UBC Social Ecological Economic Development Studies (SEEDS) Student Report

Climate Action Partnership. Contribution of Food Greenhouse Gas Emissions Reductions: Moving UBC Beyond Climate Neutral

Collin Ankerson, Paul Chiang, Jolinca Chien, Sarah Chin, Alex Chiu, Chris Chiu, Cindy Chiu

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Scenario 1: Climate Action Partnership. Contribution of Food Greenhouse Gas Emissions Reductions:

Moving UBC Beyond Climate Neutral

Group 5

Collin Ankerson

Paul Chiang

Jolinca Chien

Sarah Chin

Alex Chiu

Chris Chiu

Cindy Chiu

Table of Contents

Abstract

This report was conducted as part of the UBC Food Systems Project to observe the effects of increasing food production at the University of British Columbia (UBC) and the effects it will have on greenhouse gas (GHG) emissions. The majority of foods served on campus originate from an external source. This study attempts to quantify the GHG emissions from the transportation of the food to campus and to estimate the reduction in GHG emissions by growing the same crops in UBC as an alternative. Using potatoes as a sample crop and estimating a harvest of 0.378 tons of potatoes on a 600m^2 plot similar to the Land and Food Systems (LFS) Orchard Garden, 0.019 tons of Carbon Dioxide (CO_2) emissions can be saved. This sample calculation, however, examines potatoes which are grown fairly locally and uses a small plot of land contributing to a fraction of the food consumed by inhabitants of UBC. By replacing potatoes with another crop purchased from a more distant source or by increasing the yield of the crop, the amount of GHG savings can be increased. Initiatives on campus such as the LFS Orchard Garden have shown that food production is feasible not only on the UBC Farm. Increasing food production at feasible sites and replacing them with imported food will decrease GHG emissions associated with food procurement.

Introduction

In the past few centuries, GHG emissions from human activities have increased exponentially which has led to an overall increase in GHGs in the atmosphere. The dramatic increase in GHG emission was produced primarily from the burning of fossil fuels for energy. GHGs in the atmosphere have effects on climate and can lead to various changes in environment and weather. It is estimated that over the past century, there has been an increase of 0.6 to 0.9 degrees Celsius in the Earth's climate causing greater extremes in temperature worldwide (Energy Information Administration, 2008). This has led to what is commonly known as "global warming". Global warming has been associated with negative consequences such as droughts or cold weathers leading crops to fail. Other effects include the melting of ice caps in the north and south poles increasing global sea levels, reducing rainforests and damaging other ecosystems, and increasing natural disasters (Global Warming, 2007). It is estimated that global warming will

further increase this century by roughly 2 to 4.5 degrees Celsius unless people begin to make changes to reduce GHG emissions globally (AGSC 450, Group 30, 2008).

UBC as a whole has started initiatives to reduce GHG emissions on site. One example is the UBC Food Systems Project (UBCFSP). For the past eight years, it has been a continuing collaboration between the Faculty of Land and Food Systems (LFS), AMS Food and Beverage Department (AMSFBD), UBC Food Services (UBCFS), UBC Sustainability Office, UBC Farm, UBC Waste Management, UBC Sage Bistro, UBC Campus and Community Planning (CCP), and Sauder School of Business classes. As part of the fourth year cap-stone course Agricultural Sciences 450 (AGSC 450), the UBCFSP aims to create a sustainable food system on the UBC campus through the group efforts of students and partners.

In 2007, the government of British Columbia (BC) legislated that all public sector organizations such as universities, hospitals and government operations must be carbon neutral by 2010, meaning that these institutions should have a zero net GHG emissions by 2010 (Penner, 2007; BC Ministry of Environment, 2008). As a university, UBC is therefore obliged to be accountable for its GHG emissions. Since most GHG emissions come from the combustion of fuels to produce energy, this report aims to reduce GHG emissions from the transportation of food items (Energy Information Administration, 2008). UBCFS and AMSFBD currently serve approximately thirteen to fifteen thousand meals each day but most of the ingredients for these meals must be brought on site from other locations (AGSC 450 Group 30, 2008). If food production was to increase on campus, it may be possible to achieve our goal of reducing GHG emissions through the

reduction of food miles.

Problem Statement

The rapid climate change on our planet is directly influenced by the increasing GHG emissions in our environment. As reported by the International Panel on Climate Change, there was a 70% increase in GHG emissions and an 80% increase in CO_2 emissions globally between 1970 to 2004 (2007). These numbers would continue to rise if we do not make significant changes to our way of living. The damage of climate change towards our food system is vast. For instance, it could shorten growing seasons of our crops and deteriorate our produce through extreme weathers.

GHGs include carbon dioxide (CO_2), methane, nitrous oxide, hydrofluorcarbons, perfluorocarbons and sulphur hexafluoride but are often calculated in terms of tons of CO_2 equivalents. CO_2 is the main GHG produced in the consumption of fossil fuels and since different GHGs contribute to the greenhouse effect in different ways, using tons of CO_2 equivalents standardizes GHGs on an international level (Energy Information Administration, 2008). Carbon neutrality for a facility can be achieved in three different steps. First, the carbon emissions of a typical day must be measured, recorded, and broken into three scopes (BC Climate Action Secretariat, 2007). Scope 1 is related to direct emissions from fossil fuel consumption such as from driving and running machinery (Pacific Carbon Trust, 2009). Scope 2 is from indirect emissions purchased from other companies, for example electricity and steam (Pacific Carbon Trust, 2009). The third scope is another form of indirect emission that is used but is not owned by the facility, such as a business trip on an airplane (Pacific Carbon Trust, 2009). After

GHG emissions are calculated, next is to aggressively reduce these emissions. This can be accomplished in a variety of different ways such as reducing fossil fuel consumption, using sustainable sources of energy, and disposing of waste products properly. The last step in achieving a carbon neutral facility is to offset any remaining carbon emissions by purchasing GHG offsets. GHG offsets are used to invest in GHG reduction projects such as renewable energy or carbon sinks (Pacific Carbon Trust, 2009). The GHG offsets are priced at $25 per ton of CO_2 equivalent gas (Pacific Carbon Trust, 2009).

In the pursuit of becoming carbon neutral and beyond, UBC has made numerous alterations and developments on our campus to reduce GHG emissions. For example, with the aid of the ECOTrek program, energy emissions produced by the campus and buildings has been reduced over 20% (Ferris & Best, 2007). Also, with the development of the Climate Action Partnership (CAP), the Sustainability Office and other sectors on campus are working collaboratively to reduce GHG emissions by creating a GHG emission profile and inventory of UBC, and also conducting climate change solutions. However, the emissions created by the UBC food system are difficult to quantify. Therefore, it is important to investigate which divisions inside the food system are a major contributor to GHG emissions, and discover new methods and ideas that minimize these GHG emissions.

In recent years, the severity of global climate change has been recognized and the path to resolution has been embraced by individuals and institutions all over the world. Colleges and universities are no exception, and may even play a more important role in furthering innovation due to their shaping of society by producing well educated

graduates. Campuses across North America are forging important partnerships, setting aggressive targets, and drafting realistic policy proposals. In the United States, presidents of colleges and universities have formed the American College and University President's Climate Commitment. The 620 signatories have committed their respective institutions to a series of detailed steps that lead to carbon neutrality (Presidents Climate Commitment, 2008). The Association for Advancement of Sustainability in Higher Education has compiled a list of campuses with climate action statements (AASHE, 2009). UBC is currently in the process of drafting its climate action statement to fulfill its commitment to the University and College Presidents' Climate Change Statement of Action of Canada (UBC Sustainability Office, 2009).

The food system and its effects on the climate change at UBC are being researched through the UBCFSP in AGSC 450 classes. In its eight years of implementation, the project has produced countless recommendations that have led to major steps toward a more sustainable food system. Some of these include the AMS Lighter Footprint Strategy, UBCFS's commitment to sustainability and decision to buy locally when feasible, and the placement of compost bins all over campus.

The UBC farm has supplied the campus with food for sale directly to consumers through Sprouts, a student-run food operation; the farm's Saturday market; and its Community Supported Agriculture (CSA) box program (Amy Frye, personal communication, March 4, 2009). By providing this local food option, the emissions that would be released in transportation are saved. Establishments on campus have also been able to make use of produce from the farm in their daily operations, and some have even designed new menu items around those ingredients (Steve Golob, personal

communication, March 4, 2009). The farm has also served as a research site for new agriculture projects, some of which examine ways of reducing GHG emissions.

Universities in North America, and especially in BC, will undoubtedly continue to become more aggressive in their policies toward climate change because of the rising carbon tax, the cap and trade system that will likely to come into effect with the Western Climate Initiative of 2009, and the cap and trade policy being proposed by the Obama administration in the United States. This economic incentive to reduce emissions will lead universities to examine their food systems and the ways in which they affect GHGs and climate change. If UBC or other institutions develop new and valuable methods to lessen the impact of climate change, the entire global system would also benefit. The rise of organic food industry and local food produce are two prime examples the effort to mitigate the effects of climate change and minimizing GHG emissions. More importantly, awareness on the impact of climate change is growing gradually in a global basis as more people are learning and purchasing organic food or local food produce. Also, more people are realizing how the use of pesticide would not only deteriorate the quality of food but also increase GHG emissions.

The UBC food system has a direct impact on GHG emissions, such as food production and distribution on campus, and food mileage that is produced by the imports of food. However, these emissions are not accounted in the UBC GHG emission profile (AGSC 450, Group 21, 2008). Our objectives of this project are to investigate how much of an impact increasing food production on campus has on reducing GHG emissions as

well as how to begin a food production project on our campus.

Vision Statement and Identification of Value Assumptions

A vision statement was developed through the collaborative effort between partners of the UBCFSP and seven generations of AGSC 450 students. It outlines seven guiding principles to achieve a sustainable UBC food system. The statement can be found in Appendix A.

Our group agreed with the underlying ideas behind this statement but also discussed the consequences of adhering to the seven guiding principles. We understand how the statement is able to encompass all six project scenarios of the 2009 UBCFSP. Although some scenarios dealt with specific food vendors and others, such as the scenario for this report, were more general, the whole project was interconnected to strive for a sustainable food system on the UBC campus. During our discussion, we identified certain challenges and barriers that may be difficult to overcome on the way to enhancing diversity and quality of the ecosystem and to improving social equity. For example, social equity may not be solved by improvements to the food system or by localization of food alone. There are factors pertaining to social equity that may only have a small connection to food. While some members of our group felt that reaching these goals would be difficult and perhaps impossible, we noted that the statement was a vision to work towards. Some members were hopeful that with small steps similar to the ones we are taking for the UBCFSP, what appears to be impossible can be achieved. The following are suggestions on how the vision statement could be changed to better reflect a sustainable food system:

1. *To the greatest extent possible while keeping economic sustainability in mind*, food is locally grown, produced, and processed.

2. *Production of waste should be minimized, but* waste that is produced must be recycled or composted locally.

4. Providers and educators promote awareness *including issues surrounding each topic* among consumers about cultivation, processing, ingredients and nutrition.

As a group, we held a weak anthropocentric viewpoint. We understand that while human needs are most important, environmental health in itself is valuable as well. We agreed the maintenance of a healthy, sustainable environment is necessary for human well-being. Strong anthropocentrism differs from weak anthropocentrism in that it views nature as important for human benefit only. Our research question also reflected a weak anthropocentric stance. Food must be provided for students, faculty, staff, and visitors on the UBC campus first and foremost. However, would increasing food production on campus benefit the environment in terms of climate change?

Methodology

The methodology for our group consisted of four major sections: literature review, personal communication, carbon emission calculations and a short survey. In our literature review, we began by reading past AGSC 450 reports as well as a summary report on the findings from the whole 2008 UBCFSP written by a working group formed at the end of AGSC 450 2008. From the summary report, five targets to carbon mitigation were identified. For the purpose of this paper, we chose to focus on the target of increasing food production on UBC campus. We then looked into determining whether or not growing food on campus as opposed to sourcing off campus would have a real

decrease in carbon emissions. To do so, we began by conducting background research on GHGs associated with agriculture and transportation. We also looked into past initiatives on the UBC campus and other campuses to grow food and how those projects began.

Further information on where UBC is in terms of food production were obtained from e-mail communication with Jeff Nulty, Landscape Designer of UBC Plant Operations, Liz Ferris, Climate Action Coordinator, and Jan Fialkowski, Executive Director of University Neighbourhood Association. An in-person appointment was also organized with Dr. Andrew Riseman, Associate Professor in LFS, who provided us with information on the process of creating the LFS Orchard Garden, a current project in campus food production. Guest lecturers such as Andrew Parr, Director of UBCFS, Steve Golob, Chef at student residence Place Vanier, Amy Frye, UBC Farm Marketing Coordinator, and Mark Bomford, UBC Farm Program Coordinator, for AGSC 450 were also a source of our research. Equations used for the carbon emission calculations were obtained from online sources as well as through our teaching assistant, Tegan Adams. Values used within the equations were from Dorothy Yip of UBCFS and Statistics Canada. A short survey was conducted on UBC students from various faculties to assess community support for food production on campus (refer to Appendix B).

Logically, determining whether or not carbon emissions are significantly reduced due to increase food production on campus should be completed before setting out to find out how to do so. However, we conducted our research in carbon emissions and how to start a garden concurrently due to time constraints and lack of expertise in carbon

calculations which prolonged the process. It is important to note though that food production at UBC will have benefits other than contribution to mitigate climate change.

Findings and Discussion

One of the most important inputs into any food system is food itself. UBC food system is fortunate enough to have a small portion of the fresh produce used, be grown on campus at the UBC farm. According to Steve Golob (personal communication, March 4, 2009), Head Chef at Place Vanier, a student residence at UBC, 90% of vegetables ordered for the dining hall is from the United States. Of the produce grown by the UBC Farm, 8% is sold to the UBC food system. This accounts for $9400 worth of goods that goes into a variety of facilities and events across campus such as Sage Bistro, Agora, residence dining halls, and the Agricultural Science Undergrad Society's (AgUS) weekly barbeques (Frye, personal communication, March 4, 2009). Although produce from the UBC Farm may cost more than off campus sources, the superior quality is apparent to Place Vanier chefs, causing them to want to acquire more (Golob, personal communication, March 4. 2009). However, the farm sells a majority (61%) of its produce to the public at the Saturday Farm Market, some to restaurants around Vancouver, and also to various other customers including farm staff (Frye, personal communication, March 4, 2009). From the high demand, it would be logical for the farm to try and grow more food, but there have been many barriers to expansion. Comprising of 24 hectares of land, only 10 hectares are cultivatable and emphasis on activities on the farm must be on education rather than on profit (UBC Farm at UBC, 2009; Mark Bomford, personal communication, March 4, 2009). Unpredictable demand, difficulties in guaranteeing

production, inconsistent help due to reliance on volunteers, and logistic complications with delivery are also barriers (Frye, personal communication, March 4, 2009).

In a short e-mail with Jeff Nulty, Landscape Designer of UBC Plant Operations, he informed us on the ongoing food production areas on-campus. However, he is aware that there is very little food production within the campus core. These areas often involved small-scale productions for the purpose of ornaments (Nulty, personal communication, March 10, 2009). For example, the Sage Bistro maintains a few pots with herbs on the patio of the University Centre, which the cooks use for the restaurant. Overall, our interpretation of the data collected from Mr. Nulty is that food production within the campus core is not valued by the university at this point.

Many initiatives to grow food on campus have been unsuccessful, even when the project was a small herb garden. For example, rules concerning safety prevented the UBC Graduate Student Society to implement a rooftop garden at Thea Koerner House as well as UBCFS to start an herb garden at Place Vanier (Tegan Adams, personal communication, February 25, 2009; Andrew Parr, personal communication, March 4, 2009). There are currently plans for an herb garden for the new Student Union Building on campus where many food outlets are concentrated (Liz Ferris, personal communication, February 25, 2009). Two successful operations that have been developed are the University Neighbourhoods Association's Community Garden (UNACG) and the LFS Orchard Garden. The UNACG is located in the Hawthorn Place residence neighbourhood off Main Mall on UBC campus (Jan Fialkowski, personal communication, April 2, 2009). It is a program that involves residents applying for and

taking care of their own small plot of land. All flowers and produce grown must only be for personal use and cannot be sold (UNACG Manual, 2008). On the other hand, the LFS Orchard Garden, described below, is not a private plot opened to only residents.

LFS Orchard Garden

In 2008, the LFS Orchard Garden was developed as a product of Agroecology Directed Studies and AGSC 450 courses. It is a 600m^2 plot located just behind the MacMillan building and has been used to produce potatoes, garlic, beets, squash and other seasonal crops. We decided to investigate the development of this site as a basis for future agricultural plots. During a meeting with Dr. Andrew Riseman (2009), we discovered that in order to use campus land, the main step is to send an application to CCP. The CCP is a large organization concerned with planning all aspects around UBC including the infrastructure of the academic core and the growing University Town community. CCP works with the Provincial Government of BC, The City of Vancouver, The University Endowment Lands, the Greater Vancouver Regional District and the citizens of Electoral Area A to set developing guidelines in the best interest for the future of UBC. A development handbook was created by the CCP to describe what is necessary for a new development. Developments are separated into non-institutional uses or institutional developments which we are concerned with depending on whether research is being conducted on these sites. The application for the site must include site plans, drawings, and schedules with legends and compass roses so that the director reviewing the application may have an accurate description of the proposed site. If the application is accepted, then construction can begin on the site. Depending on what the site is, a contract may be created detailing how long the site is available for use before the

university can reclaim it for other purposes. The LFS Orchard Garden was given a two year period while they were promised to be undisturbed for a minimal of four years.

Community Support

A major determinant of the success in projects on campus is community support. This section aims to briefly assess whether there would be support for food production projects on UBC campus.

In order to have a general idea of community support from the students on campus, we conducted a survey and asked if they would like to contribute to increasing local food production in any of a variety of ways. Students were asked if they would like to be involved in growing food on campus through course work, volunteering, paid work and/or researches. From our data, we found that more than 66% of students would be willing to participate in growing food on campus through one or more of those pathways mentioned above. Moreover, about 80% of students would support food grown locally, such as from rooftop gardens and community gardens. Students indicated that they would be most willing to participate through paid work (55%), and the least through research (25%). Although a scale survey with a small sample size, it reached students in a variety of faculties including LFS, Commerce, Arts, Computer Science, Applied Science, Science and Music to minimize bias. It is interesting to note that only 48% of respondents indicated that it matters where their food is coming from, and the students who answered "yes" are mostly from Commerce and LFS. This may be from a lack of education in the effects of food related transportation and climate change.

Due to limited resources, we were only able to survey 60 students, which is about 0.1% of the total population in UBC. Our results may thus be statistically

insignificant. However, even with a small sample size of 60 students, there is an indication of community support among students that can be built upon. Another survey with a bigger sample size and balanced distribution is warranted for more accurate results. Also, it may be beneficial to include the student's year of study on the survey to see if the participant's level of study affects results. Education interventions can be implemented if it is found that certain students in a particular faculty or year lack knowledge about food production.

In addition to possible student support, there has been ongoing community support from various organizations within campus. The AgUS has been hosting barbeques every Wednesday night to bring students together and to network with faculty members. The menu often involved produce freshly harvested from either the UBC Farm or the LFS Orchard Garden (AgUS, personal communication, March 15). As well, the Director of UBCFS, Andrew Parr, has indicated that if projects on campus were able to increase food production to supply to UBCFS and if it was logical financially, the organization would be willing to assist in start-up costs for the projects (personal communication, March 4, 2009).

Carbon Emission Calculations

To calculate the amount of carbon dioxide released by the transportation of potatoes, and ultimately to determine the amount saved by increasing food production on campus, we used the Leopold Center method provided by the paper, "Fighting Global Warming at the Farmer's Market" by Stephen Bentley and Ravenna Barker (2005). The first part of the calculation involves multiplying the weight of produce in tons by the distance traveled in kilometers, yielding a unit of ton-kilometers (Ton-km). Emissions

factors, also provided by Bentley and Barker (2005), for the various modes of transportations are in the units of grams of CO_2 per Ton-km, meaning that the equation without any values inserted appears as:

Weight in tons x distance traveled in km = Ton-km x emissions factor = grams of CO_2

In the information provided to our group by a UBCFS representative, Dorothy Yip, we learned that in 2008, UBCFS used 45,371 pounds of potatoes. Potatoes were chosen because we knew they had been grown at the LFS Orchard garden and because information about them was readily available. Most of those potatoes were trucked from a location 250km away in Washington State (Yip, personal communication, March 25, 2009). Some potatoes come from a closer location (25km) in the lower mainland, but because exact quantities were unknown and transportation to the food supplier is quite complicated, our group choose to use only the 250km distance in our calculations. So, by applying these values in combination with the emissions factor for trucks, we were able to make this calculation:

45,371 lbs of potatoes = 20.58 metric tons of potatoes 20.58tons x 250km = 5145 Ton-km 5145 Ton-km x 207 g of CO_2/Ton-km = 1065015g of CO_2 = 1065.02 kg of CO_2

With this information, it was then necessary to calculate how much of this 1065.02kg of CO_2 would be displaced by a small community or rooftop garden. Presumably, if some amount of potatoes could be provided to UBCFS from on campus production sites, they could decrease the amount ordered from Washington. We used the

size of 600m^2 for our hypothetical garden since it is the size of the operational LFS Orchard Garden.

To determine the possible yield from a garden of this size, we used information provided by Statistics Canada website on the average yield of potatoes in BC in 2007.

Average potato yield in BC in 2007: 33.63 tons/ha = 0.003363 tons/m^2 x 600 = 2.02 tons/600m^2

Therefore, assuming that 2.02 tons of potatoes would be grown on campus and not trucked in from Washington, the new CO_2 emissions calculation looked like this:

20.58 tons – 2.02 tons = 18.56 tons

18.56 tons x 250km = 4640 Ton-km

4640 T-km x 207 grams of CO_2/Ton-km = 960480 grams of CO_2 = 960.48kg of CO_2

Then, by subtracting this from the original calculation for emissions, we determined the amount of CO_2 not emitted by replacing 0.378 tons of potatoes from Washington with the same amount grown on campus.

1,065.02kg of CO_2 (all potatoes from Washington)

-960.48kg of CO_2 (one 600m^2 garden, and the rest from Washington)

104.54kg of CO_2 not emitted

We found that 104.54kg of CO_2 would not be released from transportation of potatoes if an amount of the total usage was replaced by on campus production. Taking this idea one step further, we calculated how much space would be necessary to grow all of the potatoes needed by UBCFS on campus. Our findings, based on the average yields in the province, were that 1630 m^2 (1.63ha), or 28 600m^2 size gardens would be needed

to grow 20.58 tons of potatoes. CO_2 emissions are most often quantified and priced in tons. So, the 104.54kg of CO_2 savings we calculated would be converted to 0.10454 tons. Speaking strictly from a GHG reductions perspective this is an insignificant amount. Economically speaking, even applying high estimates of a $40 carbon tax and a $30 carbon permit would result in one ton of carbon emissions being priced at $70 in BC. This means that the monetary savings earned from not emitting 0.10454 tons of carbon would equal $7.32.

Our calculation suffers from many assumptions that most likely have swayed our results. First, our method for calculating the emissions produced by the transportation of potatoes from Washington is based on one trip during which a truck carries all the potatoes needed for the whole year. This was done because exact information on the trucking of potatoes from farmer to supplier to storehouse to UBC was difficult to obtain, and without this information the method we used for calculation would not have been able to yield accurate results. Second, we did not account for the CO_2 emissions released during the construction of new gardening area on campus. This would include fertilizer production and transport, seed transport, and CO_2 liberated from the soil during tillage, to name a few. These were deemed too difficult to accurately calculate by our group due to time constraints. Third, we were not able to calculate the amount of CO_2 that would be sequestered by new plant growth. This was ignored because we were unable to find the CO_2 absorption factors of agricultural plants separated by species, and again because of time constraints.

It is clear that the results of this calculation are inaccurate, but it can still serve as an illustration of the ways in which we can begin to quantify emissions and think about where to focus our efforts in reducing them. Our group wanted to apply an academic method and a critical eye to the increasingly common claim that local food is more "sustainable" and more specifically, that it will help in reducing GHG emissions. We hope that through further research the methods of calculation can be refined, and built into the strategic planning of UBC food system choices.

Targets and Barriers

In our analysis of GHG emissions produced from the single shipment of 0.378 tons of potatoes from Washington State to UBC campus, we saw that the cost-benefit results of on-campus food production versus non-local food import. We drew upon these results to create and expand on two targets regarding the reduction of GHG emissions through on-campus food production and conversely the reduction of food imports into the UBC food system.

Target 1: To progressively increase land use on UBC farm for food production as much as possible until new land on campus is available for the same purpose.

This target aims to increase food production on campus by expanding the areas of growth. From our findings, we found that growing food on campus can cut down GHG emissions produced from food shipping. However, from our calculations, the overall decrease in GHG emissions is not significant enough to be beneficial. To improve the results, a greater area of cultivation is required. An area for increasing food production would be the UBC Farm. Due to barriers mentioned earlier, the farm faces constraints to expansion but the breaking of these barriers and other forms of farming may be able to

progressively increase yield. Another potential area for food production is on the main campus grounds. An example is the LFS Orchard Garden but a multitude of similar plots would be necessary for the desired results.

Barriers:

Seasonality

Compared to other cities in North America, Vancouver has a long growing season and a relatively moderate climate (UBC Farm at UBC, 2009). However, minor fluctuations in temperature can devastate a crop, such as the failure of UBC Farm's 2008 butternut squash crop (Nancy Toogood, personal communication, March 4, 2009). This not only can hinder the development of a plot in terms of food production to supply the demand, but can also demoralize those who put effort into the garden.

Community Support

Human resources is essential to ensuring food production success. However, it can be difficult to find a consistent and committed group of personnel to handle the establishment and maintenance of the plots. Our findings from our community support survey showed that some students would participate in some way. However, a small sample was surveyed and the results do not necessarily a true representation of community involvement. As well, the student population varies throughout the year and it may be difficult to retain help throughout the summer months.

Limited Land

UBC Farm is subject to use on the condition that its main purpose is in academically driven. There is a high demand for the land, but the farm aims to broaden its sources of income, which includes increasing the sales to food service outlets on campus (Frye, personal communication, March 4, 2009). Land on the main campus is in the jurisdiction of CCP who determines whether land is to be used for food production and for how long.

Money

Starting a food production plot is low in cost compared to bigger-scaled production like UBC Farm. However, insufficient funding can pose a threat to development. Although the Director of UBCFS has indicated interest for investment, further commitment is needed.

Target 2: Reduce GHG by decreasing food imports, especially non-local food, from entering the UBC food system.

With every import of any food ingredient or food product into the UBC community, there is the release of GHG emission from transportation. The purpose of this target is to evaluate the effectiveness of on-campus food production in reducing GHG emission by avoiding transportation. In addition, along with GHG emission reduction, urban agriculture will be encouraged in the context of the UBC community and, consequently, provide educational opportunities, ease the stress on our current food systems, and provide GHG sequestering sources. It is most likely that food grown or produced within the UBC community will not be able to meet the high demand. It is

simply not feasible, at least not in the context of UBC's educational goal. However, by reducing the level of imports, GHG emission can be reduced to a certain level.

Barriers:

Insufficient Food Availability

If on-campus food production does not have the capacity, qualitatively and quantitatively speaking, to feed the UBC community, then it is necessary to acquire food from a source outside the UBC community. If food is acquired from outside of the community, transportation is needed and GHG emission is produced.

Competitive Pricing

Due to the fact that processing giants have the advantage of economies of scale, their costs are minimized and their prices have become a barrier to on-campus production. Food that is grown on campus has the advantage of minimal processing and storage; however, it is still being grown at a higher cost relative to the imports. Although the quality of the on-campus produce may be higher than the imported produce, the matter of cost is still a priority for majority of the food suppliers. It is a burden for the food suppliers to supply food to students in a financially possible way.

Franchises

For franchise food suppliers, it is mandatory to import food products from their distributor or supplier in meeting the standards of the franchise's parent company. This means that even if on-campus food production is sufficient, delivery of food products and supplies is unavoidable.

Recommendations

UBC Sustainability Office:

Include the UBC food system as part of the UBC GHG profile due to the food system's significant impact on GHG emissions.

Annual data for overall carbon emissions from our food system would be helpful to quantify in which areas efforts should be focused on to decrease emissions. A few areas of the food system which are known to create carbon emissions include transportation and processing of foods, as well as the disposal of waste products.

UBC Campus and Community Planning and UBC Landscaping:

Allow and support food production projects on main campus in the form of gardens, rooftop gardens, or edible landscape.

Changing the UBC landscape to include food production will need long-term (e.g. greater than five years) approval and support from these organizations for success in establishment and maintenance.

UBCFS and AMSFBD:

Commit to supporting on campus food production financially by assisting with project start up costs as well as purchasing food that is grown.

Not only will barriers be broken for increasing food production, these organizations would also benefit in receiving quality produce.

Decrease the number of franchises on campus.

Reducing franchises on campus would allow more freedom in the acquisition of food and allow for greater infusion of local food.

All stakeholders:

Raise awareness of local food production, food produced on campus, food security, and food sustainability to staff and students across all disciplines.

According to our survey, 52% of students indicated that it does not matter to them where their food is grown. Of the other 48%, there was overrepresentation by students of certain faculties. This may be due to a lack of knowledge about issues surrounding the food system. Outreach to all users of the system is an essential step to sustainability.

Future AGSC450 2010 colleagues:

Consult with professionals within field of carbon calculations to determine a more accurate result in carbon calculations.

Due to lack of expertise, it was very difficult to estimate the correct GHG emission levels in the food system. In order to implement feasible analysis, more research on food distances travelled by a variety of foods purchased by UBC is required. Only potatoes were analyzed in this report and with it being trucked to UBC from a fairly local source, emission saving appear less significant. In addition, the estimated carbon calculation used in our findings was based on a very simple model.

Conduct a community support survey with a larger sample size.

In our survey on community support for on-campus production, we only had a survey size of 60 people, which is roughly only 0.1% of the 60,000 people the UBC population (UBC, 2009). This sample size is not a significant number because it is not very representative of the general population. In addition, our sample size was composed mostly of students from the faculties of Commerce and LFS, which may show high bias due to different visions and goals of the respective faculties. By including the year of study, the collected data may show a correlation between depth of study and support for on-campus food production. Then, one may be able to conclude or test if the depth of education can encourage support for on-campus food production.

Conduct research into crops suitable to grow in Vancouver climate as well as which crops complement each other in terms of crop rotations.

By applying this knowledge with the knowledge of the whereabouts of distributors, we can attempt to grow foods normally purchased from greater distances. Due to time constraints, we focused on crops already grown on either UBC farm or the LFS Orchard Garden. An example of a suitable crop to grow is the butternut squash. In 2006, a UBCFSP group tested the applicability of using growing butternut squash in the UBC farm and incorporating it on a pizza in Pie R Squared, a food outlet on campus. This is an effective crop as large amounts are not required compared to staple crops like potatoes. To be most effective, a crop rotation should be used in food production. Crop rotations have beneficial traits in both pest management and nutrient cycling. Since a

crop suitable for the land at UBC and with high carbon savings have not been discovered yet, we did not investigate into crop rotations in this report.

Conduct research into possible sites on main campus where food can be grown.

At this point, the most logical location to increase food production is the UBC farm. While our target aims to increase production on the farm, it may not be centered enough in the core of UBC for its students to feel the connection to the food they eat. As well, the farm faces its own barriers to expansion. Possible concerns when looking for a new site on main campus include noise and odour pollution, and safety concerns. If established properly, however, it has the potential to be a great contribution to enhancing community through food as well as increase local food production.

Conclusion

With the public's awareness and concern about the global climate change crisis ever increasing, more attention is being placed on ways of reducing GHG emissions, one of which methods is decreasing food miles. UBC can remain as a leader in sustainability, as it makes progress toward becoming carbon neutral by 2010, by increasing not only locally purchased foods but also on-campus food production. It was found through our calculations of carbon emissions that this is feasible under certain assumptions. More significant results can be achieved if more land can be acquired for the purpose of food production, or if a food crop purchased from a substantial distance is grown to reduce the need for transportation. Although growing food on campus has many hurdles to overcome and the payoff is limited, financially and environmentally, if properly planned with long-term intentions it can be worthwhile.

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Appendices

Appendix A – Vision Statement for a Sustainable UBC Food System

The overarching goal of a sustainable food system is to protect and enhance the diversity and quality of the ecosystem and to improve social equity, whereby:

1. Food is locally grown, produced and processed.
2. Waste must be recycled or composted locally
3. Food is ethnically diverse, affordable, safe and nutritious
4. Providers and educators promote awareness among consumers about cultivation, processing, ingredients and nutrition
5. Food brings people together and enhances community
6. Is produced by socially, ecologically conscious producers
7. Providers and growers pay and receive fair prices

Appendix B – Community Support Survey

AGSC 450 UBC Food Systems Project

Faculty: _____

Please answer the following questions by marking the appropriate box.

	YES	NO
1. Does it matter to you where your food is grown?	☐	☐
2. Do you/would you support food grown on campus through the use of gardens, rooftop gardens, or similar means?	☐	☐
3. Would you like to be involved in growing food on campus through:		
a. Course work?	☐	☐
b. Research?	☐	☐
c. Volunteering?	☐	☐
d. Paid work?	☐	☐

Thanks for your time!