suggest clear procurement guidelines with an environmental sustainability focus.

CENTRAL FINDINGS

All groups performed a literature review. The following is a summarization of their findings.

WHAT OTHER INSTITUTIONS ARE DOING

- Yale University uses a three tier procurement policy that was used as a model for the developed guide [Group 4, 2010].
- University of Northern British Columbia has established a 'Green Strategy' that includes maximizing local and organic foods, increasing vegetarian, vegan and other 'ethical' food options (Green University Committee, 2009) [Group 4, 2010].
- Harvard University has over 10,000 students that have taken the "Harvard Sustainability Pledge" to reduce their ecological footprint, the Harvard Green Office provides a "Green Catering Checklist" to specify preferred 'green' options, and the "Leaf Certification" label is used to show the degree of sustainability of products offered on the campus (Sustainability at Harvard, 2009) [Group 4, 2010].

DEFINING SUSTAINABLE FOODS

The groups were asked to identify factors that make foods sustainable. The following are their results and justifications:

Local and Seasonal Food

- The Leopold Center states that much of the food we eat travels between 1,000 and 2,000 miles from farm to plate (Pirog et al., 2001) [Group 4, 2010].

- According to Group 4, local food is defined as food that is cultivated, processed and consumed within British Columbia, Canada and Washington state, USA [Group 4, 2010].
- Eating seasonally means eating foods that are abundant in the season. Eating seasonally is the complement to eating locally [Group 4, 2010].
- BC has the most diverse agricultural industry in Canada producing over 225 products (BritishColumbia.com) [Group 4, 2010].
- Local food is generally fresher and more nutritious (Harvard Medical School) [Group 4, 2010].
- Local food helps strengthen the local economy and better establish a healthy food system [Group 4, 2010].
- Sourcing food locally is a precautionary step against future increasing food prices which may result from increased fuel costs [Group 4, 2010].

Socially Equitable Food

- Social sustainability and strength of the food system is improved by paying farmers a fair price for their products [Group 4, 2010].

Food Grown by Environmental Stewardship

- Maintaining the health of the land and soil that produces our food is a key component of the sustainability of our food system. Some common agricultural practices that demonstrate environmental stewardship include [Group 4, 2010]:
 - Organic farming
 - Integrated pest management (IPM)- the monitoring and pest control techniques that lead to minimum applications of pesticides on crops (E.S. Crop Consult, n.d.).
 - Reduced use of synthetic fertilizers

SPECIFIC FINDINGS FOR FOOD CATEGORIES

The following are the groups' findings that helped to shape their food procurement recommendations for different categories of food:

Vegetables and Fruit

- It is not recommended to buy fruits and vegetables internationally when they are available fresh from BC. Supporting local farmers keeps money within the local economy and means less money in the pockets of large food distributors (Gliessman, 2007) [Group 4, 2010].
- Local fruits and vegetables are usually fresher and therefore higher in nutrients. They also tend to use less energy to produce and transport (Leitzmann, 2005) [Group 4, 2010].
- Many BC organic farmers employ environmentally friendly principles such as water conservation, building soil health and conservation of wild flora and fauna. Some locally grown, certified organic produce is price comparable to conventional products and is recommended for purchase whenever economically possible [Group 4, 2010].
- The BC Environmental Farm Plan (EFP) helps farmers calculate the environmental strengths and potential risks of their farming methods and helps them to plan solutions. Conventional or organic farmers who have participated in this program are likely to be working towards increased sustainability (Ardcorp, 2008). Many of these farms employ IPM and other ecologically friendly techniques [Group 4, 2010]. This is a confidential program (Ardcorp, 2008) so identification of farms participating in the project can be difficult.
- Metro Vancouver has a 'Get Local' food chart to show when produce is in season. BC can also produce fruits and vegetables that can be canned or frozen for storage for the winter months which are also considered local [Group 4, 2010].
- Food dollars can make large ecological, social and political impacts on other parts of the world. Purchasing produce from countries where labour and chemical regulations are less likely to be enforced is strongly discouraged (Baker et al., 2002). For this reason, produce purchased from outside of BC should be third party certified organic and/or fair-trade to assure food was grown in a more ecologically friendly and produced in a more socially just manner [Group 4, 2010].
- When not purchased locally, produce should be purchased from the geographically closest regions such as Alberta, Oregon and California. Purchasing food that is grown in Canada and

the United States is recommended as opposed to purchasing food from Africa, China or South America [Group 4, 2010].

- Yale's Sustainable Food Purchasing guide makes the following recommendations for tropical fruit consumption (Engel, T. et al. n.d.) [Group 4, 2010]:
 - Only serve citrus fruits in January, February and March and only serve honeydew, cantaloupe and other sweet melons during summer and early fall months when they are in season in North America.
 - Make an institution wide change to certified organic and fair-trade options for a labour neutral move towards sustainability. This is especially important for bananas, mangos and other fruits imported from long distances.
- The following produce has been found to have particularly high pesticide residues: apples, peaches, pears, strawberries and celery. These are recommended to be purchased organic whenever possible (Baker et al., 2002) [Group 4, 2010].
- Good distributors: Discovery Organics, Horizon Organics [Group 4, 2010].

Dairy:

- Milk and cheese can be an important component of the local diet in BC where vegetables can not be grown year round [Group 4, 2010].
- Avalon Dairy and Olympic dairy products should be used whenever possible. Avalon Dairy is the best supplier for dairy since they are local to the Vancouver area, offer certified organic options and distribute their dairy in reusable glass bottles (Avalon Dairy, n.d.). Also Olympic puts sustainability, environmental stewardship and social responsibility at the center of their company policy and decision making by purchasing dairy from suppliers less than 60 km from their plant, they have reduced the water and energy requirement of their processing plants, and they share truck space with other retailers to be more efficient (Olympic, n.d.) [Group 4, 2010].
- Pasture raised and organic cows are the healthiest cows and they have higher levels of omega-3 fatty acids, vitamin E, beta carotene and other antioxidants in their milk (Engel et al., n.d.) [Group 4, 2010].
- Dairy from outside of Canada should be avoided, as BC and Canada have an abundance of sources for dairy. When purchasing dairy from outside of Canada, purchasing organic dairy is important as other countries, such as the US, allow the use of growth hormones such as recombinant bovine growth hormone (rBST) which has adverse health effects for the cows (Engel et al., n.d.) [Group 4, 2010].
- Dairyland and Lucerne Foods are large manufacturers that supply dairy in BC which means milk may be coming from great distances within BC before being processed and distributed. Dairyland supplies some organic dairy options [Group 4, 2010].

Meat:

- Meat production accounts for 18% of annual anthropogenic GHG emissions measured in CO₂ equivalents (FAO, 2006) [Group 4, 2010].
- It takes 3-10 kg of feed to yield 1 kg of meat (Aiking et al., 2006). The energy conversion ratio for chicken is 4:1, for pork 17:1, and for beef 54:1 (Segelken, 1997). For this reason chicken is generally recommended over other meats [Group 4, 2010].
- Locally produced, organic and free range meat is the best choice followed by non-organic, local and free-range. In BC, free-range cattle are raised on land with little other agricultural value (Bomke, pers. comm., 2009) [Group 4, 2010].
- Conventional farming methods use intensive systems with high waste output and limited space per animal. Antibiotic use for growth promotion has been linked to antibiotic resistance in humans (Food Marketing Institute, 2004) [Group 4, 2010].

Meat Alternatives:

- Genetically engineered (GE) soy beans are generally herbicide resistant which means higher levels of herbicides can be used on the crops with potential negative effects on the environment. UBC should avoid all GE foods until the human and environmental health risks are assessed by independent sources [Group 4, 2010].

- Superior Tofu and Sunrise Soya are BC companies that use GE-free organic and GE-free conventional soybeans to make their soy products. Superior Tofu sources their soybeans from Canada and Sunrise Soya sources their soybeans from Canada and the US. All soy products should be purchased from these companies [Group 4, 2010].

Seafood:

- Ocean Wise and Sea Choice are two programs that make recommendations regarding sustainable seafood consumption. These standards should be used in choosing seafood [Group 4, 2010].

Eggs:

- UBC now sources cage-free shell eggs. Sourcing organic cage-free eggs would improve environmental impacts of feed type and would call for stricter regulation on space and animal welfare [Group 4, 2010]. Cage-free eggs are not certified, unless they are third party certified organic or BC SPCA certified (Chickenout.ca).

Grains:

- BC produces mainly barley, oats and rye (Ministry of Agriculture, Food and Fisheries, 2004a) [Group 4, 2010].
- The best sources for grains are: the Organic Milling Co-Operative, which buys grain from its members and other cooperatives and sells it to the specialty baking industry and health food processors (BCICS, 1999), and Anita's Organic, which carries certified organic and kosher grains, flour and cereals (Anita's Organic, 2009) [Group 4, 2010].
- Stonemilling reduces waste by 15% by decreasing the amount of dust during production (Anita's Organic, 2009) [Group 4, 2010].
- Western Rice Mill, located in Vancouver, BC, supplies organic rice from Third Planet Rice Varieties and Lundeburg, which practices sustainable agriculture techniques such as crop rotation and fallowing weeds without chemical fertilizers (Lundeburg, n.d.) [Group 4, 2010].

Condiments:

- All condiments should be provided in dispensers to decrease packaging [Group 4, 2010].

Sugar:

- Organic and fair-trade sugar should be used when possible. Organic sugar is made without additives or emulsifiers and retains larger amounts of nutrients due to simple extraction processes (Coco Camino, 2010). Coco Camino, Horizon Distributors and Discovery Organics sell bulk organic sugar. [Group 4, 2010].
- Rogers Sugar of Lantic Sugar uses primarily GE sugar beets as a source for its sugar. Rogers offers an organic sugar as an alternative [Group 4, 2010].

Oils:

- Organic oils are best as they are guaranteed to be GE free. Alternatives are oils that are likely GE-free such as sunflower or safflower oils (Engel et al. n.d.) [Group 4, 2010].

CURRENT UBC FOOD PROCUREMENT PRACTICES:

- Gordon Food Services' Central Foods is the AMSFBD's main food provider. Neptune foods is the distributor. AMSFBD receives deliveries 1-2 times per week [Group 13, 2010].
- The UBC Campus Sustainability Office and Supply Management (2010) published a sustainable purchasing guide titled "Buying into the Future" but the guide includes little food procurement information [Group 13, 2010].
- Direct purchasing from farmers faces the barriers of the limited crop availability of small producers, and transportation from the vendor can be costly (N. Toogood, personal communication, 2010). For this reason, it is highly recommended that distributors providing local and organic foods are supported [Group 4, 2010].

RECOMMENDED DISTRIBUTORS:

- Horizon Organics- distributes dry, chilled and frozen organic and natural products.
- Discovery Organics- distributes fresh produce and some other items focusing on local products but imported organic products are offered as well [Group 4, 2010].

- Pro-Organics- supports mainly BC farms and distributes produce and other products such as dairy and dry goods [Group 13, 2010].

Vegetable Price Comparison: Sprouts vs. Central Foods [Group 13, 2010].

*Note: These prices include the price of shipping. **Bolded** values represent the lowest price option available. All values presented in ¢/lbs.*

	Central Foods (AMSFBD)	Pro Organics (Sprouts)	Discovery Organics (Sprouts)
Russet (Baker) Potatoes	34.5 ¢/lbs	54.7 ¢/lbs	72.0 ¢/lbs
Red Potatoes	81.5 ¢/lbs	88.0 ¢/lbs	80.0 ¢/lbs
Alfalfa Sprouts	336 ¢/lbs	487 ¢/lbs	270 ¢/lbs
Beets	67.0 ¢/lbs	88.0 ¢/lbs	92.5 ¢/lbs
Carrots	43.0 ¢/lbs	78.9 ¢/lbs	122 ¢/lbs
Tomatoes	83.0 ¢/lbs	160 ¢/lbs	82.0 ¢/lbs
Peppers	135 ¢/lbs	324 ¢/lbs	251 ¢/lbs
Squash	102 ¢/lbs	82.0 ¢/lbs	120 ¢/lbs
Mushrooms	182 ¢/lbs	306 ¢/lbs	120 ¢/lbs
Cabbage	115 ¢/lbs	61.3 ¢/lbs	99 ¢/lbs

RESULTS

FOOD PROCUREMENT GUIDE- FOOD CATEGORIES BY RANKING

Group 4, 2010

- A guide has been designed for use by the procurement staff at UBCFS and AMSFBD to help guide purchasing decisions with an ecological focus. This tool does not factor in price as this is a constantly changing factor and will be accounted for by default.
- Food procurement is divided into food categories including: vegetables and fruit, dairy, meat, meat alternatives, eggs, condiments, sugar, oil and grains.
- Each food category is ranked by best, good and avoid as determined by farm location, production method, farm size, and seasonality. Within each category are special tips, other factors to consider for the category of food and recommendations of distributors and producers that carry the recommended products.

FOOD PROCUREMENT GUIDELINES- GENERAL

Group 13, 2010

Current guidelines taken from UBC Sustainable Purchasing Guide (2010):

- Order organic, shade-grown, certified fair trade coffee and tea.
- Always request fair trade products. Fair trade products include coffee, tea, sugar, cocoa products and bananas.
- Use locally produced and organic fruit and vegetables when available.

Additional recommendations for sustainable Food Procurement guideline:

- Increase the number of local producers providing food to the AMS
- Coordinate with Sprouts if possible
- Increase purchase from local sources
- Use locally, organic and seasonal ingredients
- Decrease the number of deliveries
- Purchase in bulk if possible
- Suggest distributors to use fuel efficient vehicles when distributing produce to UBC

KEY RECOMMENDATIONS

To UBCFS AND AMSFBD PROCUREMENT STAFF:

- Use 'The Food Procurement Guide' to guide ecologically friendly purchasing produced by LFS 450 Group 4, 2010. Give feedback on the guide for further improvement and refinement. Specifically, UBCFS was recommended to [Group 4, 2010]:
 - Procure single serve Avalon Chocolate milk
 - Use Olympic or Avalon dairy products as priority
 - Switch to cage-free liquid eggs
 - Design menu options that change to follow BC seasonal produce availability
 - Use only organic apples, peaches, pears, strawberries and celery as the conventional crops have been found to have particularly high pesticide residues
 - Serve citrus fruits when they are in season (January, February, and March)
 - Only serve honeydew melons and cantaloupe during summer months and in the early fall, when they are in season and taste best (Engel, T., et al. (n.d.).
 - Reduce the amount of meat dishes. When using meat, use chicken most and beef least and try to use free-range meat whenever possible
 - Procure fair trade organic sugar
 - Purchase organic oils. If the cost of organic oils is prohibitive, preferentially procure non-organic safflower or sunflower oil as these are less likely to be GMO
- Create relationships with distributors and processors to better understand what is involved with food procurement and development [Group 4, 2010].
- Increase the amount of local, organic and ecologically friendly products used at UBC [Group 4, 2010].
- Apply pressure to distributors to source products from small, local farms [Group 4, 2010].

To UBCFS AND AMSFBD:

- Increase consumer awareness of procurement policy changes by increasing signage at food outlets [Group 4, 2010].

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SCENARIO 5:

EXPLORING WAYS TO LIGHTEN AMS FOOD AND BEVERAGE DEPARTMENT'S ECOLOGICAL FOOTPRINT

Community Partner: Alma Matter Society Food and Beverage Department (AMS FBD)
LFS 450 Groups: Groups 2, 7, 12, 20, 23

BACKGROUND:

In January 2007 the AMS Council passed the AMS Environmental Sustainability Policy which triggered the creation of the AMS Lighter Footprint Strategy to reduce the university campus's Ecological Footprint. The AMS Lighter Footprint Strategy aims to make the UBC campus more sustainable and serve as a model for other organizations and institutions to follow.

SPECIFIC OBJECTIVES:

Students were requested to further inform the growth of the food system component of the AMS Lighter Footprint Strategy including development and implementation of alternative 'lighter footprint' menu items that do not contain dairy or beef products and/or contain seasonal, local and/or organic ingredients as part of the new Local, Organic, Vegan (LOV) food line being developed by the AMS. The chosen AMS food venues to be focused on were The Pit Burger Bar, The Honour Roll and The Moon.

CENTRAL FINDINGS

LITERATURE REVIEW

All groups performed a literature review. The following is a summarization of their findings:

Defining the need for Sustainable Diets

- According to the American Public Health Association (2010) a sustainable food system is one that provides enough healthy food to meet current food requirements while maintaining healthy ecosystems with little or no impact to the environment. The food must be produced, distributed and consumed locally and be available, accessible, affordable and safe (APHA, 2010) [Group 2, 2010].
- It is estimated that the Ecological Footprint of the current world population is 1.4 Earths. This means it would require 1.4 Earths to provide the resources we use and to re-absorption the

waste we produce. Put in other words, it would require 1 year and 5 months of regeneration to offset 1 year's worth of used materials. This number is projected to be 2 Earth's worth by the 2050 (Global Food Network, 2010) [Group 7, 2010].

- According to Small Farm Permaculture and Sustainable Living (n.d.) large monocultures, imported and highly packaged foods contribute to a large Ecological Footprint due to need for large amounts of land, high inputs of pesticides, fuel and energy and high GHG emissions [Group 7, 2010].
- Pimentel and Pimentel (2003) showed that in 2002 17% of all fossil fuel used in the US was from food production [Group 12, 2010].
- Weckernagel and Rees (1996) report that the food system is responsible for 30% of our ecological footprint [Group 20, 2010].
- It is estimated that of the 6 billion people alive today, 2 billion consume meat based diets and 4 billion consume plant based diets (Pimentel and Pimentel, 2003) [Group 12, 2010].
- 37% of total human caused methane emissions are caused by the cattle industry (Down to Earth, 2010) [Group 20, 2010].
- A plant based diet compared to a meat based diet would reduce the average person's use of agricultural land by 75% (Miner, 2010) [Group 20, 2010].
- Coley et al. (2009) concluded that most modern day plant and meat based diets are not sustainable in the long run due to high inputs of fossil fuels and large GHG emissions but that meat diets generally require more energy, land and water inputs and generate more GHG emissions than plant based diets do [Group 12, 2010].
- Princen (2002) states that globalization contributes to distancing between producers and consumers which causes a disconnect between resource availability and environmental damages. This results in individuals with little ability to reduce their environmental impacts [Group 20, 2010].
- Randers (2007) states that food production and packaging are the main contributors to high ecological footprints, not the distance the food travels, Randers also states that the production of vegetables is far less energy and land intensive than the growing of the vegetables [Group 20, 2010].
- UBC generates over 12 tonnes of garbage a day, enough to fill 55 Volkswagon Beetles resulting in over 11,000 Beetles full of trash that UBC sends to the landfill annually (Wastefree UBC, n.d.). 40% of the waste produced at Food Service outlets is made up of disposable containers, such as coffee cups and paper plates (Wastefree UBC, n.d.) [Group 2, 2010].

WHAT OTHER INSTITUTIONS AND BUSINESSES ARE DOING

Groups identified the following food system sustainability initiatives underway at other institutions:

- University of Alberta (2010)- The Augustana Café offers a 'local lunch' once a month in which all ingredients are locally produced. The lunch is offered at the same price as other meals [Group 20, 2010].
- University of Western Ontario (2009)- The residence dining service purchases locally produced and processed as well as organic foods [Group 20, 2010].
- McGill University- 90% of food products are produced in Canada and are provided by Compass Food Canada (Compass Food Canada, 2008) [Group 20, 2010].
- University of Guelph (2009)- Purchases local foods and prepares many of their dishes from scratch [Group 20, 2010].
- Amuse and Bishops restaurants are models for using local, seasonal and organic products, connecting restaurant to farm and other lighter footprint practices [Group 7, 2010].

WHAT UBC IS DOING

Groups identified the following food system sustainability achievements and initiatives already underway at UBC:

- Overall UBC receives a mark of B+ on its College Sustainability Report Card (2010) with the highest marks in food and recycling sustainability strategies, green building, and climate change/energy [Group 23, 2010].

Not included in the report card were the UBC AMS FBD initiatives, some of which are listed below.

- Plastic forks are now stored behind the counter and are provided to customers on a need only basis (N. Toogood and D. Larson personal communication, 2010) [Group 12, 2010].
- Local, organic, or vegan (LOV) items are offered under the AMS lighter footprint menu item LOV labels at several AMS food venues (N. Toogood personal communication, 2010) [Group 12, 2010].
- Bernoulli's Bagels- All non-processed and canned food ingredients are local and all non-processed items are organic (A. Douglas, personal communication, 2010) [Group 20, 2010].
- Blue Chip Cookies- The venue uses organic Fair Trade coffee beans and uses as many local ingredients as possible. Some vegan options and special are offered under the LOV "Lighter Footprint" labels (S. Lam, personal communication, 2010) [Group 20, 2010].
- Honour Roll- The venue offers some vegan and local options. Discounts are offered for customers who bring their own containers and free green tea is provided for customers who bring their own mug (J. Chang, personal communication, March 19, 2010) [Group 20, 2010].
- Pi-R Squared- Most ingredients used are local and some are obtained from the UBC farm. Some pizzas are made based on seasonal availability of ingredients (G. Sutiono, personal communication, 2010) [Group 20, 2010].
- Pendulum- The venue offers organic coffee beans and has many vegan and vegetarian options (B. Hutson, personal communication, 2010) [Group 20, 2010].

SPECIFIC FINDINGS:

The following are the groups' findings in regard to their projects focusing on the AMS Food and Beverage Department (AMS FBD) and specific food outlets:

THE AMS FBD

Current Practices

- The AMS FBD orders food products from food suppliers for all its food venues. The individual food venues then order what they require from the AMS central storage room (N. Toogood, personal communication, 2010) [Group 23, 1010].
- Food providers that offer something beyond what current providers offer will be considered if they are able to deliver goods to UBC (N. Toogood personal communication, 2010) [Group 12, 2010].

THE PIT BURGER BAR

This is the first year that the Pit Burger Bar has participated in the UBCFSP. The following is a summary of the groups' research regarding their selection of menu items.

Ranking of the Footprint of Food Ingredients

- Main food ingredients were considered in the ranking process as burger buns and condiments are standard for all food items [Group 12, 2010].
- Eshel and Martin (2006) compare the energy input and the energy output of some meats and vegetables. In this method the calories (Kcal) of fossil fuel and human labour needed to produce the foods are compared to the edible Kcals yielded by the production. In the following table it can be seen that beef and farmed salmon have the worst energy return while potatoes and soy have the best [Group 12, 2010]:

Food item	100 x (Kcal output/Kcal input)
Chicken	18.1
Beef (grain fed)	6.4
Salmon (farmed)	5.7
Soy	415
potatoes	213

- Pimentel and Pimentel (2003) show that of the three meats reported, beef has the least efficient energy return while chicken has the best [Group 12, 2010].

Food item	Ratio of E _{input} to E _{output}
Chicken	4:1
Beef cattle	40:1
Fish dishes	Between 8.1:1 and 23:1

- The following is the overall ranking, from highest ecological footprint to lowest, of the main food ingredients at the Pit Burger Bar based on the above data and GHG emission data: beef burger, fish burgers (unknown if wild or farmed), veggie burgers [Group 12, 2010].
- The following are the ecological footprint calculations in global hectares (gha) per kilogram food product from Collins and Fairchild (2007) and Gill (2005). A global hectare of agricultural land is defined as having an annual productivity equal to the world average (Santa-Barbara Family Foundation, 2003) [Group 20, 2010].

	Collins, Fairchild (2007) gha/kg	Gill (2005) gha/kg
Beef	0.0157	0.0214
Cheese	0.0111	0.0152
Poultry (cooked)	0.0032	0.0113
Fish	0.0101	0.0068
Processed vegetables	0.0005	0.0014
Bread	0.0005	0.0011
Fresh vegetables	0.0004 (Green – 0.0003)	0.0016 (Green – 0.00138)

- Based on the above two estimations, the highest to lowest ecological footprint are as follows: beef, cheese, poultry, fish, processed vegetables, fresh vegetables and bread. According to Gill (2005) the fresh vegetables have a higher footprint than the processed vegetables because they require more packaging and longer transport [Group 20, 2010].

Survey and Survey Results:

- Survey was administered to gauge the popularity of the Pit Burger Bar items and to better understand demands and characteristics of current and potential customers. 91 students participated in the survey conducted near the AMS food outlets to capture current customers of the Pit Burger Bar. 25% of respondents ate at the Pit Burger Bar at least once a week, 48% at least once a month and 77% at least once a term. 60% of respondents reported the beef burger was their most purchased item, followed by 11% favouring chicken burgers and only 3% favouring salmon burgers. No respondents chose the vegetarian burger as their favourite item even though 6 respondents reported trying the burger and 5% of respondents were vegetarian. This indicates that a change of product might be appropriate for both the salmon and vegetarian burgers [Group 12, 2010].
- A similar survey was conducted near the Pit Burger Bar with 115 survey respondents. In this survey it was found that 62% of respondents reported the beef burger was their most purchased item, followed by 27% favouring chicken burgers and only 7% favouring salmon burgers and 4% favouring vegetarian burgers. It was also found that 70% of respondents purchased burgers most often followed by 21% purchasing appetizers and 9% for other menu items. The survey asked participants about the types of changes they would like to see made to the Pit Burger Bar menu. 46% of participants did not respond to this question, 24% responded they would like increased vegetarian options, 19% wanted more local options and 7% wanted

healthier options. Based on these results, it was determined that since the beef burger is a staple of the Pit Burger Bar it should not be changed. For this reason, the addition of a LOV appetizer was considered [Group 20, 2010].

Potential LOV items for Pit Burger Bar

The recipes or sourcing information for the following recommended products was provided to stakeholders and is available in the groups' original reports.

- Locally produced veggie burger and veggie strips- Potential source is Richmond based Garden Protein international which offers the Gardein line of products including a 'Beefless Burger' and a 'Seven Grain Crispy Tender' [Group 12, 2010].
- Dipping sauce- This would be prepared in-house and would be based on local ingredients. Examples include: thai sauce, horseradish sauce and mint sauce [Group 12, 2010].
- Daily curry and roti- This is an alternative vegetarian/vegan menu item that could feature local seasonal vegetables. Since it could be kept hot in a crock pot, it would be an easy and space efficient addition to the Pit's menu.
- Apple Fries- Apples could be locally sourced from Hidden Springs Farm as recommended by Lewis (2009) as this provider meets the AMSFBD dependability, quality, quantity and cost requirements. The cost of the apples is \$0.50/lbs, can be delivered and is available seasonally [Group 20, 2010].

THE HONOUR ROLL

Current Practices

- According to N. Toogood (personal communication, 2010), the Honour Roll staff know proper waste management including composting and recycling. Although recycling and composting bins are located in close proximity to the Honour Roll, they are not effectively used by customers [Group 23, 2010].
- Honour roll is one of the few AMS food outlets that do not use biodegradable containers as BSI Biodegradable Solutions does not supply appropriate sizes or transparent materials (N. Toogood, personal communication, 2010) [Group 23, 2010].
- Honour roll adds to the ethnic diversity of foods on campus and offers relatively healthy food options for students. [Group 23, 2010].
- Honour Roll has little signage informing customers about the origins and nutritional value of the foods they serve [Group 23, 2010].
- Honour Roll serves some fish and seafood that meets Ocean Wise standards (N. Toogood, personal communication, 2010) [Group 23, 2010].

Survey and Survey Results

- A survey was designed to gauge consumer response to the ideas of implementing brown rice sushi and hand held, uncut sushi as well as customer willingness to use biodegradable to-go containers and customer awareness of some current Honour Roll initiatives. 100 participants responded to the in-person survey which was administered on two consecutive Fridays. Participants were preferentially selected for if they were eating Honour Roll sushi or other AMS FBD food outlet foods. An electronic survey was also administered to 40 additional participants. This data was used secondarily and mainly to see if people who are not currently Honour Roll customers would have different opinions of the proposed ideas [Group 23, 2010].
- The main reasons respondents reportedly eat at Honour Roll are convenience, low prices and for nutritional reasons [Group 23, 2010].
- The survey demonstrated that 99% and 98% of survey participants did not participate in the Honour Roll's reusable mug for free green tea and reusable container promotions. It is assumed that this is due, in part, to lack of advertising for the promotions and therefore customer lack of awareness [Group 23, 2010].

Proposed Changes at Honour Roll

Brown Rice Sushi

- The processing of white rice requires additional processing steps including milling and enriching that is not required by brown rice processing. This means that there is an energy saving by

offering brown rice sushi (Blachford, 2006). There is significant energy, resource and labour required to produce the vitamins used in the enriching process and many toxic bi-products result which can have negative consequences for the environment (Travis and Hester, 1991). Brown rice requires more cooking time, however, which increases its energy requirements to some extent [Group 23, 2010].

- It was also found that brown rice is significantly more nutritious than white rice with substantially more essential fatty acids, fibre, minerals and vitamins (USDA, 2010). Studies have demonstrated that eating brown rice can lower high blood pressure, reduce weight gain, high cholesterol heart disease, Type II diabetes and cancers (Klein, 2007) [Group 23, 2010].
- 70% of the above survey respondents explained they were interested in buying brown rice sushi [Group 23, 2010].
- The AMS FBD already orders brown rice so ordering will not be a barrier to implementation (N. Toogood, personal communication, 2010) [Group 23, 2010].

Product Packaging: Using Biodegradable Plastics & Uncut Sushi

- Uncut sushi is a new trend that can increase convenience of eating sushi on the go. There are economic benefits to not cutting sushi at Honour Roll as cutting sushi accounts for an entire employee position at Honour Roll [Group 23, 2010].
- In the above described survey it was found that 47% of survey respondents felt that Honour Roll's sushi was hard to eat on the go. 47% of respondents also said that they would buy a plastic-wrapped uncut sushi roll. It was felt that many survey participants may have had trouble conceptualizing uncut sushi, despite the inclusion of a picture in the survey [Group 23, 2010].
- Biodegradable plastics are digestible by soil microbes and can thereby reduce waste. These products are generally more expensive than standard petroleum based products. The additional cost of using biodegradable plastic could be balanced by the introduction of uncut sushi [Group 23, 2010].
- BSI Biodegradable Solutions (2010) is able to custom make packaging materials. If packaging is developed and Grab 'N Go sushi is not implemented, snap buttons should be requested on the boxes to eliminate the need for tape. If the Grab 'N Go sushi is implemented, biodegradable plastic transparent bags can be used, which will reduce waste over the current boxes. The word "Compostable" should be readable on the bag. BSI was contacted requesting further information on special products but no response was received [Group 23, 2010].
- In the above described survey, 61% of respondents reported that they did not recycle their plastic sushi containers but 81% of respondents said that if the containers were biodegradable that they would compost them. Group 23 spoke to several survey participants about the difference in response and found that the respondents were not likely to recycle the boxes as a cleaning step is believed to be required [Group 23, 2010].
- The survey also revealed that 98% of participants have never brought their own reusable container to the Honour Roll [Group 23, 2010].

THE MOOD NOODLE BAR

Current Practices

- Customers are encouraged to bring their own containers for a discount [Group 7, 2010].
- It was observed by Group 7 (2010) that the Moon employees responsible for ordering food were not aware of where the foods were coming from [Group 7, 2010].
- The Moon does not offer any LOV items [Group 7, 2010] but does have vegetarian items for purchase.
- None of the vegetables used at the Moon are local or seasonal from November to June [Group 7, 2010].

Ranking of the Footprint of Food Ingredients

- Beef has a higher Ecological Footprint than pork and chicken due to higher CO₂ equivalent emissions and greater land and fossil fuel usage. Chicken has the least impact (Wageningen University, 2010) [Group 7, 2010].

Proposed Changes at The Moon

- Two recipes were identified as lighter footprint than existing Moon recipes based on the availability of vegetables in July. These recipes are beef snow pea stir fry and leek zucchini stir fry. The recipes were prepared and sampled by a sensory panel of 8 people. The panellists results were as follows [Group 7, 2010]:

Score by category (40= max)	Overall quality	Taste	Texture	Likely to buy	Visual appeal
Leek & Zucchini	27	25	25	31	31
Beef & Snow Pea	32	37	29	37	32

- Both recipes scored similarly for visual appeal. The beef and snow pea recipe scored higher on taste, overall quality and likely to buy. Comments on the leek and zucchini stir fry included that the dish requires more flavour and colour and that the vegetables were a bit soft. Suggestions for fixing these issues include adding a spicy element, a stronger tasting, thicker sauce or a different vegetable such as red pepper. These results were interpreted by Group 7 to mean that customers would be likely to try both recipes but would be more likely to choose the beef and snow pea recipes a second time [Group 7, 2010].
- Preparation and cooking time for both dishes was about 20 minutes with the greatest time spent on chopping and preparing the produce. Longer prep time may be required to wash and prepare vegetables sourced locally as they are not pre-prepared [Group 7, 2010].
- Nutritional analysis as calculated by my Diet Analysis Plus is as follows:
 - Leek and Zucchini Stir Fry: For every 366 g serving: Calories 298 kcal, Total Fat 7g, Saturated Fat 0g, Cholesterol 0mg, Sodium 943mg, Fiber 7g, Sugars 15g, Protein 6g, Vitamin A 110%, Vitamin C 112%, Calcium 7%, Iron 11%
 - Beef and Snow Pea Stir Fry: For every 325 g serving: Calories 460 kcal, Total Fat 16g, Saturated Fat 5g, Cholesterol 82mg, Sodium 1077mg, Fiber 4g, Sugars 9g, Protein 38g, Vitamin A 71%, Vitamin C 32%, Calcium 7%, Iron 21%
- Based on this analysis it is concluded that both recipes are nutritionally healthy. The zucchini and leek stir fry offers the complete recommended daily vitamin A and vitamin C. Both recipes are very high in sodium. This is likely not different from the Moon's current recipes. It is noted that when vegetables are in season they have a higher nutrient profile than in other months [Group 7, 2010].
- The leek and zucchini stir-fry, provides a 366g serving including rice. It is much lower in total and saturated fat than other Moon recipes and contains no cholesterol. It is a good source of fiber and iron, as well as an excellent source of vitamin A and vitamin C [Group 7, 2010].
- Fresh garlic is recommended for use in both recipes. This would take the place of the powdered garlic used at the Moon. Garlic could be purchased from the UBC Farm or other local provider to help increase the local ingredients used at the Moon. There are also health benefits to consuming fresh versus powdered garlic as it contains bioactive organic sulphur compounds that can reduce blood pressure, the incidence of stroke and cholesterol and antioxidants (Kitts, personal communication, 2010) [Group 7, 2010].

ECO-BOX REUSABLE CONTAINER INITIATIVE

The Eco-Box Reusable Container Initiative is a program that allows students to borrow reusable containers from AMS and other UBC food outlets with the purchase of a food item, thereby reducing the amount of resources used in and waste generated by packaging materials. The large number of students participating in the eco-box program would yeild a substantial reduction in garbage generation. The introduction of this initiative coincides with the construction of the new Student Union Building (SUB) which can be designed to incorporate such a program. This innovative initiative may draw attention and funding for this and similar campus sustainability initiatives. Not only is the eco-box better for the environment, but this is also a great opportunity for UBC to take leadership and be the first institution in the Greater Vancouver area to adopt such a program [Group 2, 2010].

Examples of Eco-box and Similar Initiatives

The following are the results of research into existing Eco-Box programs:

- At the University of Colorado, students check out a reusable container with their university ID card (Brown & Eaton, n.d.) [Group 2, 2010].
- At some universities students have the option of using a reusable container for \$10 and exchange their used containers for a clean one or for a key chain (McDaniel, 2009) [Group 2, 2010].
- The Sustainable Dining Club at Dartmouth College offers dining kits that include a reusable container, cloth napkin, silverware, a water bottle, and a coffee mug. The kits cost \$20 each but it was found that each student uses \$1.17 worth of disposables every day, meaning that one of these kits will pay for itself in seventeen days (Brown & Eaton, n.d.) [Group 2, 2010].
- The Metro Vancouver Sustainable Businesses Department (MVSBD) recommended a deposit system to help ensure the return of borrowed containers (MVSBD, email communication, 2010) [Group 2, 2010].
- The MVSBD is currently working on reusable plates for festivals and a cooperative system for reusable take-out food containers at restaurants in a common neighbourhood. Other businesses with similar initiatives of using reusable plates or containers include Curry to U on Graville Island and Oakville Place Shopping Centre (MVSBD, email communication, 2010) [Group 2, 2010].
- The University of Toronto (U of T) eco-takeout container program follows a card system, where students purchase a card for \$5.00 which they can exchange for a take out container upon the purchase of a meal. A card purchase comes with a 50 cent discount on the next ten meals purchased with a reusable container, resulting in a zero net cost for the student in the long run (U of T Sustainability Office, 2010) [Group 2, 2010].
- At the University of Toronto, all dirty containers are washed by the main food court vendor of the University. Students return their used containers to a specific bin at the cash register in the food court (U of T Sustainability Office, 2010) [Group 2, 2010].

Findings for waste and packaging solutions

The following are the results of research into existing waste and food packaging solutions:

- In Singapore, the Environment Council grants the 'Green Label Food Court Certification' to eligible groups (Singapore Environment Counsel, 2010) [Group 2, 2010].
- Notre Dame Food Services (2008) uses a "Fresh Set of Eyes" program to secretly assess each food service's recycling and sustainability practices [Group 2, 2010].
- University of Maryland Dining Services (n.d.) includes environmental job expectations in their employees' performance reviews [Group 2, 2010].
- RecycleMania (2010) is a competition for campuses in USA and Canada to compete for who recycles the most [Group 2, 2010].
- The University of Colorado feels that a desirable and comfortable atmosphere that encourages dining in rather than take out can help reduce waste (Brown & Eaton, n.d.) [Group 2, 2010].
- Raising awareness of waste generation by erecting a giant pyramid of garbage can help students conceptualize the size of the waste problem (Curry, 2008) [Group 2, 2010].
- The focus on changing waste disposal habits should be placed on new students. Eco Reps program that pay students to conduct outreach activities can be useful (Brown & Eaton, n.d.) [Group 2, 2010].
- "Single stream" recycling in which all recyclables can go in one container can decrease the resistance to recycling. Notre Dame Food Services (2008) has also found that for compost to be effective, compost bins must be put next to every landfill trash can [Group 2, 2010].
- Relocation of paper napkins to dining rooms cut consumption by 50% at University of Maryland. Cook to order and batch cooking can reduce leftovers. Micro filtration can reduce the amount of cooking oils used in half. Installing variable speed cooking exhaust hoods can reduce energy usage (Maryland Dining Services, n.d.) [Group 2, 2010].

- Students eat less and waste less food when they do not have a cafeteria tray in a buffet style cafeteria (Curry, 2008). This can result in a 20-50% reduction in food and beverage waste (Kuck, 2009) [Group 2, 2010].
- A sink for cleaning reusable containers in the common area may encourage students to use reusable mugs and containers (National Wildlife Federation, 2000) [Group 2, 2010].
- By cutting down plastic usage in a year, a city with a population of 740,000 can save 1.5 million liters of oil, as well as an eliminated 4.2 million kilograms of carbon dioxide (Curran, 2007) [Group 2, 2010].

Current Practices in the AMS SUB and UBC FS Food Outlets

- The AMS and UBC Food Services pay \$0.022 for each take-out container. The biodegradable containers hold 34 oz of food. A 30 oz size container may be introduced to accommodate smaller portions offered at restaurants, such as The Moon (N. Toogood, personal communication, 2010) [Group 2, 2010].
- AMD FBD outlets are busiest either between 11am-2pm or in the morning hours. An average of 8,000 people walk through the SUB daily with 80% of these people looking for some type of refreshment: meals, snacks, coffee, beverages, etc. (N. Toogood, personal communication, 2010) [Group 2, 2010].
- The current SUB does not have a central washing station to support an eco-box program. There are plans to include such a facility in the new SUB (N. Toogood, personal communication, 2010). Many UBC FS food outlets also do not have the standardized three-sinks for rinsing, washing, and sanitizing, nor do they have commercial dish washers (D. Yip & A. Ferguson, personal communication, 2010) [Group 2, 2010].
- Nancy Toogood, the manager of the AMD FBD, (personal communication, 2010) reported that the AMS food outlets are currently using bio-degradable paper-based containers, styrofoam, and polyethylene containers. Both styrofoam and polyethylene containers are usually non-degradable. After being transported to the landfill, the styrofoam and polyethylene containers break down into minute toxic pieces that can not be broken down by microorganisms and penetrate through soil and contaminate ground water and pollute plant roots and soil particles (Jensen and McBay, 2009) [Group 2, 2010].
- Although the bio-degradable paper-based containers are compostable, the majority of students throw them into garbage bins. This results in a even larger loss of energy as the energy required to produce the bio-degradable containers is far greater than that required to produce the non-degradable polyethylene containers (Jensen and McBay, 2009) [Group 2, 2010].

Issues of Concern for the Eco-Box Program

Dorothy Yip, general manager of Retail Operation, Purchasing & Project Coordination Food Services, and Ayrin Ferguson, Manager of UBC Human Resources & Administration (personal communication, 2010) were in favour of the idea of reusable containers and brought up the following important concerns: the issue of hygiene and sanitation of the boxes must be examined; the allocation of costs between the AMS and UBC Food Service outlets for a joint project must be considered; the storage of eco-boxes in food venues with little storage space must be accounted for; solutions for lost containers must be identified and the economic impact of this must be examined; the ecological impact on the environment of the program must be analyzed; and incentives for students to participate in this program must be determined [Group 2, 2010]. These issues are explored further in the following sections.

Eco-Box Sanitation and Hygiene

The following are relevant points presented by Group 2 surrounding sanitation of the eco boxes and other hygiene issues.

- The Metro Vancouver Sustainable Businesses Department (MVSBD) (email communication, 2010) stated that food container hygiene is a key issue. It is crucial to have a central washing and sanitation station that is strictly regulated by food safe guidelines on industrial washing requirements (time, temperate, pre-soaking, air drying etc.) (MVSBD, email communication, 2010) [Group 2, 2010].

- After review by Group 2, no food safety regulations were found that specifically apply to reusable container programs. The BC Restaurant and Foodservices Association, in partnership with the Province of BC has the "Restaurant Regulations made easy in British Columbia" website, <http://www.restaurantregulations.ca/home>, which may offer some solutions [Group 2, 2010].
- The US Federal Department of Agriculture has banned the use of home containers being used at public food carts as this can cause cross contamination (Cuisine Bonne Femme, 2010). The Eco-Box offers a solution to this concern [Group 2, 2010].

Eco-Box Proposed Materials

- Group 2 decided that the ideal material for the eco-box would have the following characteristics: be health safety approved by Canadian government agencies, affordable, non-leaking, washable using commercial dishwashers, durable, lightweight, environmentally sustainable, easy storage and transportation, and microwave safe. According to MVSBD (email communication, 2010), transportability and durability are important factors when deciding on a suitable container material. As a result Group 2 identified plastic, stainless steel, and wood as the three top materials for the boxes [Group 2, 2010]:
 - Plastic: Major advantages: plastic is cheap, light weight, and durable. There are many suppliers offering varied styles and prices. Major disadvantages: negative health claims, non-recyclable. Most plastics have not been proven to be carcinogen free. In general, plastics used for making lunch boxes cannot be recycled at the end of usage (Styromelt, 2007) and will end up in the landfill. According to MVSBD, plastic containers should be avoided as heating plastics can generate harmful toxins (MVSBD, email communication, 2010) [Group 2, 2010].
 - Stainless steel: Major advantages: lightweight, very durable, very hygienic. Major disadvantages: expensive, not microwave safe. The material itself has to be mined from the ground and may have a bigger impact than plastic. Stainless steel can be recycled easily.
 - Wood: Major advantages: renewable resource, compostable. Major disadvantages: not suitable for commercial cleaning, not microwave safe, few suppliers, high cost, low durability.
- Three potential container options are explored below [Group 2, 2010]:
 - *Plastic collapsible lunchbox made from PVC free plastic*. A RubberMaid brand container is currently sold at AMS outlets for \$6.00. Tupperware makes a similar product called "Flat Out" (<http://www.tupperware.com>). The Rubbermaid container is made from #7. The Tupperware container is made from #4 and #5. None of the plastics contain PVC, but they do use small amounts of BPA.
 - *Stainless steel tiffins, a traditional Indian reusable lunch bowl*. This container is available from <http://www.happytiffin.com/lunch-bowls.html>. The tiffins are air-tight, water-tight and light weight. The 37 oz version weighs 0.7 pounds and costs \$17.50 retail. The higher price may tempted more students to not return the boxes.
 - *Wooden bento box, a traditional Japanese lunch box*. This box is available at <http://casabento.com>. It is microwave safe and dishwasher safe (except the lid) and costs \$30.00 retail. They are probably less durable than plastic or stainless steel boxes and don't have as good ability to retain liquids.

Recommended Eco-Box Design

The following design was inspired by the Eco-Box program at Mills College (2010) [Group 2, 2010]:

- Students pay a small fee at the beginning of the year to access the reusable eco-box program. Students are then registered into the computer system. The eco-box can then be used throughout the UBC campus, with the exception of first year residences where they have their own separate container program. Students can bring dirty containers to designated drop off locations across campus and exchange them for clean ones. If a new box is not used at that given time, a placeholder card will be issued to the student, which can be traded in again for a clean eco-box. Students must get a clean box that is centrally washed at the new

SUB with a commercial dishwasher each time they purchase food. Students will scrape remaining food from the eco-box into compost containers located at the to-be-determined drop off locations and staff receiving dirty containers have the right to refuse a containers if they are not hygienic. This process can be repeated as many times as desired during the length of the school year. Dirty eco-boxes will be transported from drop off locations to the New Sub central washing and sanitation station for cleaning. Each morning, eco-box containers will be delivered and distributed by the cleaning staff. A trolley will be used to distribute containers to food outlets that are located within the SUB and a small truck will be used to deliver containers to food outlets that are outside the SUB.

- If the placeholder cards or eco-box is misplaced students can pay a small fee and would be able to redeem new placeholder cards at the UBC card office located in the UBC Bookstore. The fee will encourage students to be careful with their containers and will help to cover the cost of replacing the container [Group 2, 2010].
- The cost to join the Eco-Box program should cover the cost of the boxes and other program costs while still being more affordable than choosing to pay for the take out containers [Group 2, 2010]. One option is to include the eco-box program as part of the annual student fees and give students the option to opt out as is done with the U-pass.
- In order for this program to become a campus-wide initiative, disposable containers need to have an additional cost or a 'sin-tax'. The tax should be high enough to encourage students to participate in the eco-box program (Group 2 recommends \$1 per biodegradable box) [Group 2, 2010].
- Stakable stainless steel boxes are the recommended Eco-Box as they are the most hygienic, durable and space saving [Group 2, 2010].
- The initial estimation of the number of eco-boxes that must be provided to each food outlet can be taken from the number of take-out boxes that are currently being used on a daily basis or by the number of transactions a food outlet makes per day. The number of students that enroll in the reusable container program can also be used to estimate a suitable number of containers that each food outlet should have [Group 2, 2010].

Potential Logistical Issues of the Recommended Design:

An eco-box program requires the cooperation of the AMS and UBC Food Services in order for this campus wide initiative to be a success.

- According to Nancy Toogood (Personal Communications, 2010), the AMS FBD Manager, the maintenance costs will have to be negotiated between the two organizations [Group 2, 2010].

KEY RECOMMENDATIONS

TO THE AMS FOOD AND BEVERAGE DEPARTMENT:

- Replace current plastic containers with biodegradable containers at the Honour Roll. Negotiate with BSI to create custom packaging with a "snap-button" closing function to eliminate the current need to tape boxes closed [Group 23, 2010].
- Request video coverage of AMS FBD Lighter Footprint initiatives through UBC's SEEN project and the UBC Wellness Center [Group 23, 2010].
- Improve marketing of the LOV products. Facebook can be a useful marketing tool [Group 7, 2010].
- Further explore the potential for implementing an Eco-Box program in the new SUB. Work with future LFS 450 classes and the new SUB design team to tailor the program to the UBC context [Group 2, 2010].

TO THE PIT BURGER BAR MANAGEMENT & STAFF:

- Sample recommended vegetarian burgers and strips and if acceptable begin offering these as an alternative to the current vegetarian burger [Group 12, 2010].
- Prepare and sample the recommended dipping sauces and, if acceptable, begin offering them as a LOV item [Group 12, 2010].

- Increase the chicken, salmon and vegetarian burger options on the menu to balance the large beef burger selection [Group 20, 2010].
- Increase selection of vegetarian and local options based on survey participant responses [Group 20, 2010].
- Offer a special that is accompanied by the recommended apple fry recipe [Group 20, 2010].

TO THE HONOUR ROLL MANAGEMENT & STAFF:

- Implement Grab 'N Go uncut sushi wrapped in biodegradable plastic bags. Contact BSI to negotiate bag prices. Begin by offering uncut sushi rolls that do not require soy sauce, such as the Chicken Teriyaki roll [Group 23, 2010].
- Offer brown rice sushi for all menu items including rolls and rice bowls. Begin by offering brown rice California or yam tempura rolls as these are already westernized sushi options. Alternative rice options include partially milled rice [Group 23, 2010].
- Encourage proper disposal practices amongst Honour Roll customers by using tape on the containers that says "recycle me" or, if compostable containers are implemented, "compost me" [Group 23, 2010].
- Advertise current and new lighter footprint initiatives. Some potential signage has been designed [Group 23, 2010].
- Develop, implement and advertise a stamp card system to encourage people to consistently bring their own containers. For example, a full 10 stamp card could be redeemed for a free sushi roll or \$2.50 off of a donburi bowl.
- Sell custom sushi roll sized reusable containers at Honour Roll to encourage students to bring their own containers [Group 23, 2010].

TO THE MOON MANAGEMENT & STAFF:

- Implement one or both of the new LOV recipes Beef and Snow Pea stir fry and Leek and Zucchini stir fry. Modify if necessary [Group 7, 2010].
- Implement the following alterations to your current menu items:
 - Dishes with 'mixed vegetables' can include local and seasonal vegetables with the changing months [Group 7, 2010].
 - Use fresh rather than powdered garlic. Preparation using a food processor can reduce the preparation time [Group 7, 2010].

TO THE AMS SUSTAINABILITY COORDINATOR:

- Develop a food storage room so that foods such as apples can be purchased in bulk at harvest time and stored throughout the winter [Group 20, 2010].

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SCENARIO 6:

THE LFS CROPEdia – CREATING AN UBC URBAN AGRICULTURE EDUCATIONAL RESOURCE

Community Partner: Partners Center for Sustainable Food Systems at UBC Farm, LFS Orchard Garden, Agora Café and the LFS Undergraduate Society (AgUS)

LFS 450 Groups: Groups 3, 16, 18, 21

BACKGROUND:

Both the LFS Orchard Garden and the UBC Farm help to connect community, land and food systems, whereby faculty can work with students on local and global food systems issues. Also in the LFS community the Agora Café has been working with student volunteers to increase their food preparation skills, to apply both nutrition and food system concepts learned in their classes and to gain knowledge on local food issues such as seasonality and production methods. Unfortunately, many people, including members of the LFS community, do not know where to find quick and easy information on the plants that can be grown in our climate and due to this lack of information many people are excluded from the educational aspect of the UBC Farm, LFS Orchard Garden and the Agora Café.

SPECIFIC OBJECTIVES:

The stakeholder organizations would like to see the average community member be an empowered eater and to get more involved with their food choices. Through technology, education and easy to access resources this may be possible. To address this, the idea of an encyclopaedia, or Cropedia, for produce grown by the LFS Orchard Garden (LFSOG) and the UBC Farm was developed. The Cropedia is a resource for use by volunteers and community members of these organizations. Students were asked to construct the website and its contents considering that the average person today expects fast, easy to access information presented in an easy to read, aesthetic manner.

CENTRAL FINDINGS:

Students were asked to explain the larger context of the food system that this project is situated in. The following is a list of their findings:

- The global food system is responsible for a large portion of GHG emissions which contribute to air pollution, acid rain, and climate change (Get Local, 2008) [Group 3, 2010].
- Bentley and Barker (2005) report that smog from GHG's can cause up to \$70 million in crop damage each year in southern Ontario [Group 16, 2010].
- According to Farm Folk City Folk (2008) over the past 20 years, import and export of food has tripled resulting in 25% of Canada's energy consumption and GHG emissions can be attributed to food transport [Group 16, 2010].
- Health Canada (2006) points to the availability of inexpensive, easily accessible foods as a potential predominant contributor to the increasing obesity rates in Canada [Group 3, 2010].

WHAT'S HAPPENING AT UBC

- UBC was Canada's first university to adopt a sustainable development policy in 1997. In 2003, UBC received the Green Campus Recognition from the US National Wildlife Federation (UBC Annual Report, 2005) [Group 21, 2010].
- UBC Farm and the LFS Orchard Garden are working towards re-localizing the food system by producing produce. Similarly, the Agora Café and Sprouts are working towards preparing and procuring foods that are as local as possible. These organizations also create opportunities for the community to learn about local food systems [Group 3, 2010].

PROJECT OUTCOME:

The Cropedia site can be found at: http://cropedia.landfood.ubc.ca/wiki/Main_Page

PROJECT RATIONALE

- The Cropedia is a guide that helps consumers better understand the local food system and the crops that can be grown in the local climate.
- Group 16 (2010) reported that "The purpose for creating the Cropedia webpage is to increase awareness of food seasonality and local food to ensure the quality and safety of the food system as well as to promote the sustainable community."
- Cropedia can act as a link between producers and consumers.

THE SITE:

The following is a description of the site.

- Each of the 4 groups was responsible for 11 crop pages resulting in a site that currently has information for 44 crops. Crops were selected based on their academic connections or their economic contributions to the UBC Farm. The crops that were included are: Asparagus, Arugula, Apples, Basil, Broccoli, Beets, Blueberries, Bush beans, Cabbage, Carrots, Filet bean, Garlic, Cauliflower, Chard, Parsley, Oregano, Cherry tomato, Eggs, Raspberries, Pole beans, Cucumber, Head lettuce, Savory, Potatoes, Fresh shelling beans, Kale, Snow peas, Radishes, Kohlrabi, Pumpkins, Sugar snap peas, Rhubarb, Leek, Spinach, Thyme, Rosemary, Sweet corn, Squash, Tomatillos, Sweet potatoes, Sweet onion, Strawberries, Zucchini, Tomatoes.
- Each page contains most, if not all of the following categories of information: crop image, years grown at UBC Farm and LFS Orchard Garden, growing conditions, seasonality, nutritional information, recipes, additional usage inventory, academic connections, references and additional information.
- The LFS Learning Center' Multimedia Developer, Duncan McHugh, helped build the wiki pages and offered technological support.
- Information was obtained through interviews with UBC Farm Market Coordinator, Amy Frye, and LFS Orchard Garden Manager, Jay Baker-French. The nutrition facts panel was taken from the Canadian Nutrient File (Health Canada, 2009).

OPPORTUNITIES

- To expand the Cropedia to other regions, a Craigslist type format could be adopted in which different regions have different hubs and people can post and communicate [Group 3, 2010].
- Cropedia can be publicized through the AMS FBD food outlets that use UBC Farm produce [Group 3, 2010].

KEY RECOMMENDATIONS

TO CROPEDIA MANAGEMENT TEAM

- The UBC Farm staff, LFS Orchard Garden staff, LFS faculty members should collectively update the Cropedia site as these individuals have the most up-to-date information [Group 18, 2010]. The site should be viewed as a work in progress and should be constantly refined [Group 3, 2010].
- An introduction that explains the purpose of Cropedia should be added to the main page [Group 3, 2010].
- The site should be organized into categories of crops including: vegetables, herbs, fruits [Group 3, 2010].
- Have links to the Cropedia site on other related websites: UBC Farm, UBC Food Services, AMS FBD, etc [Group 16, 2010].
- Other sections that should be considered for addition to the site are:
 - Appropriate gardening practices [Group 3, 2010].
 - How to compost [Group 3, 2010].
 - How to make organic fertilizer [Group 3, 2010].
 - An interactive site for users to post questions [Group 3, 2010].
 - Upcoming events page [Group 3, 2010].
 - Academic connections for non-crop specific stuff. [Group 3, 2010].
 - Information on pest and insect interactions [Group 21, 2010].
 - The front page should include a rotating recipe from Agora Café or Sprouts for seasonal produce [Group 21, 2010].
- Current pages should be improved with the following changes:
 - Include hyperlinks to the webpages of the UBC Farm, LFS Orchard Garden, Agora Café and Sprouts Café [Group 21, 2010].
 - More detailed nutritional information with citations [Group 3, 2010].
 - Storage or processing for crop [Group 3, 2010].
 - Information on ripeness and selection of the product [Group 3, 2010].
 - List of companion crops and antagonist crops [Group 3, 2010].
 - A recipe rating system and comment area should be added to the pages [Group 21, 2010].
- The site should be made searchable on Google [Group 3, 2010].
- An evaluative survey should be administered to Cropedia users to help better understand how the site can be improved [Group 21, 2010].
- The site should be advertised at food outlets selling or using UBC Farm and/or LFS Orchard Garden produce [Groups 3, 21, 2010].
- Sustainable food system focused websites often focus on one aspect of food. The gaps should be bridged where possible [Group 16, 2010].

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SCENARIO 7:

IDENTIFYING A DIRECTION OF FOOD SYSTEM EDUCATION OUTREACH AT SPROUTS

Community Partner: Sprouts
LFS 450 Groups: Groups 10, 15

BACKGROUND:

Sprouts is a student volunteer driven club at UBC that is dedicated to fostering food security and community on and beyond our campus. The club's main initiative is the operation of a non-profit hybrid cafe/grocery store in the UBC Students Union Building, which sells local and organic produce, minimally packaged groceries, bulk foods, and café goods. In addition to running the store, Sprouts also offers a number of outreach projects to the UBC community, including a pay-what-you-can lunch called Community Eats, a wholesale buying club, a bicycle-powered grocery delivery service called The Sprouts Box, and a series of free, educational workshops on various cooking and food-related skills.

SPECIFIC OBJECTIVES:

Sprouts requested the help of LFS 450 groups in developing outreach strategies for increasing food system knowledge across campus, especially among populations that do not normally frequent Sprouts and who may have little background on food security and local food issues.

CENTRAL FINDINGS: WORKSHOPS AT SPROUTS

CURRENT WORKSHOPS

- Current workshops focus on cooking. They are 2-3 hours in length, held in the AMS FBD kitchen which has space for 10 participants, and are limited to items that can be cooked in an oven or industrial soup pot [Group 10, 2010].
- The main challenges faced by Sprouts in offering workshops are lack of registration in the workshops and low attendance rates of registered people [Group 10, 2010].
- Currently, most workshop attendees speak English as a first language, are undergraduate students and many are Sprouts volunteers [Group 10, 2010].

WORKSHOP SURVEY RESULTS

A survey was conducted in the Student Union Building (SUB), home of Sprouts, to get a general understanding of the public's awareness of Sprouts, preferences for workshop topics and relationship between food choice and academic field. The survey was conducted on a Wednesday from 1-4pm throughout the SUB and 38 participants were recruited. The survey results follow [Group 10, 2010]:

- 20 participants did not know where Sprouts was located. Of the 18 who were aware of Sprouts' location, only 9 had been to Sprouts.

- The ideal workshop length for 70% of survey participants was 1 hour or less.
- All workshop topics ('food, nutrition and health; gardening and foraging; food and environmental well-being; and 'cultural aspects of food and social justice') had some interest by participants, with the 'Food, Nutrition and Health' topic having the most interest and the 'gardening and foraging' topic having the least. Of note, participants requested indoor gardening workshops, and healthy cuisine workshops.
- It was felt that lack of interest in traditional gardening workshops may be due to lack of access to a garden and that gardening skills may not be immediately useful. Indoor gardening workshops may be of interest as this better fits the respondent's context.

INTERVIEW FINDINGS:

Group 10 interviewed 11 experienced workshop givers. The following is a list of their recommendations [Group 10, 2010]:

- Target a specific audience with a specific interest rather than the general public (Lewis, personal communication, 2010). Examples include: AMS staff, students living in high-rises on campus, the University Neighbourhoods Association, the Musqueam Indian Band, and student graduate societies and cultural clubs.
- Certain audiences may have different schedules than the typical Sprouts audience. It was recommended to have a variety of times for workshops to accommodate several target populations' schedules.
- Respondents agreed that the ideal length for lecture-based workshops is 45 to 90 minutes. All workshops should allow for post-session discussions and socializing.

PROJECT OUTCOMES

WORKSHOPS

In developing workshops, Group 10 developed the following criteria [Group 10, 2010]:

- Workshops will have a focus on food system sustainability;
- Workshops will not be focused only on cooking;
- Workshops should contain a lecture and an experiential learning component;
- Workshops should be consistent with Sprouts' vision and goals, as outlined in its constitution;
- Workshops should appeal to populations on campus who may not be engaged in food system sustainability issues and do not already frequent Sprouts.

Additionally, all workshops should:

- Target Sprouts workshops toward specific communities at UBC and in greater Vancouver who have a limited awareness of food system sustainability issues;
- Limit lecture-based workshops to 1.5 hours or less;
- Consider using the Food Teaching Laboratory in Room 130 of the Food, Nutrition and Health (FNH) building for workshops with a cooking component as it has 6 stoves and a demonstration and tasting area. A Land and Food Systems faculty member may be able to act as a sponsor to offset the cost of renting rooms in the FNH building;
- Consult with the target audience when scheduling workshop dates and times;
- Consider coordinating workshops with other organizations at UBC and in the local community that offer food system-related workshops, particularly the UBC Farm and UBC Botanical Gardens (Bomford, personal communication, 2010);
- Translate promotional material for Sprouts workshops into non-English languages.

The following workshop topics were identified in consultation with the Sprouts board members. A workshop description and implementation details for each topic have been provided to the Sprouts management committee [Group 10, 2010].

- Apartment Sized Vegetable Gardens
- Local Pumpkin Pie

- Edible Flowers Class
- Drying your Own Fruit
- Soil and the Body: Connecting Human and Ecological Well-being
- Wild Campus Foraging
- Children and Healthy Eating
- Ethnic Foods Using Local Ingredients

SPROUTS BOX AND BUYING CLUB

Group 15 analyzed the Sprouts CSA box program and the Bulk Buying Club. The following are their findings and project results:

SPROUTS BOX

- 2008-2009 was the first year of the Sprouts Box program. 2 boxes are offered at \$15 (recommended for 2-3 people) and \$20 (recommended for 3 or more people). The boxes contain local, organic and seasonal produce and are delivered weekly [Group 15, 2010].
- There is interest in expanding the program to include pick up. Sprouts will be obtaining a new office space which will allow for the expansion of the program [Group 15, 2010].

Opportunities

- Sprouts can offer a variety of box options including [Group 15, 2010]:
 - A fruit-only box (summer)
 - A vegetables-only box
 - A grocer's box: fruit, vegetables, herbs and other (eggs, bread, milk, cheese)
 - The works: fruit, vegetables, herbs, and bulk-buys
- Sprouts can offer boxes in a variety of sizes
 - Individual
 - Large family
 - Group
- Sprouts could offer a pick-up box program. The pickup time could be offered two days a week to help meet participants' schedules. A pick-up deadline will have to be enforced. To do this it would be beneficial to maintain an email group of participants for communication [Group 15, 2010].

BUYING CLUB

- The Sprouts Buying Club gives members access to buying bulk ingredients to avoid middleman mark ups [Group 15, 2010].
- Currently, there is little outreach to the community regarding participation in the buying club [Group 15, 2010].
- A list of distributors and available products are available on the Sprout's webpage [Group 15, 2010].

Outreach

- Group 15 emailed 20 AMS student clubs inviting them to participate in the Buying Club. 1 club responded. The low response rate is postulated to be due to timing as the email went out at the end of the semester [Group 15, 2010].

KEY RECOMMENDATIONS

TO SPROUTS MANAGEMENT TEAM:

- Implement the recommended workshops designed by groups [Group 10, 2010].
- Promote Sprouts workshops through booths hosted at community events. Sprouts could initiate an outreach sub-committee to coordinate volunteers for such events [Group 10, 2010].
- Use the following outreach strategies [Group 15, 2010]:

- Email AMS clubs at the beginning of the year in hopes that the timing will be better.
- Design flyers posters and brochures advertising the Bulk Buying Club and the Sprouts Box. Distribute to residence mail boxes, AMS clubs and other community members.
- Promote Sprouts initiatives before core arts and science classes to help attract new audiences.
- Increase the interaction that participants in the program can have. A discussion board could be added to the Sprouts webpage so that participants can discuss and recommend products to one another.
- Offer workshops on how to bulk-buy and how to use the Sprouts Box.

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SCENARIO 8:

DEVELOPING AN INTERACTIVE WEB-BASED RESOURCE OF UBC-VANCOUVER SUSTAINABLE FOOD SYSTEM INITIATIVE

Community Partner: Andrew Riseman, UBC Campus Sustainability Office
LFS 450 Groups: Groups 14, 24

BACKGROUND:

As a research intensive university with a stated commitment to sustainability, UBC is in a position to establish a new paradigm of how large institutions can reduce their impact and reliance on the natural systems that sustain them. While much is being done across campus to achieve our campus' sustainability goals, much more can be done through improving awareness and strengthening connections between initiatives to make project results more broadly available.

SPECIFIC OBJECTIVES:

Groups were asked to create a web-based, virtual environment using geo-referenced information linked to campus locations related to sustainable food system initiatives including production, sustainable food purchase options, food related SEEDS projects, and outcomes of previous LFS 450 reports, to engage all campus stakeholders in promoting, supporting and learning about UBC's sustainability practices.

CENTRAL FINDINGS:

INTERVIEW RESULTS:

Interviews were held with Place Vanier, The Pendulum, Sprouts, Bean Around the World and AMS Food and Beverage Department all of whom use UBC Farm produce. The questions focused on the demand, preference for, benefits and challenges of using UBC Farm produce. Interviewees were also asked about their interest in potential technologically based projects promoting campus food sustainability initiatives. The following are their findings [Group 24, 2010]:

- All food establishments supported the idea of using technology to help find food establishments using local produce.

Ralph Wells- The Sustainability Manager for the University Neighbourhood Association

- Wells (personal communication, 2010) feels that a web-based application for locating local foods on UBC Campus would be useful for his group as sustainability is an important interest area for them.

Place Vanier Dining Room

- There is observed preference for UBC Farm and other local produce and the presence of such items is believed to have brought in new customers to the establishment.
- Only about 50% of students read signage.
- When food prices greatly increase due to local procurement, the price for the menu item is increased. Reducing the price is not believed to be an effective method for increasing the acceptance of local organic foods as students have pre-paid meal plans which make price less relevant.

The Pendulum

- Menu items that incorporate UBC Farm produce are often vegan and are quite popular.
- When UBC Farm produce is not available due to low supply or seasonality, The Pendulum orders the same ingredients from elsewhere.

Sprouts

- Menu items are based on what is available seasonally from local producers.

Bean Around the World

- At the UBC Campus store there is much interest in local and vegan items.
- The establishment does not currently use UBC Farm produce but is interested. Prices for the items would have to cover costs.

AMS Food Outlets

- Data has not been collected looking at preference for items with UBC Farm produce. Items containing UBC Farm produce are well received.
- Menu items containing UBC Farm and other local produce are specifically priced to match other menu items' pricing so that price does not become a deterrent for students to try dishes featuring local items. Nancy Toogood, the AMS Food and Beverage Department's Manager, indicated that the revenues made by other products help balance any losses for using local foods.

SURVEY RESULTS:

The entire UBC Campus community was identified as the target audience for potential technologically based projects promoting campus food sustainability initiatives. A survey was designed to gather information on what the types of technology used by members of the UBC community and the on-campus food choices they make. The survey was administered near food outlets including Ike's café, Tim Horton's, Bean Around the World, Agora, and in the SUB; in the classes of our group members; and near UBC student residences. 167 surveys were completed for analysis. The following are their findings [Group 24, 2010]:

- 78% of survey participants were 18-24 years old and 18% were 25-55 years old. 64% were female. 30% lived on campus.
- 96% of respondents have access to a computer. 71% of participants used 5 or more of the 10 listed technologies with Email, Facebook, and Google Maps being the most popular applications.
- 23% of respondents used an iPhone, 22% used an ipod Touch, and 19% used Twitter.
- Survey participants were asked what food outlets they frequent between outlets that feature local foods (Agora, Sprouts, Sage Bistro, Vanier, Totem, Bernoulli's Bagels, Pie R², The Honour Roll, Ike's Café) and outlets that do not (Starbucks, McDonalds, Tim Hortons, and Subway) but were not informed what the survey was attempting to measure. It was found that 38% of the respondents selected restaurants that serve local foods, 50% selected restaurants that do not, and 12% selected both types.
- It was found that the same group of people who reported choosing food establishments that serve local food options, also tended to rank choosing restaurants that serve local foods due to the lower carbon footprint of local foods and choosing local foods because they support

the community as important or very important as compared to the groups of respondents that do not choose food outlets that serve local foods.

- Respondents were asked how confident they were that they would eat local foods in the coming week with 34% respondents indicated that they were very confident.
- 58% of respondents reported that they would be interested in a web-based application to help locate local foods on campus.
- Identified biases of the survey include: sample was not likely representative of the entire UBC community due to biased survey administration locations resulting in groups of respondents that may have similar viewpoints.

IDENTIFIED RESOURCES

- Yelp (2010) is an online forum for locating and sharing feedback on restaurants and other businesses in an area [Group 14, 2010].
- Green Maps uses on-line maps to promote sustainable community development (Green Map Systems, 2009) [Group 14, 2010].
- On-line mapping program www.batchgeocode.com can be used to plot an on-line map from addresses entered in an Excel spreadsheet [Group 14, 2010].

PROJECT OUTCOMES:

FACEBOOK PAGE:

Each group was asked to define the context for the scenario. The following are their findings:

- The Nielsen Company showed that Social networking 'membership communities' are the 4th most popular internet activity with email being the 5th most popular (NielsenWire, 2010) [Group 24, 2010].
- Facebook is the fastest growing of the top 3 most visited social networks sites [Group 24, 2010].
- A Facebook Fan page titled "Eat local + Organic at UBC" was created that is accessible to all Facebook users. The page currently includes a Google Map of UBC sustainable food initiatives. It is thought that coupons for campus establishments and recipes using local foods could be made available on the site [Group 24, 2010].
- A Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis was performed on the Facebook fan page [Group 24, 2010].

<p><i>STRENGTHS</i></p> <ul style="list-style-type: none"> - Little explicit cost - Easy to set-up and maintain - High number of users already 	<p><i>WEAKNESSES</i></p> <ul style="list-style-type: none"> - Requires weekly if not daily maintenance (suggested 1 hour/day) - Limited expertise in social media
<p><i>OPPORTUNITIES</i></p> <ul style="list-style-type: none"> - Great potential for growth – to increase awareness, knowledge towards local foods. - Integration of all communication strategies (phones and other portable devices can access Facebook) 	<p><i>THREATS</i></p> <ul style="list-style-type: none"> - No guaranteed results – i.e. an unreceptive audience - Facebook may be a fad and becomes quickly replaced by a more prominent competitor social media application.

BLOG: SUSTAINABILITY INITIATIVES ON UBC CAMPUS

Group 14 constructed a blog titled "UBC-Vancouver Sustainable Food Systems Initiatives " can be found at <http://ubcsfsi.blogspot.com/p/ubc-sustainable-food-system-initiatives.html> . The blog contains a Google map with all 52 identified sustainability initiatives on the UBC campus. The map also contains edible food plants across campus that were identified by Bartley (2008). The database contains the following features [Group 14, 2010]:

- The represented organizations include both food related sustainability initiatives as well as non-food related initiatives.

- A cross word puzzle focusing on UBC sustainability initiatives to increase awareness by users.
- A google map identifying the initiatives included in the database.

THE AMAZING SUSTAINABILITY INITIATIVES RACE

Group 14 envisioned an iPhone application that could encourage participants to interact with the built world to discover sustainability initiatives on campus through the virtual environment. A summary of the outcomes follow [Group 14, 2010]:

- According to Morgan Reid of the LFS Learning Center (personal communication, 2010), iPhones are used by an estimated 15% of cell phone users. iPhones can run down-loadable software applications that can incorporate features such as internet, assisted GPS, digital compass, multi-touch screen, and a virtual keyboard (Apple Inc., 2010).
- The cost to develop an iPhone application is \$99/year (iPhone Dev Center, 2010).
- The envisioned iPhone game involves students being on site at the UBC campus. Students are given clues and are prompted to find different sustainability initiatives on campus. When one initiative is found another clue becomes available. Bonus questions called 'road blocks' are included in the game. The game would be timed and linked to facebook so that participants can compare their results with others. At the end of the game, a coupon for a featured sustainable initiative will appear.
- The game was not able to be developed due to lack of expertise and funding. Group 14 produced a document titled "How to make an iPhone App: The Basics" for use by a future groups that would like to pursue the idea.

KEY RECOMMENDATIONS

To UBC COMMUNITY STAKEHOLDERS:

- Provide coupons for services (café coupons, etc.) for use on the Facebook fan page [Group 24, 2010].
- Continue to develop the google map, blog, smart phone applications and facebook page to enhance campus engagement in sustainability.

To FUTURE LFS 450 STUDENTS:

- Design the iPhone application and organize a promotional event [Group 24, 2010].

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ACCOMPLISHMENTS 2010

The following is list of accomplishments associated with the UBC Food System Project. The majority of accomplishments reported below are the result of the 2010 students groups. In addition, a selection of accomplishments which resulted from the 2009 UBCFSP iteration are also reported here; specifically accomplishments which accrued after the publication of 2009 *UBCFSP Summary*.

FOOD PRODUCTION:

- The AMS New SUB Committee reviewed and accepted the group's proposal for a rooftop garden to be included in the plans for the New SUB. As a result, the SUB will be built with infrastructure to accommodate a future garden. The committee agreed that a second project phase is needed; as a result a project proposal to create a formal business plan for the garden will be offered to UBC MBA students and a formal crop production plan proposal will be completed by a directed studies student in Fall, 2010.
- LFS Orchard Garden coordinator, Jay Baker-French, implemented the 2009 group's recommendations to consult with Agora Café and AgUS in his crop choice for the 2010 summer season. The Agora Café is now purchasing summer produce from the garden and processing and freezing the goods for winter use.
- The LFS Orchard Garden enclosure was planted with blueberries, kiwi and dwarf apple trees among other crops recommended by the 2009 group LFSOG proposed plans.

FOOD PROCUREMENT:

- As recommended by the procurement scenario groups, UBC Food Services has replaced all their tofu with Victoria based Dayspring's organic and locally produced tofu line, which also resulted in cost savings as recommended by groups. Requests for tofu have increased from 1 to 35 requests per day in UBC Food Services' Place Vanier residence cafeteria according to head chef Steve Golob.
- UBC Farm sales to Place Vanier have increased 30% over the last year from \$800 in 2008 to \$1400 in 2009.
- As a result of previous LFS 450 groups' recommendations, UBC Farm flowers are now procured by UBCFCS at both Place Vanier and Totem Residence to display on their dining tables and at special events.
- As a result of relationships established between UBC Food Services and Discovery Organics in 2007/2008 which led to the procurement of the first local organic apples on campus, UBCSFS is now purchasing 100% local and organic whole fruit from Discover Organics throughout the school year.
- Sprouts is further exploring the option of expanding their current 'Sprouts Box' home delivery program to include a grocer's box in which bulk buying options are divided between boxes.
- The AMS Sustainability Coordinator, Justin Richie, and the AMS Food and Beverage Department Manager, Nancy Toogood, are pursuing group recommendations to include a 'root cellar' type food storage unit and an Eco-box reusable container program in the new SUB.

FOOD PREPARATION AND CONSUMPTION:

- The AMS Food and Beverage Department's 'The Honour Roll' will be offering a brown and white rice combination in their sushi beginning in September, 2010 in an effort to

increase the nutritional value of the sushi and to introduce less processed foods into the menu items.

- The Head Chef, Steve Golob, of UBC Food Service's Place Vanier has developed 140 new recipes focusing on local food. The new menu is color coded to highlight alternative food choices such as vegan, vegetarian, iron rich and gluten free. Some of these recipes have been nutritionally analyzed and added to the Cropedia site.
- As recommended in previous years, Agora Café is now preserving summer harvest produce from the LFS Orchard Garden and UBC Farm for use during winter months.

FOOD POLICY, GUIDELINES & PLANS:

- UBC Food System Project is a member of the Climate Action Plan's (CAP) Food Action Team and will report to the team on a semi-annual basis.

FOOD MARKETING & EDUCATION:

- Groups successfully organized and implemented a 'Meet the Farmer Event' in March, 2010 to raise student awareness of UBC Food Services' increased use of UBC Farm and BC products. As a result of the event's success, it will be expanded to include the AMS FBD and will be held in a more central location in September, 2010. In addition, an event template was developed to serve as planning resource for future similar events.
- Sprouts Management will begin to offer the 2010 LFS 450 student designed workshops over the course of the next year. These workshops focus on local food system sustainability issues and offer participants an opportunity to learn new skills. Some workshops include: Apartment Sized Vegetable Gardens, Drying your Own Fruit, and Wild Campus Foraging.
- Sprouts will advertise their student oriented services in the campus residences in September, 2010 to help raise awareness of the programs to students who may not otherwise seek them out. For example, students in the Gage Towers residences may be interested in participating in the bulk buying club.
- The 2009 recommended UBC Farm Carbon Smart food guide was published and is being dispersed at the weekly farm markets, and campus sustainability related events. The 'Eat Carbon Smart' website offers supporting information about a carbon smart diet and is located at <http://eatcarbonsmart.ca/>.
- The AMS FBD has implemented a new seasonal menu campaign including the Fall Harvest Items as a spin off of the Eco-label LOV items which groups proposed and implemented in 2008.
- The UBC Food System resource titled 'Cropedia' was developed as a resource for UBC food system members. The site details growing, harvesting, preparation, and nutrition information as well as recipes for 44 crops grown at the UBC Farm and the LFS Orchard Garden. The site can be found at http://cropedia.landfood.ubc.ca/wiki/Main_Page. Regular recipes with links to the *Cropedia* will also be featured in UBC's Health Safety and Environment (HSE) Healthy Promotions Program (HPP) Healthy UBC blog and in their monthly Healthy UBC Newsletter.
- Seasonal recipes developed by 2008 LFS groups as well as a link to the Cropedia site will be included in "UBC Local Food Cookbook" developed by the Campus Sustainability Office based on a Health Safety and Environment (HSE) "Healthy Workplace Initiatives Fund".
- A Google Map of the UBC Campus sustainability initiatives was developed as a tool for students and faculty to be able to more easily locate campus sustainability initiatives. It is now available at <http://ubcsfsi.blogspot.com/p/ubc-sustainable-food-system-initiatives.html>

- UBC Farm has printed and is distributing the Carbon Smart Food guides that were inspired and informed by students in 2009.
- The UBC Food System Project now has a web-page describing the project and a blog where stakeholders can report impacts as they occur.
<http://blogs.landfood.ubc.ca/foodsystemproject/>

WASTE MANAGEMENT:

- At the 2010 AMS Block Party, the AMS Food and Beverage Department piloted this year's group recommendation to offer uncut sushi rolls in cellophane packaging. This was done in an effort to significantly reduce waste derived from the plastic containers in which sushi rolls are currently sold. As a result of the pilot's success, AMSFBD's 'The Honour Roll' will incorporate uncut sushi rolls starting in September 2010 in an effort to reduce packaging waste. The first rolls to be included are the chicken teriyaki roll, California roll and avocado roll.
- The AMS Sustainability Coordinator put forward a proposal for an Eco-Box program in the new SUB. The idea will be pursued by an Applied Biology course and Applied Science course in September, 2010.
- LFS OG has established and maintained a three bin composting system as recommended by 2009 UBC Food System Project students.

PARTNERSHIPS:

- The UBCFSP and SEEDS Program has joined a group to partner with the City of Vancouver in the "Public Food Procurement Policy Partnership."
- THE UBCFSP established a formal partnership with the New SUB Coordinator and other members of the New SUB Committee to help advance the New SUB's sustainability mandate by developing corresponding academic projects to meet this mandate.
- The UBC Food System Project will now partner with the Think&EatGreen@Schools Project housed in the Faculty of Land and Food Systems to work with University Hill Secondary school located on the UBC Campus to improve its food systems.
- The UBC Food System Project will now partner with the AMS Rooftop Garden Committee to bring an academic affiliation to the garden.
- UBC Food System Project is a member of the Climate Action Plan's (CAP) Food Action Team and will report to the team on a semi-annual basis.