

UBC Social Ecological Economic Development Studies (SEEDS) Student Report

The UBC Food System: Assessing Sustainability J-CACTAS Consulting
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University of British Columbia
AGSC 450
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GROUP 10

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Abstract

Our objective is to develop a research proposal for the assessment of UBC's food system sustainability. We designed a model of the UBC food system sustainability continuum, ranking inputs, wastes and the UBC farm from unsustainable to sustainable. In order to measure UBC's current food system, we adapted and created indicators for three focus areas of study. The focus was placed on ecological, economical and social sustainability. The implementation of these indicators will allow researchers to assess UBC's food system quantitatively and qualitatively in order to identify the progress to sustainability.

Introduction

We would like to thank UBC for choosing J. CACTAS (Josephine, Chris, Amy, Carla, Theresia, Andrea and Shiu-Kay) Consulting. We are a multidisciplinary group of graduating students from the UBC faculty of agricultural sciences. We pride ourselves in our diverse backgrounds ranging from agroecology to dietetics, which enables us to provide a well-rounded assessment of the UBC food system.

The general problem was determining what we considered to be 'sustainable' in the context of the UBC food system. We identified the impracticality of UBC ever becoming completely sustainable. This is due to the fact that in order to feed the population of over 40,000 at UBC (UBC, 2002), we would require a large area of land, an infrastructure for processing wastes, and an impractical amount of capital. Furthermore, we identified the difficulty in ensuring a steady and reliable supply of acceptable foods within the local community as a large stumbling block. Therefore, our main concern was to ensure that the UBC food system could be as sustainable as possible. In order to accomplish this, our consulting firm designed a model continuum, a continuum that will allow us to determine the current state of the UBC food system and track the progress towards sustainability for future years.

Map of the Current UBC Food System

Before a model could be designed to assess sustainability, we needed to define the UBC food system. We decided to take an input/output approach to analyzing the current UBC food

system (Appendix 1). We will outline the inputs, outputs, nutrient cycling and recycling systems present at UBC.

In terms of inputs, the UBC food supply consists of foods from local, national and global suppliers. UBC Farm through the UBC Co-op and the UBC Market Garden is an example of a local food supplier. UBC Farm produces food crops for the Alma Mater Society Food and Beverage Services. These food supplies then feed into two branches:

1. Campus Food Sources. These are made up of all food vendors and outlets operating on the UBC Campus, as well as the UBC Village. These include:

1. Vending machines
2. UBC Catering for special meetings and conferences
3. Alma Mater Society Food and Beverage services such as the Pendulum, and Pie R Square
4. UBC Food services such as the cafeterias in the UBC residences, the Snack bars, and the Mr. Tubesteak stand outside of Koerner Library
5. The UBC Village including McDonalds, International Food Fair, Benny's Bagels and One More Sushi
6. The food services available at the Fraternity Houses
7. The kiosks operated by the various undergraduate societies.

2. Private Food Sources. These are made up of all the foods that students or staff members bring onto campus in the form of private lunches, dinners or snacks.

In terms of nutrient cycling, UBC has two different systems in place: the human-structured composting and recycling system, and the natural nutrient cycling system. The AMS Food and Beverage Service and the UBC Food Service outlets participate in the recycling and composting programs on campus. This food waste is recycled back to UBC Farm as inputs into the food system to grow crops, which is then resold to the AMS Food and Beverage service. In theory this should lead to a closed nutrient cycle.

On another level some organic food waste is eaten and degraded by rodents, birds, insects and bacteria. Nutrients from this natural form of recycling are released and returned to the soil.

In terms of outputs, the UBC Food system produces waste, nutrients, recyclable material, and food products. As mentioned above, UBC produces food crops that are sold back to the AMS Food and Beverage service as well as to the local members in the community through Saturday farmers' markets. Waste that is not recycled or composted leaves UBC and goes to the landfill outside of UBC. In addition, UBC does not have its own recycling plant; therefore, material will leave the UBC system in order to be recycled. In theory, new products will be formed and returned to UBC to close the loop. ([REDACTED]

[REDACTED]

Model of the UBC Food System Sustainability Continuum

Once the conceptual map of the UBC food system had been decided upon, a model to act as a reference in the assessment of the state of sustainability was conceptualized. A linear continuum model was chosen to represent the progression from unsustainable to sustainable (Appendix 2). The points of and in between, are named and defined.

In order to do an adequate assessment, the food system has been simplified into three components that symbolize the whole. These three components are the inputs, the wastes, and the farm. Inputs are defined as resources needed to run the food service system, i.e. foodstuffs, water, power and labour. The wastes are seen as the main outputs of the system, i.e. garbage, pollution, recycling and compost. While it can be argued that the farm is an input, it is a belief that it is an integral and separate component of the food system that has an effect on sustainability. [REDACTED]

[REDACTED]

Assessing the sustainability of these parts allows one to then extrapolate to the whole [REDACTED] [REDACTED]. However noting that in order for the entire system to be deemed sustainable, it is a requirement that all components be on the same point on the continuum [REDACTED]

[REDACTED]

The decision to adopt this graphic rating scale, consisting of 5 odd numbers in equal increments (1,3,5,7,9), is a result of the belief that this is one of the most objective methods of evaluation (Robbins & Langton, 2001). Organizational behavior studies find that by using an odd number 5-point scale of equal increments, people will be best able to use an appraisal form in a manner which is efficient and objective with minimal ambiguity (Robbins & Langton, 2001). Studies also show that with this system people are less confused as there are no even numbers on the scale (Robbins & Langton, 2001). [REDACTED]

Sustainability Indicators

In order to effectively place UBC's food system on the continuum, we need a way to evaluate how sustainable it really is. We have decided to accomplish this by choosing appropriate ecological, economic and social indicators that we can measure and evaluate individually.

Ecological Indicators

Landscape Biodiversity:

Gliessman (2000) defines diversity as "...a product, a measure, and a foundation of a system's complexity --- and therefore, of its ability to support sustainable functioning". The more diverse a system is, the less vulnerable a system is to pests, disease, and other detrimental abiotic factors. Diversity can be analyzed in a variety of different dimensions: species, genetic, vertical, horizontal, structural, functional, and temporal (Gliessman, 2000) . Species and genetic diversity are concerned with the number of species and degree of genetic variability within an agroecosystem, while vertical and horizontal diversity are concerned with how these species are distributed amongst the agroecosystem. Structural diversity analyzes the number of niches or trophic roles available within the system organization. Functional diversity concerns itself with the complexity of the

interactions, energy flow and cycling among the components. Temporal diversity analyzes the degree of heterogeneity of cyclical changes within the system.

We chose to include landscape diversity as one of our indicators because we believe that it is a good measurement of ecosystem sustainability. It is impossible for an ecosystem to function efficiently with low levels of biodiversity. Biodiversity is necessary for protection against pests and disease and therefore for the reduction of external inputs.

Since the term biodiversity is generally referred to as the combination of genetic and species diversity, we can measure an areas' diversity by the number of species in that given area (Gliessman, 2000). Random sampling could be initiated in many areas of UBC in order to determine a general distribution of species. Plant species and animal species will both need to be identified to give an appropriate measure of sustainability.

Soil Quality:

Brady and Weil (1999) define soil quality to be "...the capacity of a soil to function within (and sometimes outside) its ecosystem boundaries to sustain biological productivity and diversity, maintain environmental quality, and promote plant and animal health". In order for a soil to accomplish these things, many functions and criteria must be met. The soil must be able to protect ground/surface water quality, protect air quality, resist soil erosion, protect biodiversity, support plant productivity and quality, support animal productivity and quality, and provide food safety and composition (Brady & Weil, 1999).

The soil is the most important aspect in ecosystem health and sustainability [REDACTED]. If the soil quality is low, then every other aspect of the ecosystem will be affected. For example, if productivity drops then there will not be enough food to feed all components of the system. We chose to include soil quality as an

indicator because the overall functioning of an agroecosystem relies directly on whether the soil is healthy.

In order to measure soil quality, we need to look at what determines a healthy soil. Soil quality is affected by so many properties: texture, depth, infiltration and bulk density, water-holding capacity, soil organic matter, pH, electrical conductivity, extractable N, P, and K, microbial biomass C and N, potentially mineralizable N, and micro- and macroorganism levels. This means that many tests will need to be run. Students can do the majority of these tests since they are not too challenging and can be implemented in a soil science class. One of the class activities could be to measure soil quality in separate areas of UBC. This would eliminate the need for outside inputs (i.e. consulting firms) and allow for students to have hands-on experience. The results could then be used to measure overall campus sustainability.

Groundwater and Aquifer Quality:

Water quality can be a large determinant of health of the overall ecosystem. High water quality is necessary for the proliferation of all species. Contaminated groundwater is constantly seeping into our watersheds and reservoirs ultimately affecting our drinking and irrigation water. The most detrimental components in contaminated water are high nitrate concentrations and high levels of turbidity (cloudiness). High nitrate levels can render water undrinkable and may even be fatal to very young children. High turbidity levels prevent sunlight from penetrating into the water, thus having a huge effect on photosynthesis and survival of natural filtering aquatic organisms (Brady & Weil, 1999). In January 2002 turbidity levels in the GVRD watershed were so high that residents were being advised by the Society Promoting Environmental Conservation (SPEC) to boil all drinking water (SPEC, 2002).

We believe water quality to be an important indicator for sustainability. Since, water quality plays such a large role in human and animal health; it is obviously a good measurement of sustainability.

In measuring water quality, one could concentrate on nitrate levels and turbidity. The higher the nitrate and turbidity levels within the drinking and irrigation water, the less sustainable the ecosystem. There should be regular tests on irrigation water at the UBC farm as well as on the water used for drinking.

Waste Management:

UBC is making great steps towards a more sustainable food system with a large emphasis on waste management. The UBC Waste Management Program has made great attempts to improve recycling and composting resources. Waste management plays a particularly large role in the sustainability of a food system in many ways. The recycling and composting of outputs from food sources not only appropriately recycle nutrients, but also help to reduce the amount of external inputs needed. For example, the composting of wastes can contribute to fertilizing flower beds and farm products without the need to purchase chemical fertilizers. This composting process returns many beneficial nutrients back to the earth to complete the nutrient cycling process.

Waste management is obviously a very important indicator of ecosystem health and sustainability. Completing the nutrient and energy cycling process plays a major role in reducing external inputs and creating a closed ecosystem. A closed ecosystem is highly desirable in the long-term goal of self-sufficiency. As we mentioned previously, self-sufficiency will help UBC to maintain a sustainable food system.

We can measure waste management in a number of ways. One possibility is to calculate the approximate amount of wastes produced through the analysis of food purchases on campus. We can then determine the approximate amount of wastes being recycled or composted and use this to

compare to wastes produced. The ultimate goal is to have as much waste being recycled or composted as being produced. We do encounter a problem with the large amount of wastes being brought onto campus from private lunches and other sources. However, our goal is to develop **self-sufficiency** ■■■■■ on campus alone and if we can create a reasonably closed system as far as waste management is concerned, then we are well on our way to creating a sustainable food system.

These efforts can be used in conjunction with the UBC Waste Management Program's attempts. "The UBC Waste Management Office's mission is to initiate, coordinate and promote both waste and litter reduction through reuse, recycling and composting activities at the University of British Columbia" (UBC Waste Management Program, 2003). We can work directly with the waste management program to promote recycling and composting campus-wide.

Economic Indicators

Being a stakeholder of food business, the motivating factor is to maintain an economically viable business. This allows stakeholders to make a contribution to the wider economy and community, and also provide people with lifestyle choices and social options. Economic sustainability has many conflicts between short term and long term consumption and investment in business. Moreover, sustainability requires initial capital to begin its improvement. The initial capital usually comes from the profit of the business, public funding, government grants, and academic research. To measure economical sustainability, two indicators were chosen: profit of food business and viability of UBC farm.

Profit of food business:

In food business, being economically viable is key to making a profit. Profit can be measured by subtracting the cost of food and operation from overall sales. Overall sales is defined as the amount of the product times the price of the food item sold. The cost of food includes the

purchased inputs, rent, energy costs, processing costs, labour wages, transportation costs, waste management costs, and taxes. From a sustainable point of view, the decision of investment should be made in long term. When evaluating the cost of food we include the degradation of the environment (i.e. pollution of water, build up of non-degradable waste such as plastic and Styrofoam) and use environmental accounting.

Viability of UBC Farm:

As mentioned before, the viability of UBC farm depends on the potential profit (see definition of profit above). When calculating sales, the cost of food includes the purchased input (seeds, fertilizers, pesticides, irrigation cost, energy cost, and machinery), wages of labor, and transportation cost. From a sustainable perspective, the viability of the farm includes not only the market value of the farmland and sales, but the degradation of the environment, the cost of chemical pollution of water, and the nitrogen loss in soil, which can all be evaluated using environmental accounting

The Social, Ecological, Economic Development Studies (SEEDS) have already worked on many environmental programs with the environmental management system (EMS). These include hazardous waste management, chemical conservation or pollution prevention, and environmental compliance auditing. These reduce the costs related to environmental degradation; therefore, increasing the profit of UBC farm.

To further enhance the sustainability of the farm, we need to collect data on its productivity (e.g. produce and eggs). Assessment should be made based on the profit and the amount of products sold over a five-year period.

Social Indicators

We chose three social sustainability indicators that will help measure the state of the UBC's food system: 1) Education and information on the UBC food system, 2) Participation of community members in different components of the UBC food system, and 3) Food security in the UBC food system. [REDACTED]

Education and information on the UBC food system:

“To act effectively and responsibly, people must be well informed (Kloppenburger et al., 2000).” In order to achieve a sustainable food system, the UBC community (all students [full time, part-time, UBC residents and non-residents], faculty and campus employees) needs to be educated and knowledgeable on the food system. The accessibility of information on the UBC food system is crucial to its overall sustainability. The UBC community would probably make more informed choices on things that may affect the sustainability of the food system if they are educated on the food system. For example, if the UBC community is educated on waste management of the food system and how waste affects the sustainability of the food system, they may start to consider how their choices may affect the whole food system. Maybe with this knowledge, they may try to reduce food system waste by bringing travel mugs instead of disposable paper cups for coffee. Increasing education and accessible information on the UBC food system would be a start in enabling the UBC community to make informed choices to further sustainability. “A sustainable food system is one in which accurate knowledge about the food system is easily accessible and widely distributed, and people have the resources and ability to communicate that knowledge (Kloppenburger et al., 2000).” However, it is important to know that education is not the ultimate solution to our food system's

sustainability issues, but it will serve as the beginning to help the UBC community become aware of the importance of a sustainable food system.

We can measure the UBC community's knowledge of our food system by distributing a survey (Appendix 4). [REDACTED]

Participation of UBC community members:

The involvement of community members in different components of the food system at UBC is important to its sustainability. There are two types of participants in the UBC food system: direct and indirect. Direct participants are involved with the growing and processing of food; where indirect participants are the ones who purchase food at food service outlets and are not involved in the operation and governance of the UBC food system. "A sustainable food system is one in which people participate directly in the operation and governance of multiple components of the food system in ways that are more complex and influential than simple market transactions (Kloppenburger et al., 2000)." It is important that the UBC community is directly involved in the food system in order to ensure that our food system is sustainable.

With the use of the UBC farm, Community Shared Agriculture (CSA) would be a possible way to increase direct participation of the UBC community in the production, processing, operation and governance of our food system. CSA is the system of growing and distributing organically grown food that seeks to restore the relationship between farmers and consumers. (Green Venture, 2000) UBC farm could be the place where the UBC community participates in food production. The relational aspect of CSA is an important part of a sustainable food system. It facilitates a more direct, face-to-face interaction between producers and consumers (Kloppenburger et al., 2000).

We can measure participation by finding out the number of students, faculty members and campus employees that are directly involved in food production, processing, operation and

governance of the UBC food system. This can be expressed as a percentage obtained by: (# of students, faculty members and campus employees directly participating in the food system) divided by (the total # of people in the UBC community) multiplied by 100% = % of UBC community participating directly in our food system.

Direct participation would be any kind of input into the UBC food system other than the financial input via food purchases. For example, manual inputs into food production at the UBC farm and food preparation at UBC food service outlets are examples of direct participation in the food system.

Food security:

Food security in a community occurs when all people, at all times, have access to nutritious, safe, personally acceptable and culturally appropriate foods obtained through normal food distribution channels, but not food banks (Kalina L., 2001). A sustainable food system must have food security. Therefore, the UBC food system must strive to meet all of the above criteria for food security before a sustainable food system can be achieved. The consumption of nutritious, safe, personally acceptable and culturally appropriate foods are crucial to the preservation and enhancement of human health and to the maintenance of emotional and physical well being (Kloppenburger et al., 2000).

We can measure food security by examining the food choices, affordability and food safety standards of the UBC food system. By obtaining information of the cultural composition of the UBC community, we can identify the different cultural foods that are appropriate for our community. With the help of a survey, we could identify what members of the UBC community consider “personally acceptable foods”, e.g. if there are vegetarians in the community, food security for those individuals would mean having vegetarian choices at food service outlets. In order to

analyze food prices, we can obtain average income of students via a survey and compare it to the average money they spend on food.

Value Assumptions

Our group had more than one position regarding the different aspects of food sustainability which both helped and hindered this process. Some of us considered the price and quality of food to be a more significant aspect of food sustainability than the way food is grown. Food prices can be the determining factor for many people in terms of food choices. If food prices are high, it could restrict food choices, accessibility and directly affect personal food security. Moreover, food quality has a direct relationship with consumer health. The health and well-being of the consumer depend greatly on the quality of food we consume. Therefore, some of us consider the price and quality of food to be the most significant aspects of food sustainability.

Other members of the group had different positions, where they placed significance in the manner of food production. There is a strong belief that the UBC food system should be self-sustaining and should strive to be a closed system. In doing so, they would accept lower quality food as long as they are grown in a sustainable manner. They also believe that education in ecological sustainability is crucial to the attainment of a sustainable food system at UBC. Even though our group members have different ideas of what they deem to be significant, their positions are all important to the ultimate goal of sustainability at UBC.

Due to our diverse backgrounds, ranging from human nutrition to agroecology, our group had values from both extremes: some group members who specialize in nutrition and food science hold anthropocentric values whereas others who specialize in animal science and agroecology hold ecocentric values. Our anthropocentric view is reflected in our value in food quality and food security. We feel that human needs and interests are the considered preferences. Our ecocentric view

is reflected in our value in sustainable agriculture where some members place great value in nutrient cycling and the well-being of the environment and all of its components.

Through many discussions on the issue of food system sustainability, our group realized that we together hold weak anthropocentric worldviews. Even though there are members who value nature in and for itself, we realize that we still naturally put human interests first because food prices and quality do affect us directly and immediately. Moreover, social issues like food security also have a great impact on personal well-being.

Recommendations

Our recommendations to the UBC Sustainability Office on ways to study the UBC food system are as follows:

- The relationship between UBC Food Services and the broad-spectrum local, global, and national food producers, suppliers and processors needs to be evaluated more closely.
- The focus of this project should be expanded to encompass the resources of the entire mainland. We realize that the project was intended to look at just UBC, but UBC uses resources from all over the lower mainland and we believe that this needs to be taken into account.
- We feel that there should be a closer examination of the specific components of the system. For example, one group could look at the UBC Village, while another group analyzes the AMS Food and Beverage services or the UBC Food Services.

- [REDACTED]

[REDACTED] Therefore, each component could be analyzed in greater depth with the addition of other indicators such as air quality and energy reduction.

- We also considered the possibility of government involvement on a report such as this. For instance, this could develop into a master's degree with grants and/or other assistance from Health Canada, the Department of Human Resources, Environment Canada, etc.

All of these recommendations are to be used in conjunction with the efforts of the Sustainability Office. We believe that this could potentially become a campus-wide endeavor.

Conclusions

Due to the time and resource constraints of the group, which were beyond our control, the focus taken was one of a broad and general overview of the UBC food system. While broad, we believe that the model design and the indicators chosen will help to start assessing the sustainability; and therefore the future of the UBC food system. The previously indicated problem of assessing what is meant by 'sustainable' in the context of the food system and the resulting problems are covered by the model proposed. Incorporating more than the minimum number of sustainability indicators was important to the group, as it was a belief that the number of indicators in this research proposal makes the method of assessment stronger and more user-friendly. This model can and will serve as a baseline assessment tool and a point to work from in the years to come.

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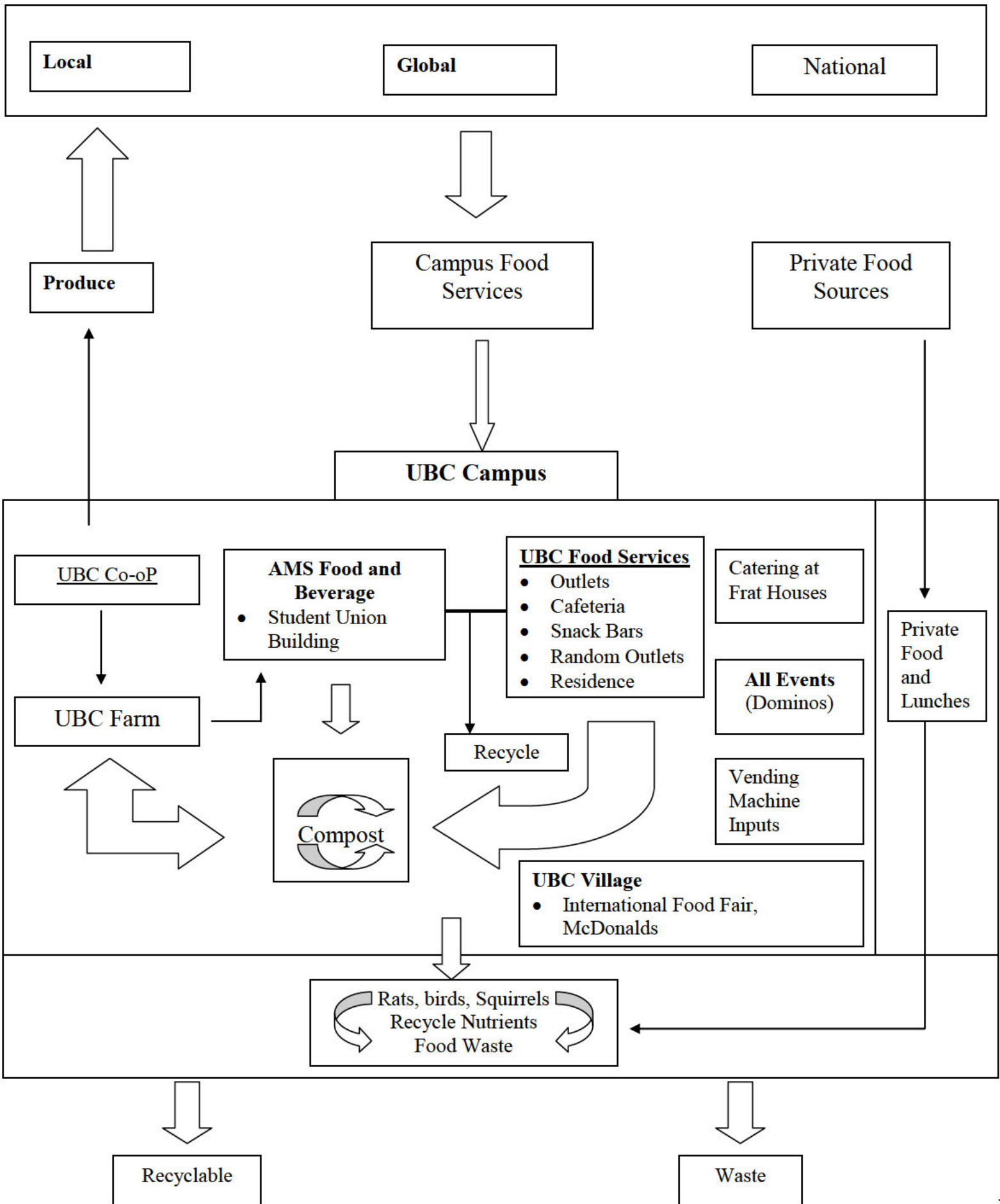
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Appendix 1 - Map of Current UBC Food System



Appendix 3 – Economic Terms

Economically sustainable --- Maintain a long-term viability of economic, social, and ecological perspectives in monetary terms

Economically sustainable indicators --- The indicators are to measure progress towards the goal of maximizing net profit over the long term in social, ecological, and economic monetary terms.

Profit --- The positive gain from an investment or business operation after subtracting for all expenses in monetary terms.

Appendix 4 – Student/Faculty Survey

Name:

Age

Gender:

Ethnic Background:

Faculty of Study:

1. Do you reside on Campus / Off Campus?
2. Do you know where campus food service outlets buy their food?
3. Where do you think disposable coffee cups go after the garbage cans are emptied?
4. Where can you find information on how food is prepared at UBC food service outlets?
5. How many times per week do you purchase from UBC food service outlets?
6. Are you familiar with the UBC Sustainability Office? How did you learn about it?
7. How often do you bring a mug from home for beverages?
8. Do you participate in the UBC recycling/composting program?
9. Are you familiar with the UBC Farm? How did you learn about it?
10. Would you like to receive more information about the UBC Sustainability Office's projects?