UBC Food System Project

Scenario 7

(Investigating the Overall Ecological Footprint of the University of the University of British Columbia Point Grey Campus Food System)

Group 13

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Part I: Abstract, Introduction, Problem Definition, Vision Statement, and Identification of Value Assumptions

Abstract

The Faculty of Land of Food Systems in the University of British Columbia (UBC) has been researching and implementing sustainability initiatives through the Agricultural Sciences (AGSC) classes for several years, however, there is no current quantitative measure of the success of these programs. Therefore, our group has been assigned to investigate the feasibility of conducting an Ecological Footprint Analysis (EFA) of the food system at the UBC Point Grey Campus.

A literature review of previous academic institutions that have conducted an EFA was performed and the findings of Colorado College in the United States and the University of New Castle in Australia have been summarized. We also reviewed the partial analysis of the Pendulum Restaurant performed here at UBC and have determined how the knowledge gained from the project could be applied to an analysis of the entire food system. We then reviewed various methods available for carrying out an EFA and have determined that the component-based method used in the Pendulum Restaurant partial analysis would be the most practicable. We have provided a clear description of what we feel is the definition of the UBC food system and explained our reasoning behind this, as well as provided sample calculations that would be needed for an EFA. Lastly, we have summarized our main findings and made recommendations that pertain to the 2009 AGSC 450 students and teaching team.

Introduction

The University Of British Columbia Food System Project (UBCFSP) is an ongoing collaborative research project created to address food security and sustainability issues present in the UBC food system. The aim of the project is to examine the current level of sustainability in the UBC food system and find ways to improve it, which involves assessing the scope of the problem, creating a common set of goals and objectives, and finding ways to achieve the set goals and monitor progress (Rojas, Richer, & Wagner, 2007). The project is conducted based on the principles of community-based action research (CBAR), which strives to involve the community being studied (in this case, the UBC community) in the research process, allowing the community members to gain a better understanding of their situation and help develop solutions (Stringer, 1999). The UBCFSP is presently in the process of assessing the current state of the UBC food system and is beginning the process of exploring solutions to the identified problems (Rojas et al., 2007). This year, the AGSC 450 student teams participating in the project were presented with eight scenarios and this report discusses scenario seven, which is the investigation of the feasibility and possible method for conducting an EFA of the UBC Point Grey Campus food system. This report includes reasoning as to why such an analysis would be beneficial to the UBC community, a description of the various methods for conducting an EFA, how next year's AGSC class should conduct the analysis (including the food system boundaries we identified, as well as how and what information was gathered), and recommendations to both next year's AGSC 450 class and other involved parties.

Problem Definition

Our interest in improving sustainability stems from the fact that humans are currently consuming the earth's resources at a rate that cannot be sustained and we need to make changes to ensure that we will continue to have resources available for future generations. Sustainability is the ability of a system or process to be maintained or kept in existence, without depleting resources (Harmon, Harmon, & Maretzki, 1999). Under this definition, our current food system is not sustainable. To explain, we have a very globalized food system, with the average food item in North America travelling 1300 miles and changing hands half a dozen times before finally being consumed, a process which is both socially and environmentally damaging (Kloppenburg, Hendrickson, & Stevenson, 1996). The industrial food supply system has undergone dramatic commercial and technological expansion in the last half-century, allowing it to provide food for a rapidly expanding human population, but this expansion has not come without problems (Lang & Heasman, 2004). Although the industrial food system can produce enough food to feed the world's population, health issues such as obesity, starvation, and food contamination, as well as social concerns such as the health of rural communities, animal welfare, division of wealth, and poor working conditions for labourers are constantly arising (Lang & Heasman, 2004). In addition, the agricultural practices employed to produce, process, and transport the food are being criticized for their negative environmental impacts, such as the loss of species and habitat diversity, pollution of surface and groundwater, deterioration of soils and soil functions, and contamination of the earth's atmosphere (Gerowitt, Isselstein, & Marggraf, 2003). As the problems with the current industrial food system are becoming more apparent, we are being forced to decide whether to continue along the same path or make changes to improve the sustainability of our food system and repair the damage that has been done to the environment (Kloppenburg et al., 1996).

The issues presented above regarding the unsustainability of our current food system are particularly relevant to universities because they have great power to enact change. As stated by David Orr, many of the problems we see today regarding our food system are a result of an improperly-structured education system, which has produced decision-makers with no knowledge of ecological principles (Orr, 1991). In addition, universities have immense operational budgets and the ability to impact many individuals through education and striving to set a good example (Rojas & Richer, 2008a).

UBC has already made a commendable commitment to improving sustainability and decreasing its impact on the environment. In 1990, UBC signed the Talloires Declaration, which is a ten-point action plan for incorporating sustainability into university teaching, research, operations, and outreach programs (Association of University Leaders for a Sustainable Future, 2001; UBC Sustainability Office, 2007). In 1997, UBC became Canada's first university to adopt a campus sustainability development policy (UBC Sustainability Office, 2006). A campus sustainability office was created in 1998 and, since then, many sustainability initiatives have been launched at UBC, including the SEEDS (Social, Ecological, and Economic Development Studies) program to help UBC community members work together on sustainability projects, the green building program to create more sustainable campus structures, and the ECOTrek program to reduce energy and water usage on campus (UBC Sustainability Office, 2006). In addition to campus-wide programs, many other initiatives have improved the sustainability of the UBC food system, including introducing compostable take-out containers into UBC Food Service outlets, encouraging the use of reusable containers, offering Fair Trade coffee at food outlets, purchasing locally produced food where possible, adopting energy and water saving practices, and the development of a comprehensive composting service (UBC Food Services, 2007; Baynham & Dalton, 2005).

Although UBC has made great strides in dealing with sustainability issues, there has never been a complete assessment of the UBC campus to determine the starting point or the impact of the sustainability initiatives that have already taken place. This poses a dilemma because, in order to adequately manage a problem and avoid complacency, there needs to be a baseline to measure progress against - conducting an EFA of UBC would help resolve this problem (L. Ferris, AGSC 450 lecture, February 27, 2008). EFAs measure the level of human consumption in relation to the available supply of resources and provide a way for us to compare the ecological impact of various entities (cities, lifestyles, technologies, etc.), identify sustainability goals, and monitor our progress in attaining those goals (Rojas & Richer, 2008a). Thus, in order to help guide the sustainability initiative at UBC in the future and ensure that progress is being made, an EFA of the campus and, in this case, the food system, must be conducted.

Group Reflections on the Vision Statement

As a guiding framework for the establishment of a sustainable food system at UBC, a vision statement was created and is outlined in the “Vision Statement for a Sustainable UBC Food System: *Plain Language* Version” (VSPLV):

> 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
(Rojas & Richer, 2008b)

Overall, these seven principles encompass many issues that are important to remember when establishing a sustainable food system. With reference to our scenario, the guidelines identify the fact that, in order to improve upon problems, there is a need to understand the current situation, identify areas that require improvement, and develop a way to measure the impact of those changes, such as through employing an EFA. In addition, supporting local production and decreasing the production of waste (through encouraging recycling and composting or using products that create low amounts of waste) are both ways that we can decrease our ecological footprint. The guidelines also emphasize the importance of community and increasing awareness among consumers about the production of food, which will further increase the support for sustainability initiatives and hopefully encourage individuals to decrease their own ecological footprints. The growing disconnect between consumers and the production of their food has immense impacts on the sustainability of the food system and, by re-establishing this connection as the guidelines indicate is important, more people will become invested in the problems of our food supply system and support proposed solutions and, thus, a more sustainable food system (Pollan, 2006). Although these seven principles identify many issues that are integral to establishing a sustainable food system, they are quite broad ideas and goals, proposing no direction on how they should be applied. This could be a problem, as they can be interpreted various ways, some which may not be in line with the initial goals of the project and, because there is no clear direction given, it is possible that no progress will be made in achieving the overall goal of establishing a sustainable UBC food system.

Identification of Value Assumptions

When assessing how feasible it would be to conduct an EFA of the UBC food system and, in particular, when making choices about what method to use and setting our food system boundaries, our decisions were influenced by our personal values. Our group took a weak anthropocentric (human-centred ethic) approach in our work on this project. An anthropocentric ethic values human needs over those of the rest of the world. We chose this ethic because, although we think it is very important to evaluate all the impacts of our choices, we understand that those directly affecting humans are the ones that we, as humans, will focus on (Bomke, Rojas, & Skura, 2005). In addition, we understand that the act of considering non-human entities is an anthropocentric ethical choice, as the health of the ecosystems that sustain us greatly impacts our own lives.

Part II: Methodology, Findings, Discussion, Recommendations, and Conclusion

Ecological Footprint Methodologies

There are many methodologies that can be used to determine the ecological footprint. Methodologies that may be suitable for evaluating the ecological footprint of the UBC Point Grey Campus food system are the Life Cycle Analysis (LCA), Material Intensity per Unit Service (MIPS), Energy and ‘eMergy’ analysis, and the component-based method.

Life Cycle Analysis

LCA is one of the most widely used methods and involves following the life cycle of a manufactured product, including the mining of raw materials, production and distribution, re-use or recycling, and eventual disposal (Chambers, Simmons, & Wackernagel, 2000). This method accounts for all the direct and indirect energy resources and waste material associated with a product over its complete life cycle (Chambers et al., 2000). The limit is set just before the second generation impacts, which, for example, would include the energy used to fire the bricks for building the kilns in manufacturing the raw material (Chambers et al., 2000). However, indirect effects are hard to capture, so LCA relies on assumptions (Chambers et al., 2000). The advantage of this methodology is that it provides a large amount of detailed information that would aid in finding links between consumption of particular products and global biocapacity (Chambers et al., 2000). The disadvantages include lack of standardized information, overwhelming amounts of details, ignorance of cumulative effects, and confusion between human health and ecological health (Chambers et al., 2000). It is also labour intensive to track each specific product over its whole life and difficult to interpret results due to lack of aggregation of data (Chambers et al., 2000).

Material Intensity per Unit Service

The MIPS method combines life cycle analysis and material accounting to determine the overall mass transformed for a given process during its entire life cycle (Chambers et al., 2000). Based on the principles of thermodynamics, it calculates the material intensity of a product or service (measured in kilograms (kg) per unit of service) by summing up the overall material input that humans move or extract to make that product or provide that service (CPA, 2008). Material input is calculated in five categories: abiotic raw materials, biotic raw materials, water erosion, and air (CPA, 2008). The advantage of this method is that it builds thorough accounting systems by following the law of conservation of matter, provides metabolic studies that are crucial inputs for management systems, makes a good first magnitude approximation of human impact, and helps to evaluate relative improvements over time (Chambers et al., 2000). The disadvantages include the lack of information about the maximum sustainable impact that is permitted, the assumption that each kg of mass transformed impacts the ecological system at the same intensity, and ambiguous interpretation of the results (Chambers et al., 2000).

Enery and 'eMergy' Analysis

Energy and 'eMergy' analysis quantifies the flow of materials and energy through the economy (Chambers et al., 2000). Energy is used as a proxy measure for the overall environmental impact because of the high correlation that exists between a society's use of energy and its destructive ecological power (Chambers et al., 2000). This method takes into consideration all materials and energy used in production and consumption, including hidden flows of materials that were extracted in the production cycle, and monitors waste that is usually not taken into consideration in traditional analyses in order to evaluate the efficiency of the usage of material resources (SSP, 2003). It follows the law of thermodynamics on the conservation of energy and captures the mass balances in an economy, where inputs (extractions + imports) equal outputs (consumptions + exports + accumulation + waste) (SSP, 2003). There are many approaches to this methodology (Chambers et al., 2000). The 'eMergy' approach converts all processes into the energy required to run them (Chambers et al., 2000). In another approach, the biosphere's net primary productivity (measured in megajoules per year) is used as the energy currency (Chambers et al., 2000). This approach allows comparison between the biomass use by humans and the biosphere's overall capacity to produce biomass (Chambers et al., 2000). The advantages consist of provision of a good proxy measure of overall impact and rapid appraisals of industrial processes (Chambers et al., 2000). However, the disadvantages are the weak availability of data for some types of energy analysis (one such example is eMergy), the lack of integration of non-renewable and renewable energy, and ignorance towards risk and toxicity (Chambers et al., 2000).

Component-Based Method

A component-based method provides ecological footprint values for certain processes that are pre-calculated based on data of the region under consideration (Chambers et al., 2000). It can be used to calculate the impact of any form of travel (vehicles, planes, ships, etc.), primary energy usage, waste production, food consumption, and so on (Chambers et al., 2000). Calculating the impact of each of these components on fuel consumption, manufacturing, and maintenance energy involves acquiring the source of the land used and distance traveled and deriving an average ecological footprint estimate for a single passenger-km or other appropriate units (Chambers et al., 2000). This estimate is then used to calculate the impact of vehicle use at the individual, organizational, or regional level (Chambers et al., 2000). Land is categorized into energy land, built (or degraded) land, bioproductive land, and sea and biodiversity land (Chambers et al., 2000). The component-based approach collates and converts any basic life cycle data available to derive the footprint for that component and captures the vast majority of impacts that are due to human activities (Chambers et al., 2000). It avoids double counting the energy used for the production and transportation of goods by adjusting the values for primary energy use and freight transport based on assumptions about the sources of embodied energy (Chambers et al., 2000). Since different data sources can yield very different values for the same component, the component-based method attempts to adjust for this inconsistency by carrying out a sensitivity analysis using different data sources and determining the most representative figures (Chambers et al., 2000). The advantages of this method are ease of communication, detailed instructions, and the breakdown of impacts by activity for those involved in policy-making decisions (Chambers et al., 2000). The disadvantages include problems with data variability and reliability, highly intensive work in calculating the direct and indirect life cycle impacts as small changes in assumptions, and yield of different results by the data (Chambers et al., 2000).

Findings - EFAs Conducted at UBC and Other Institutions

EFAs have also been employed at other institutions, such as Colorado College in the United States and the University of New Castle in Australia.

Colorado College

Colorado College conducted an EFA using the component-based method (Wright, 2002). This method attempts to account for different facets of a specific individual, institutional, or regional environmental impact (Wright, 2002). The EFA also examined electricity use, natural gas and transportation fuel consumption, water supply, food consumption, and land occupied (Wright, 2002). Data for electricity, natural gas, and water were obtained from Colorado Springs Utilities and transferred to an electronic database (Wright, 2002). Fuel use from transportation was acquired from the Colorado College physical plant records and was subsequently converted into an electronic form

(Wright, 2002). Food data was provided by the Sodexho Marriott (their food service provider), while solid waste production data was provided by the Bestway Waste Disposal (Wright, 2002). The data obtained from different sources were calculated and arranged in a table, accompanied by cost when available (Wright, 2002). Another table presented the results of the calculations, i.e. the EFA of the campus (Wright, 2002). The paper also discusses some aspects that could not be calculated, such as clothing, wood, steel, plastic products, and pollution or waste (Wright, 2002).

The University of New Castle

There were 17000 students and 2200 staff members when this analysis was conducted in 1998 (Flint, 2001). The EFA examined many different components of the university system, including food, housing, transportation, consumer goods, and services (Flint, 2001). However, the EFA did not focus on food and only the impact of dairy products, meat, and alcohol production were measured with consumption assumed to be the same as the average Australian's, meaning it could be rather inaccurate (Flint, 2001). The data for the EFA was collected from various university personnel and governmental departments, including City Rail and State Transit, Energy Audit from the government, and the University Environmental Officer (Flint, 2001). The EFA determined that the university consumed twenty six times what its geographical area should (Flint, 2001).

Problems Faced by the Institutions

There were a few problems with conducting the EFAs, such as confidentiality, data costs, and whether the appropriate data was even collected at all. However, the main problem seems to be that universities are, by nature, very transient (Flint, 2001). First of all, the student population is constantly changing owing to the fact that there are always new students enrolling, students graduating, and students dropping out (Flint, 2001). The second reason is that different people are on campus at different times and days and the use of energy is very high during school hours and halted when the university is closed (Flint, 2001). Lastly, there was a lot less consumption during the summer months when fewer students were in classes (Flint, 2001).

The University of British Columbia – The Pendulum Restaurant

A Partial EFA of UBC has been previously conducted, focusing on the Pendulum Restaurant in the UBC Student Union Building. The ecological footprinting approach used was a component-based calculation, which separates consumption into a series of categories (Baynham & Dalton, 2005). As previously mentioned, the component-based approach it is effective for monitoring the effect of individuals' behavioural changes and is simple to apply to any scale (Baynham & Dalton, 2005). In the EFA conducted, the average footprint values for certain activities were pre-determined and were used to calculate the eco-footprints within each component or category (Baynham & Dalton, 2005). Consumption was divided into six main groups for the ease of data collection, interpretation, and decision-making in the report. The six groupings were:

a) Food
b) Consumer Goods
c) Services
d) Transportation
e) Housing/Facility
f) Materials and Waste

(Baynham & Dalton, 2005)

Each of the above categories was subdivided, depending on what the exact assessment entailed and data obtained from each of the groups was then used for the calculation of the ecological footprint of the Pendulum Restaurant (Baynham & Dalton, 2005).

a) Food

Food was subdivided into different categories wherever possible, such as fruit, vegetables, pork, beef, poultry, etc. (Baynham & Dalton, 2005). Processing, transportation, agricultural, and embodied energies are all included in the footprinting figure for food production, using average global yields (Baynham & Dalton, 2005). It was observed that more energy is required to grow, harvest, process, and transport the food than the energy that is actually present in the food itself (Baynham & Dalton, 2005). In addition, it was found that the transportation energy embodied in food production is minimal and presumably only accounts for transport within the production chain, from the farm to processing plants to local stores and any other stops along the way (Baynham & Dalton, 2005). It was assumed that it does not account for the long distances that food is moved in Canada (Baynham & Dalton, 2005).

b) Consumer Goods

Supplies that the restaurant orders on a monthly basis were recorded within this category, however, the eco-footprints of these provisions (stir sticks, plastic cups, napkins, etc.) were not calculated so as to avoid double counting land that is accounted for in materials and waste (Baynham & Dalton, 2005).

The AMS Food and Beverage Department provided the data for food and consumer goods with transfer sheets of the Pendulum Restaurant, which included the total inventory of products and the number of units ordered per month for each product during a four-month period (Baynham & Dalton, 2005).

c) Services

Services were not included in the calculation of the Pendulum's footprint, but recommendations were made to include such categories as education, health care, and social services (Baynham & Dalton, 2005).

d) Transportation

Transportation was an important contributor to the eco-footprint, since a large amount of food comes from international locations to the Pendulum Restaurant (Baynham & Dalton, 2005). There are three methods to calculate the footprint for fossil fuels. The first approach is to calculate the land requirement for growing the ethanol equivalent of the given fossil fuel consumption (Baynham & Dalton, 2005). Another method requires an assessment of land needed to restore the natural capital stock at the same rate that it is being consumed (Baynham & Dalton, 2005). The last method provides the most conservative estimate and is most widely accepted and used (Baynham & Dalton, 2005). This method involves determining the land area required to sequester carbon dioxide from fossil fuel combustion (Baynham & Dalton, 2005). This assumes that the additional carbon dioxide into the atmosphere is undesirable and has an overall negative impact on humanity due to the increase of greenhouse gases in our atmosphere, which contribute to global warming (Baynham & Dalton, 2005). Average forests can absorb approximately 1.8 tonnes of carbon per hectare per year, which is roughly equivalent to the consumption of 100 gigajoules of fossil fuel and takes account of the carbon dioxide released during oil extraction and refinement (Baynham & Dalton, 2005). In the EFA, the transportation of food to the Pendulum Restaurant was further subdivided into transport truck, train, and ship (Baynham & Dalton, 2005). The truck was assumed to be a heavy goods vehicle and included the embodied energy that was used to build the vehicle and the proportioned area of road network used during shipments of commodities to the restaurant (Baynham

& Dalton, 2005). For the diesel freight train, fuel manufacture and maintenance energy, as well as apportioned space for the rail network was integrated into the EFA footprinting (Baynham & Dalton, 2005). The footprint for ships included manufacturing and maintenance, as well as fuel usage (Baynham & Dalton, 2005). All data used was based on European Union data and were assumed to be analogous to numbers for Canadian transportation (Baynham & Dalton, 2005). It was recommended that more personal footprinting projects be incorporated, such as categories of bus, bike, and vehicles (Baynham & Dalton, 2005).

Location of food production and processing was determined by contacting the restaurant suppliers, speaking with representatives responsible for purchasing food through the AMS, and reading information from food labels (Baynham & Dalton, 2005). Food that was produced within North America was generally assumed to be transported by standard freight trucks and the distance transported by trucks was determined using road distances calculated by Mapquest, which calculates the shortest distance between any two points in North America using major highways that would be used by large trucks (Baynham & Dalton, 2005).

e) Facility

The section was subdivided into energy and water consumption (Baynham & Dalton, 2005). The land-use for hydro was derived for the EFA. Since energy used at the Pendulum was exclusively hydroelectric, the land-use figure for hydro obtained was from the amount of land used for power lines and flooding, as well as the embodied fossil fuel energy required to build and maintain the dam (Baynham & Dalton, 2005). Water was calculated strictly from the use of the dishwasher and included the energy of supplying the water (Baynham & Dalton, 2005). Heating of water was incorporated into the energy consumption of the water heater (Baynham & Dalton, 2005).

The energy use for appliances and light bulbs was determined by finding the manufacturers' company names, product names and/or number, and any other information about each appliance and the type of light bulb, and checking the manufacturers' websites for the wattage of the appliances (Baynham & Dalton, 2005). The estimated number of hours per week that each appliance was used was provided by the student manager at the restaurant (Baynham & Dalton, 2005). With this data, energy consumption at the Pendulum Restaurant was determined. The heating/cooling energy use was provided by Jesse Klimitz, a student at the University of Toronto, who assessed the energy performance and consumption patterns of the Pendulum Restaurant (Baynham & Dalton, 2005).

f) Materials and Waste

This section included both the embodied energy for the production of certain core materials such as timber, cotton, glass, and aluminum and the land required to absorb the disposal of such materials (Baynham & Dalton, 2005). Most items have the ability to be recycled or sent to a landfill and different figures are available to calculate either of these footprints (Baynham & Dalton, 2005). The recycling value was derived from the amount of energy saved from producing the item from recycled as opposed to virgin material (Baynham & Dalton, 2005).

To determine the amount of waste that was produced by the Pendulum Restaurant, garbage was collected for a period of one day and was weighed (Baynham & Dalton, 2005). It was found that seventy percent of the garbage collected was non-recyclable plastic products and thirty percent was paper products, which were also mostly non-recyclable (Baynham & Dalton, 2005). There were relatively few recyclable items and virtually no compostable materials found in the garbage of the restaurant (Baynham & Dalton, 2005). On the other hand, recycled items were counted, weighed, and placed in four categories: aluminum cans, regular glass bottles (beer, juice and cider), large glass bottles (wine), and cardboard/paper material (Baynham & Dalton, 2005). However, it was estimated that twenty percent of aluminum cans and fifteen percent of glass bottles eventually ended up in the landfill (Baynham & Dalton, 2005).

Discussion – Food System Boundaries and Sample Calculations

Food System Boundary Definition

It is necessary to determine appropriate boundaries when conducting an EFA so that that system being studied can be isolated as much as possible. However, the narrow focus of the ecological footprint determination requires that some assumptions be made by those conducting the EFA because there are too many interactions within communities at any level and an EFA can really only ever be a representative estimation. The scope of our analysis will be outlined through the following suggested restrictions.

Only include the food establishments controlled through the AMS Food and Beverage Department and UBC Food Services and not any independent food service establishments. Do not include food which is purchased off campus or brought from home. It will be easier to obtain the information required for an EFA by excluding the franchises since they are not obligated to provide information and may not have detailed public records like other services (D. Yip, personal communication, March 12, 2008). Food obtained outside of UBC and brought to school accounts for little of the food consumed on campus and would otherwise be consumed outside of campus anyway. As the EFA is a method of establishing UBC’s current practises/baseline and will be used to evaluate future progress, it is necessary to include only those services over which UBC has jurisdiction (L. Ferris, AGSC 450 lecture, February, 27, 2008). Franchises and students do not have to accommodate policies and changes brought on through UBC’s food providers, so they should not be included in the evaluation of UBC’s EFA. If these sources were included, they would not fluctuate along with UBC’s initiatives and would skew results shown in the future. However, it must be noted that this method will be an underestimation of the total food system EFA at campus

Data must be provided to account for the transportation and sourcing of foods. One option to account for the variety of locations in which these foods can be found is to determine a minimum EFA value which can be allocated to groups of foods. Examples of these groups would be those which can be grown locally, those which can be grown within a 3000 km radius, and those which are grown outside a 3000 km radius. These categories would help to give one more ‘step’ back to the food origin, in effect providing accounting benefits for foods which can be grown locally. An estimated minimum ecological footprint could be allotted to each category to account for the distance each food may have travelled. This could come into effect when purchasing more local foods or eating seasonally. However, just because a food item can be grown locally doesn’t mean that it has been. This accounting method becomes very complicated because growing seasons must be factored into the categories. Challenges exist in cold climates where, although fruit may be grown locally for part of the year, it may be in high footprint locations such as greenhouses. It may be more sustainable and economically viable to import these fruits from warmer locations.

A more feasible option is to only track the food production to the last source from which the food was obtained. This will be a gross underestimation of the EFA of our foods, but will allot some ecological resources to the food supply. This method is favourable because information on the direct source of foods is very difficult to obtain. Foods are often processed from many raw ingredients, which have further sources of origin. Not all of this data may be provided and, even if obtained, it could be a misrepresentation of the EFA calculated (D. Yip, personal communication, March 12, 2008). One level of accounting for food location is often recommended for large footprint analyses to acknowledge the distance travelled by foods, but not to obsess over the accounting details (B. Rees, AGSC 450 lecture, February, 27, 2008).

Our recommendation is to assume all inputs not consumed in the food system are accounted for by the waste produced. Waste management data cannot be separated based on location of origin (D. Yip, personal communication, March 12, 2008). Estimates may be required based on one or a few establishments' waste production. This data could be an overestimation or an underestimation, as it will likely not be an accurate portrayal of the entire food system. It may not be representative of the food cycle, but should account for items which are recycled and composted. This factor is important in tallying the EFA baseline and identifying improvements made in the future. Assume all food-related garbage accumulated at UBC originates only from applicable establishments and not from other sources (such as franchises, sources outside of UBC, i.e. those not included in the EFA accounting). This will be an overestimation of the waste produced, but should provide a close-to-accurate representation of the applicable establishments, considering the volume accounted for. Energy use does not include sources outside of the UBC food production facilities considered in this analysis. This refers to the energy used at the establishments on campus which are not part of this study, as well as the energy used at the food suppliers' facilities, farms, processing plants, etc. This will be an underestimation of the total energy used by the entire food system. Energy use does not account for all utilities used in food production. Utility accounts are provided for major food production appliances within outlets on campus. Because the EFA is a baseline of sustainability to evaluate improvements or changes to the food system, it should include major appliances which are available in more energy-conscious alternatives.

This information will not include small food processing appliances such as coffee makers, microwaves, toasters, blenders, etc. It will also not include other energy use from a food establishment including computers, cash registers, sound systems/radios, electricity needed for light bulbs, water, or heating/air conditioning. If an establishment were to not produce foods, it would still consume these resources regardless and, therefore, they are not related to the food system EFA. This is an underestimation of the energy required for food processing in each establishment.

The analysis will not include other goods and services within the campus. This includes the transportation of foods between buildings on campus, emissions given from the composter, water filtration, any affiliated maintenance, construction, and service. The analysis will also not consider the commute of employees. This unaccomplished value is expected to be minimal and we are more interested in the relationship that food has with the EFA. These services are necessary and cannot be easily avoided and so should not be included within the EFA accounting.

Sample Calculations

The AMS Food and Beverage Department was able to provide us with January 2008 transfer sheets for all outlets. These sheets include the total amount spent and the number of units ordered per month for each product. Products are categorized into beverages, food, maintenance, repair and operating input goods, and paper. In addition, UBC Food Services has inventory sheets that show the volume of food ordered from all suppliers annually, including bread and bread products, poultry and turkey products, dairy products, deli and fancy meats, and produce.

Datasheets have different units for different food products. In order to find a yearly average mass for each food product, the mass of one unit has to be determined. Also, the average amount ordered for each month needs to be established. It is then possible to multiply these two average numbers to get the annual average of the food product in kg.

Sample Calculations:
*Data from Chicken-Turkey Velocity – YTD 2007 in UBC Food Service datasheets
Whole Grade "A" Fryer – large-fresh: each unit is 3lb

- Covert to kg: 3 lb * 0.453592 kg/lb = 1.36 kg/unit
- Total number of units ordered in year 2007 = sheet P11 → 1458.97
    - 1458.97 units/12months = 121.58 units/month
- Total mass in kg per year: 1.36 kg/unit * 121.58 units/month = 165.35 kg/year

The two major suppliers of the AMS Food and Beverage Department are Sysco and Neptune. Road distances transported by truck are used to calculate the footprint instead of geographical distance. Mapquest is a tool that can be used to estimate the distance between suppliers and UBC. Footprint estimates for transportation can be calculated from Table 5.6 in "Sharing Nature's Interest". This is done by multiplying the total mass of the product by the total distance traveled and then multiplying by its footprint multiplier. Table 5.6 from "Sharing Nature's Interest" presents the footprint multiplier in hectare-years/1000 t-km. Hence, a conversion factor is needed to calculate the number of hectare-years used per kg of food for each kilometre (km) that is transported. 1 hectare-year/1000 t-km is equal to 1 hectare-year/1000000kg-km; thus, a factor of 0.000001 is used.

Sample Calculations:
*Data from Grocery-Sysco Jan 07 to July 07
Peanut Butter Smooth (10 kg) transported by truck from Sysco, BC

- 10 kg * 0.000001 * 41.9 km * 0.07 =0.00002933 ha/yr

The footprint for the facility is calculated based on hydroelectricity and water usage. Hydroelectricity is divided into three subcategories: appliance, lights, and heating/cooling. UBC Utilities simply estimates the amount of electricity that they use. It is difficult to conduct a precise footprint calculation for utilities since each food outlet pays a flat rate or a percentage rate. However, some of the food outlets do have electrical metres. To calculate the appliance footprint, the number of hours that each appliance is used in each outlet per week is required. This number is then multiplied by the kilowatts used per hour for that particular appliance to find the total energy used per week. It can be assumed that the usage remains constant throughout the year and, therefore, it is possible to multiply the total energy used per week by fifty-two weeks per year. Footprints for appliances and lighting are calculated by using the footprint multiplier for hydroelectricity in table 5.3 of "Sharing Nature's Interest".

UBC waste management does not have any information on how much waste originates from UBC food outlets versus outside food franchises. In order to construct a footprint, the garbage in each outlet would need to be weighed for one week to determine average waste. This weight could then be multiplied by the operation hours during that week to find the total garbage weight for the week. This number is assumed to be constant throughout the year and so can be multiplied by fifty-two weeks per year to find the total garbage produced in one year. Recycled items need to be counted, weighed, and placed into four groups: aluminum cans, regular glass bottles, large glass bottles, and cardboard materials. For each category, the total mass per year should be multiplied by a footprint multiplier for that specific material from table 5.9 in “Sharing Nature’s Interest”.

Conclusion and Recommendations

In summary, it would be rather difficult to conduct an ecological footprint analysis of UBC’s food system and the end results would likely be quite inaccurate. As previously mentioned, a great deal of the data available to us does not allow a separation of the food system from the rest of the campus. However, that does not necessarily mean that it is not a feasible project that is worth conducting. After all, The Faculty of Land and Food Systems and other campus establishments, such as The UBC Sustainability Office, have put a lot of time and effort into developing and implementing sustainability initiatives over the past several years and it would be useful to gain an understanding of UBC’s current ecological footprint so that we have a baseline to measure future progress against. The following are recommendations for our 2009 AGSC 450 colleagues and the teaching team to help make this project more clear and efficient:

- Weigh the advantages versus the disadvantages of conducting an EFA of just the food system. Since a lot of the data from the food system can’t be separated from the rest of the campus it would be difficult to achieve accurate results.
- Consider the importance of measuring aspects of the food system that UBC has the power to change. Even if an EFA of the UBC food system would be inaccurate overall, it would still effectively measure the areas where we can make a difference, such as UBC Food Services and the AMS Food and Beverage Department.

- Use “Ecofootprinting the Pendulum Restaurant” by Maggie Baynham and Jill Dalton and “Sharing Nature’s Interest” by Nicky Chambers, Craig Simmons, and Mathis Wackernagel as the basis for an EFA of UBC’s food system. The component-based method of conducting an EFA used in these resources has already been utilized at the Pendulum Restaurant and it would be useful to build on previous work.
- Focus on tracing the origin of the food only as far back as the suppliers within the Lower Mainland. It is far too complicated to determine where the food was grown and the distance traveled to reach UBC (B. Rees, AGSC 450 lecture, February, 27, 2008).
- It would be advantageous to have a couple AGSC 450 groups working on this project next year because it would be overwhelming for one group to conduct the entire analysis. For example, one group could work on UBC Food Services and the other could analyze the AMS Food and Beverage Department and results could be merged.
- The teaching team needs to work closely with next year’s class to identify clear boundaries. We have provided suggestions for the definition of the food system, but it would be helpful to have some expertise offered, especially since it is really important to define the food system before beginning the project so that mistakes are not realized part way through the project and the groups can begin the analysis immediately since it will be very time-intensive.
- Specific recommendations need to develop from conducting an EFA that lead to concrete changes, otherwise the results won’t be utilized to their full potential.
- It would be necessary to conduct an EFA again in a couple years to monitor the progress made since the last EFA.

With these recommendations in mind, we feel that the teaching team and 2009's AGSC 450 students will be well equipped to make great progress in conducting an ecological footprint analysis of the UBC Point Grey campus or food system, a venture that we feel is essential to increasing the overall sustainability of the campus.

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