UBC Social Ecological Economic Development Studies (SEEDS) Student Report

The Sustainability Of Ubc Food System Collaborative Project II: A Research Design And Methodology For Assessing The Sustainability Of Ubc Food System

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ABSTRACT

The focus of this report is a proposed research project based on the long-term sustainability of the UBC Food System [redacted] As a team we assessed the current food system with the knowledge we had gained through the required course readings and the UBC Campus Sustainability Office. The goals we found important, in order for UBC to move along a continuum from unsustainable to sustainable, were defined by our underlying value assumptions and our community-based approach. We felt that focussing on the three spheres of sustainability (ecology, economy and social entities), was too broad of an approach to accurately measure the state and progression of the UBC food system and chose instead goals that overlap in terms of ecological, economic or social impacts, yet as a result of this are more tangible, precise and practical.

The rationale behind our goals is to find workable indicators with valid and useful means of measurement. As the reader moves through this paper, the goals are defined in terms of their indicators and subsequently, ideas by which to assess the indicator are given. This research proposal would not be complete without outlining our view for the future of the UBC Food System. Our recommendations are a reflection of the current system and the untapped promise this possibility holds. When we found ourselves at the end of this journey we realized that the concept of sustainability is not only complex but also that it cannot exist unless we, as a community, experience a paradigm shift that allows a holistic view of the food system, encompassing all social, economical and ecological elements. [redacted]

INTRODUCTION: THE PROBLEM AT HAND

The current problems facing the food system at the University of British Columbia (UBC) are complex and comprised of many different factors. This paper will strive to elucidate the challenges UBC's food system faces by looking at the current situation of the food system and, following a community-based approach, we will endeavour to derive the real issues of concern and future areas of focus. The UBC food system is one that strives to be progressive in the food selections it offers and in its attempt to promote the concept of sustainability, for example through programs where the consumer receives a discount if they have their own coffee mug. However, it is obvious that regardless of how the system strives to change, it is only able to operate within the constraints of attempting to satisfy hungry customers, with particular food tastes, as well as maintaining the required level of revenue.

ENVISIONING A SUSTAINABLE FOOD SYSTEM

An encompassing definition of sustainability is: the preservation or enhancement of current capital – economic, social and ecological – for future generations, without the destruction of capital in any other part of the system or neighbouring system (adapted from Hart, 1998). This definition includes the consideration of a system's carrying capacity, as all activities of the system must be done without causing harm to the system's components or other systems. In addition, it encourages a local focus, since it deals with the assessment of and building of the systems' capital. Furthermore, within the idea of a system that preserves and enhances capital, we see the system's ability to adapt and the necessity of invoking a sense of inclusion of all participants within the system.

To analyse the UBC food system in a way that would help it move towards sustainability we adapted Kloppenburg *et al.*'s (1996) concept of a foodshed "…the flow of foodstuffs into consuming markets…" and added the idea of the flow of wastes from that food out of the markets. Using this adapted version of a foodshed, **we began our task of assessing the sustainability of the UBC food system.** [redacted]

UBC'S FOOD SYSTEM MAP (see Appendix A: UBC's Food System Map)

The UBC food system is a complex set of boundaries, interactions, goals and outside influences and this map endeavours to encompass all of these elements. We chose to visually depict the interactions between these elements through the use of a circular model of the food system. Outside the circle are elements that influence the way the food system will function and these outside influences are comprised of global, national and local entities. Additionally, within every system there are boundaries, which enclose the system and are able to depict how and why a system works as it does. These boundaries are not only physical but theoretical [redacted] as well.

The model also uses arrows, allowing the reader to visualise the notion that all components and interactions are bounded within the system, interacting with each other towards the ultimate goal of sustainability.

UBC CAMPUS SUSTAINABILITY OFFICE (CSO)

In 1997, the UBC Campus Sustainability Office (CSO), adopted the Sustainable Development Policy (UBG, 1997). The core values included within this policy advocate the promotion of environmental responsibility, economic viability and the acknowledgement of social values, and are used by the CSO in implementing its mission, policies and programs. Within the context of environment, economy and community, the CSO has refined its sustainability indicators to eight main areas, focussing on input requirements and the reduction of undesirable outputs, from each of the eight areas: Energy, Water, Land, Air, Food, Materials, Humans and Finance (see Appendix C: UBC CSO's Eight Focuses).

UNDERLYING VALUE ASSUMPTIONS

In accordance with **what we observed** as valuable aspects for building a sustainable food system, we chose six goals. These were: To increase the level of incorporation of local production into the UBC food system, reduce the overall waste, increase the education and awareness of all community members involved with UBC's food system, increase affordability of food, increase community involvement within this system and lastly, increase and maintain healthy lifestyles among the users of this food system

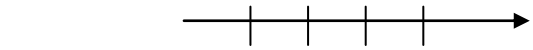
The desire for nutritional and affordable foodstuffs is a result of our appreciation as students for the difficulty in making healthy and sustainable food choices under restrictions of time and finances. The desire to educate and involve students and to target waste reduction and local production as a means of "closing the system" stem from a bio-centric community ethic [redacted] that we feel was cultivated in the Faculty of Agricultural Sciences.

Though these goals were a blend of our team's values, there was still disagreement between members of the team. One of the animal science students suggested a greater emphasis should be placed on biodiversity, while others felt that this aspect of sustainability would result indirectly from the pursuance of the other goals. The North Americans wanted to emphasise education as a tool to encourage sustainable choices, whereas one member of European descent argued for set regulations to enforce sustainable measures. However, despite our differences, it is our belief that in order for the UBC food system, in its entirety, to become sustainable, the system needs to encompass many facets, from health to waste reduction. **Sustainability cannot exist unless we experience a paradigm shift that allows a holistic view of this food system, encompassing all social, economical and ecological elements.** [redacted]

INDICATORS RATIONALE AND MEASURABILITY

Since we wanted our indicators to be relevant to the goals, we chose them according to the goals and not the categories of sustainability (ecological, economic and social) although the indicators encompass the three spheres of sustainability. In many cases the indicators will measure 2 or more categories therefore we have included abbreviations to suggest which category (ies) each indicator falls into (El= ecological, En= economic, S= social, ElS = ecological + social etc.) ([redacted]

Another criteria in choosing our indicators was to ensure they were user friendly, by devising a way to visualise the change within the indicator, and by making them flexible so they are able to adapt to changes within the system and its boundaries. Therefore, we came up with indicators that would compare current practices with the system's need or potential, so that we could easily see whether we are maintaining or enhancing capital (sustainability). To help visualise this concept, and where the components are in terms of sustainability, we came up with an Indicators Ratio Model:



(Unsustainable) ¼ ½ ¾ 1 (Sustainable)

where 1 represents sustainability (i.e. current practices match need or potential) and less than 1 is unsustainable. As an example, our indicator for local production compares the amount of food in the system that is produced locally to the amount of local food that could be incorporated (i.e. if boundaries (contracts) were changed, substitute products were found, etc). Dividing the value determined for locally produced food used, by the potential, will give a ratio that can be plotted on the above indicator line.

INDICATORS AND METHODOLOGY

1. Maximising Inclusion of Local Products

Enshrined within the idea of a foodshed is the focus on proximity of production. We agree with Kloppenburg's *et al.*'s (1996) belief that "…a community that depends on its human neighbours, neighbouring lands and native species to supply the majority of its needs must ensure that the social and natural resources it utilises, to fulfill those needs, remain healthy". We feel that emphasising the **use of local products in the UBC food system will help promote ecological, social and economic health, by fostering interrelations between components** The indicators assess the use of local products as well as whether this increase in local product use was actually fostering an improvement, in the resource management of producers.

Indicators:

a. **Level** of fossil **fuel/food mileage in relation to fuel mileage** if local purchases met potential (SEcEn)

b. The amount of food produced on campus and the extent and viability of local food production to support the campus population

Methodology:

Targeted surveys to all food outlets including franchises, campus specific services, AMS food service and franchise head offices, with questions relating to knowledge of supply origin, including fresh food & produce suppliers and distributors, must be performed (***of every single product?)***. Once the required data is collected, researcher can be continued as outlined below.

Indicator a. By using a formula proposed by the **Leopold Centre for Sustainable Agriculture**

we can estimate the distance from production source to consumption point, combining information on distances from producers to consumers and the amount of food transported. See Appendix B: Weighted Average Source Distance (WASD) (Pirog, 2001).

Additionally, a randomized survey, to assess consumer likes and dislikes, must be performed to gauge the feasibility of decreasing supply of non-local foods. Customers, storeowners, managers, employees, and local community members should be approached and asked questions including: customer preferences (cost, familiarity, number of people to feed, availability of local foods); types of food sold in stores; foods that sell consistently; profitable foods; storeowner decision-making; processes for ordering foods; and store relationships with suppliers. These list is promising and interesting, except that we need an explanation

[redacted]

This information can aid in setting goals and possible alternatives for supply origin while still meeting social and economic demands. **Dividing systems into International, National, Provincial, Regional and Local (UBC) can assess transportation methods [redacted].** From these sectors, researchers can determine producers, distributors and methods of transportation for each system. Literature and statistical research must be done to analyze fuel use and gas emissions of different transportation modes, i.e. cargo planes, trains, large semi trailer trucks, midsize tucks, light duty tucks, vans and cars (Pirog, 2001). [redacted]

Indicator b. There are 6 steps to determine the possibility of shifting toward a more locally centred food production system:

1. Data collection of production on UBC farm (types of produce, amount produced and amount of people that it can feed); [redacted]
2. Collect food consumption data from UBC residents [redacted]
3. Investigation of the University Neighbourhoods Association (www.myuna.ubc.ca), and Office of the University Architect (www.uala.ubc.ca) for statistics and by-laws on arable land on campus
4. Research the OCP from Campus Planning and their future plans for development
5. Conduct a cost-benefit analysis of sales from the farm and farmer's market to assess use and economic feasibility
6. Determine land use and therefore ecological implications of producing food for the entire UBC population as the "Gold Standard" for local food production. (The Royal Windsor Society, 2003)

2. Minimizing Waste

Waste reduction is an obvious indicator for the sustainability of any system. As Kloppenburg and Lezberg (1996) mention, "…disposal of foodstuff can pose a great cost on the environment, influencing factors such as levels of biodiversity and the cycling of nutrients within the system." However, we feel it also has great social and economic implications since in some areas, minimising waste will effectively decrease economic costs by reducing input needs and handling costs. It is important to remember that recycling may be costly, depending on facility requirements and available technologies, thus affecting the affordability of food, since added cost is passed on to the consumer (social concern). Waste reduction also affects the aesthetic value of an area, which yet again, is both an economic and social concern. The indicators strive to address the issue of decreasing wastes in a way that incorporates these concerns.

Indicators:

a. Percent of packaging that is made of recycled material relative to percent of packaging material that is being recycled (ElEn) [redacted] ***I cannot understand what do you mean***
b. The amount of composting done as compared to the amount of organic waste that could be reincorporated into the system (note this takes into account that there are organic inputs so organic outputs need to balance these) (ElEn) [redacted]
c. Finances and policies devoted towards incentives for waste reduction investment in resource conserving technologies relative to need for incentives and investment to deal with this particular system's waste (ElEn,) [redacted]

Methodology:

Indicator a. Data can be acquired through online research as well as a literature search. Packaging information can be acquired from the packaging producers as well as the company selling the packaged product. Data on how much is being recycled at UBC can be acquired from UBC Waste Disposal as well as from the UBC Campus Sustainability Office (2003). [redacted]

Indicator b. The quantity of organic wastes produced can be extrapolated from the amount of food consumed within the UBC boundaries. Again UBC Waste Disposal and the Campus Sustainability Office can be helpful in compiling numbers for the amount of organic wastes that UBC composts. [redacted]

Indicator c. [redacted]

Indicator d. This indicator is of a much more qualitative nature than the others since existing incentives for waste reduction at UBC must be listed and looked at separately (Note: incentives may stem from outside the physical UBC boundaries). Since these incentives are generally of an economic nature, quantitative research will also be required, however this type of data is most easily accessed through persons in administrative positions at UBC and through the municipal and provincial governments. **Incentive programs should be described in detail and researchers must be aware of loopholes, within the incentive structure, in order to fairly assess the usefulness it has in reducing waste. Incentives will be based on survey results that have established people's motivating factors to change their behavior. As an end result, this indicator will measure the degree to which authority is involved in waste reduction. This research is likely to be accomplished through in-depth, personal interviews.** [redacted]

3. Enhancing Education

Kloppenburg *et al.* (2000) describes a sustainable food system as one in which accurate knowledge of the food system is easily accessible and widely distributed, and all participants within the system have the ability to communicate that knowledge. The educational system should be such that individuals become competent in assessing the world around them; observing that which makes the system work yet also competent to look at the individual components of the system, since without such knowledge, linkages and interdependencies will never emerge and become apparent. We have included indicators to measure the extent that such an education is happening or has happened in the lives of students and faculty at UBC.

Indicators:

a. The number of members who feel they can make responsible choices in terms of sustainability in relation to the number of people interacting with the system on a regular basis (SEI)

b. The variability of types of education materials available in relation to the learning styles and different needs of the members of the community (S) [redacted]

Methodology:

These indicators may seem fairly general [redacted] however the subject they address is a fairly complicated one. [redacted]

[redacted]

Within this indicator, qualitative research would have the greatest benefit as the aim of this type of research stems from a holistic approach, that strives to make sense of or interpret things within their natural setting and in terms of the meanings people bring to them (Greenhalgh, 1997). ([redacted] Since the key is to find meaning in what people do, the methodology best employed for this indicator can range from passive observation to in depth interviews and focus groups. Example questions could include:

1. Do you feel you have choices that contribute to the sustainability of UBC Campus?
2. Do you feel that adequate information is available to you, so that you can make choices in keeping with your ethics?

[redacted]

4. Ensuring the members of the system can afford the food they need

Many authors (Kloppenburg *et al.*, 2000; Lyson and Green, 1999) agree that farming must be a financially viable operation. Similarly, a strong foodshed should be able to provide adequate financial compensation to the workers within the system so that they can purchase what they require. One component of this is affordability of food. Some may say this is a blind indicator because it caters to thriftiness rather than sustainability, however the affordability of food is interrelated with the ability of a system's members to provide nutritious food for themselves and their families.

Indicators:

a. Ability of a job (or hours of work needed) to match living costs (limited to food consumption) at UBC (SEn)
b. Average price and nutritional value of food on campus versus the surrounding community (low to high income communities) (i.e. comparing sustainable to sustainable) (SEn)

[redacted]

Methodology:

This data is not too difficult to obtain however it may require surveying food establishments on campus and in other communities.

Indicator a. Surveys can be conducted at any food establishments on UBC campus, with the target population being the consumers [redacted]. Quantitative and qualitative analysis are needed to find out the number of people currently employed in order to assess their financial affordability in term of food consumption at UBC [redacted].

Indicator a. This indicator can be divided into three sections, (1) average price at restaurants, (2) average price at fast food establishments, (3) average price at grocery stores and super markets. Surveys of a qualitative nature will be used to measure the average price and nutritional quality of food on campus in comparison to food available in other communities. This research approach requires data collection from store managers of said food establishment as well as students, in order to understand the perceptions and beliefs of different groups of people. The survey should include restaurants, fast food chains, grocery stores and super markets that are on campus and surrounding communities. The student survey would involve a random selection of students, on campus and in other communities, while the information from the manager should be obtained through a personal interview. Random sampling allows generalization of the research findings to the population being studied and avoids biased results. The results obtained from the student and manager survey will highlight whether there is the potential need to offer healthier food choices or to adjust food prices in order to move towards sustainability.

5. Community Involvement

Community involvement is tightly linked to education since "Not only does it educate but it also initiates change and encourages responsible behaviour" (Lyson and Green, 1999). Experience is gathered through involvement and this involvement includes members of the immediate community, the students and faculty, as well as people from outside the physical boundaries of UBC who come onto campus. An elementary school group visiting the UBC farm, for example, is one aspect of community involvement, however there are many others, most of which are subtler. Involvement describes the connection that is established between the people consuming the food and the people producing the food, as involvement includes relationship building and active

participation within the food system. In a way, everyone purchasing food in the UBC food system is participating in that system, though on a very basic level. Here, a broad approach is taken to elicit the idea of involvement, however this approach can be reduced to a more manageable set of indicators in order to reveal specific information about community involvement. The goal of community involvement is foundational and thus cannot be left out of any study of a system; therefore we have included this concept in our study of the UBC food system.

Indicators:

a. The level of job creation in the UBC community relative to need. This indicator requires both qualitative and quantitative data.
b. The amount of social space provided by food system (e.g. farmers' markets, farm work, festivals) vs. the amount that people would use for social space
c. The level of influence/control of different corporations in relation to the potential for community control

Methodology:

Some of these indicators do not seem to speak directly on community involvement; however, they are essential in determining if community involvement is functioning properly and where there are any problems within the system. Among these indicators, ecological paradigm would be the most suitable to be based on since this paradigm "…views individuals as functioning in a social context that influences their behaviors" (Lecompte and Schensul, 1999). A context consists of all social levels (e.g., family groups, peer networks, school or work settings, community and society at large) and sectors (e.g., social, technical, and environmental). Indeed, all social levels, sections, and institutions within a community, systematically relate to and affect one another. The measurement itself should be focused on observable behavior and elicited meaning in regards to structures, policies, norms, and behaviors typical of other levels in the system. The latter two indicators (b. and c.) take on a highly qualitative nature and are thus hard to measure, requiring extensive research. Active participation is required by the UBC administration in order to determine the data for some

of these indicators. Highly specialized surveys (for indicator b.) will be necessary for adequate data accumulation.

Indicator a. Quantitative research can be used to assess the numbers of jobs available for community members and the actual need within the community (system), however the need of the level of job creation can be ambiguous. A supplemental self-reported survey can be conducted to help **determine if variance was issued in accordance with system participants and hence, to develop a concise nominal definition of need for active participation**.

Example research questions:

1. Percentage of current employees from the local community
    - Technical; Services; Office & Management
2. Qualifications needed for the current job openings
3. Do community members feel there are always job opportunities available for them within the system?
4. Do community members think the job openings, if any, suit them?

Indicator b.

Some quantitative data can be gathered from the UBC administrative office and the UBC farm. Nevertheless, the assessment of this indicator should be focused extensively on qualitative information, as the function of this indicator is to manifest relationship building and active participation within the UBC food system. Self-reported surveys and focus-group interviews can be conducted to assess the amount of social space provided by the food system in relation to the number of people that would use The survey should include students, faculty, and people from outside the physical boundaries of UBC that come onto campus.

Indicator c.

This indicator should involve the use of observational studies. With this research method, researchers can record situations as they happen as well as the meanings of these events at that time, **thus a comparison between the control of food producers and food consumers over the UBC Food system can be made In addition, information on the level of influence and control of different corporations can be obtained via a partnership with the UBC administration and local and provincial governments**

6. Healthy Lifestyles

This is an umbrella term describing not only the physical health of individual students and faculty members at the university but also the satisfaction derived out of the food system in general leading to the question of whether individuals are pleased with the food services provided by UBC.

Healthy lifestyles address everything from individual health to cultural inclusion and as is probably apparent, healthy lifestyles includes all the aforementioned goals since they all contribute, in some way or another, to the satisfaction derived from the system as a whole. Like the goal of 'Community Involvement', 'Healthy Lifestyles' is intricately connected to education.

Indicator:

a. The healthiness of the food provided by UBC food services (S)
b. Food security and the assurance of access to healthy foods (S)
c. Variability of food choices allowing for equitable, affordable, cultural and ethical sensitivity in relation to demand for these choices (S)
d. Ability to provide job satisfaction to employees including improving their skill set and building upon the skills they already have (i.e. flexible enough to allow people to experiment within the system based on what they are learning and have learned) (S)

Methodology:

Indicator a. The healthiness of food can be measured by determining the percent of nutrients obtained from eating at various food outlets at UBC [redacted] **Statistics, as well as surveys [redacted] would be used to assess how the UBC food system is affecting the health of those who eat there** [redacted] . In addition, research can be done on the different types of food offered at UBC. As an example, the percentage of certain vitamins and minerals people obtain from specific foods available on campus could be established and the foods themselves could be assessed for its healthiness.

Example Questions:

1. What do you, as a user of this food system, think of the healthiness of the food system and would you consider what you eat here healthy?
2. What do you eat most often and how do you feel it contributes to your overall diet?

Indicator b. To measure food security in this system, an evaluation of the UBC food system compared to other food systems throughout Canada could be done [redacted] The evaluation could be based on various factors such as: the ratio of local production used to imported food used; the ability of the community to sustain itself without the support of outside resources; and how well the community knows about their food system.

General Survey Questions:

1. Are you aware of all the food resources on campus?
2. Do you feel as though you have good access to all of these resources?

[redacted]

Indicator c. To measure the variability of food choices, an exact assessment of what is available in the marketplace and grocery stores within the food system is required. This field research would require individuals to go out and physically assess the food system in terms of variability (cultural), food choice (organic) and item popularity. The importance of this type of research would be helpful in determining the types of foods that are in demand and the types of food that are unavailable yet there is a demand for them.

Sample Survey Questions:

1. Are you happy with what is offered at UBC?
2. Does the UBC food system meet your food needs in terms of culture and religion? Affordability?
3. What food needs to be offered at UBC that is currently not available?

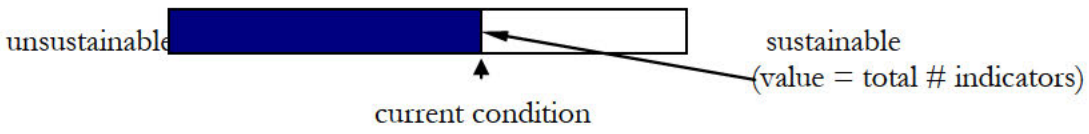
Indicator d. Measuring this indicator would assess job availability based on demand, eventually allowing for more opportunities for UBC students to become involved in the UBC food system. A survey assessing the number of people employed by the food system, the percentage of them that are students, the average wage, and job flexibility would be useful.

Sample Questions:

1. How would you rate (on a scale of 1-10) components of your job such as satisfaction in terms of wage, and opportunity?
2. How knowledgeable are you about where this food comes from?
3. Would you like to see more programs focused on educating employees on the food system?

THE SUSTAINABILITY CONTINUUM

The individual indicator models can be combined to give an overall model of sustainability. If the values of the individual indicators are added together they are able to indicate where the system is, in terms of overall sustainability. A good way to visualise this is through the use of a target bar; the bar is filled in as the system moves towards sustainability:



The first stage along the continuum will depend on the assessment of UBC's current situation. If the majority of the indicators are near or at a value of ¼ for example, the first stage will

be reached when all components are manipulated to give indicator values of ¼ or higher (i.e. ¼ of the capacity of using local production is achieved, ¼ of community members feel they can make sustainable food choices etc). **This may require the scaling back of some indictors if the interactions of two indicators are detrimental to another indictor, causing it to be further from the target for that stage**

The second stage will be an incremental increase, probably to a value that is double the first, but this is dependant on the difficult in reaching the first stage. Our group wanted to emphasise that all attempts should be made to keep all indicators at the same value or higher, otherwise all facets of the system are not moving towards sustainability.

RECOMMENDATIONS: MOVING FROM UNSUSTAINABLE TO SUSTAINABLE

Step 1: Creating an Indicator Database

A database to store all information is vital to allow for efficiency in communication about the indicators. Students from all faculties should be involved in the research that measures the indicators as part of their course curriculum. The responsibility for updating the database must also be assigned and changes should be made as they occur.

Step 2: Maximizing Current Potential

There is a need for strategies that are created for marketing initiatives such as farm programs, composting and using ecologically sensitive products. Marketing students can be utilized as a resource to help create the required marketing plans in order to increase the success rate and awareness surrounding these initiatives.

For the facilities and programs that are present at UBC Campus, their use should be maximized. For example, UBC has several small scale composters, a large one in planning and workshops that have great potential to help achieve sustainability (UBC WMP, 2003) Marketing will help achieve this goal, however another consideration is to hire students or community members to do things such as sort wastes or organize food-centred events. As for the education potential, the Faculty of Agriculture has developed some excellent course material and case studies that teach students about sustainability and this material could be implemented in courses in other faculties. This faculty also has the potential to involve students in the creation of resources that will address different learning styles - i.e. encourage presentation of issues such as these via different mediums – art, videos, children's books etc.

Another underused resource is UBC Farm. We feel this faculty could do a better job of using the farm to illustrate principles learned in class. An example of this would be requiring students to do applied agroecology (AGRO 461) in the form of a farm project. It is a shame that some students graduate from this faculty without having stepped foot on the farm. This idea of implementing on-farm work as part of the curriculum could be used in other faculties as well, such as Education and Biology.

In terms of the dairy research centre, the location makes it difficult for students to access on a regular basis, however using it for co-op work terms and class fieldtrips will help increase student's level of involvement in the centre.

Step 3: Information exchange

There are numerous strategies for waste reduction as has been shown by the innovative techniques used by countries with lower land bases and fewer available resources. Educational materials, initiatives to encourage community involvement and improve health and job satisfaction are used by many organisations, including large corporations, small stores, volunteer organisations

and governmental departments. Many of these may be applicable on campus with adaptations. UBC's own programs, many of which are innovative, can be adapted to the needs of these groups in return.

Step 4: Targeted Research

An indicator assessment after step 3 should help to determine areas of weakness. Since information exchange has not helped this problem, energy and finances should go into targeting this particular area of research.

FINAL REFLECTIONS

In terms of UBC's potential, capacity and motivation, we feel that we have presented realistic goals that the UBC food system is able to strive towards. We acknowledge that UBC is working within economic constraints, consumer demands and public policies, however through innovation and actions plans already in place, we feel that the UBC food system is in the nascent stage of a long-term paradigm shift. This gives our group hope, as it demonstrates that awareness and action can be responsible for shifting ideologies, towards a bio-centric campus, focused on maintaining and enhancing all resources for future generations. We believe further growth towards a sustainable food system must include continued research and thoroughly monitor and support all endeavours towards this goal. UBC is a groundbreaker in controversial topics and a microcosm of other larger populations; therefore we feel that every effort should be made to continue the university's role as a model and pioneer for sustainable food systems. As students of this progressive university, we are pleased to have been part of creating a research design that can be implemented in future years and assist in this pioneering movement.

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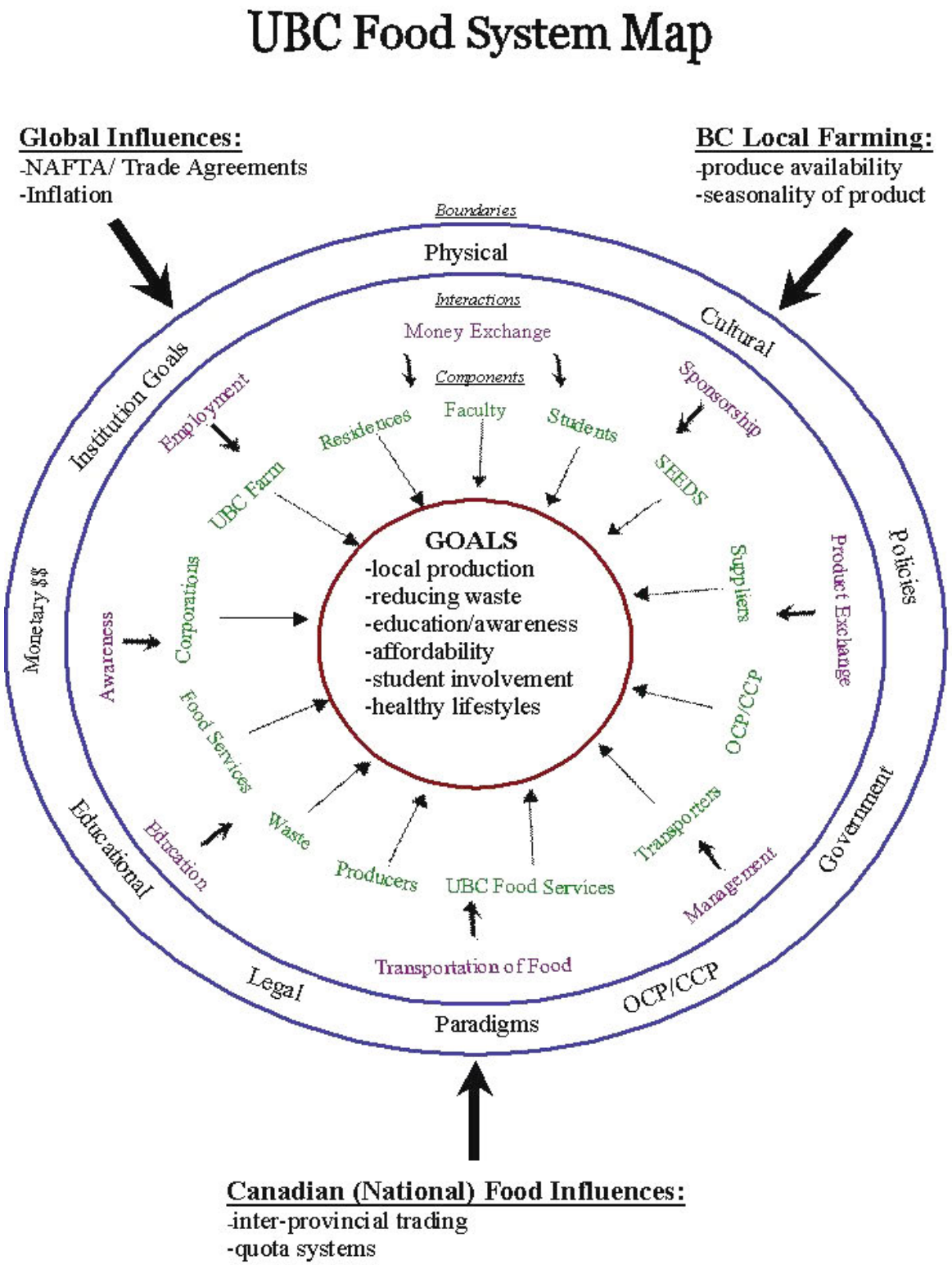
APPENDIX A: UBC'S FOOD SYSTEM MAP



APPENDIX B: WEIGHTED AVERAGE SOURCE DISTANCE (WASD) (Pirog, 2001)

WASD $=\sum(m(k) * d(k)) / \sum m(k)$
.m= amount consumed from each location of consumption origin
.k = different locations of the production origin
.d= distances from the locations of production origin to the point of consumption.
This is a formula for fresh fruits, veggies, meats and other whole foods (from production and shipping records) and may be harder for multi-ingredient processed foods (Pirog, R. 2001).

APPENDIX C: UBC CSO'S EIGHT FOCUSES

Energy

The large and growing population on the UBC campus is reflective of high energy and water needs and results in elevated waste generation by the campus population. The CSO (2003) considers source, quality and quantity of energy used, as indicators of sustainable energy.

Water

Though closely related with energy, the CSO (2003) differentiates water resource indicators into consumed water, wastewater and storm water. The aim of the CSO (2003) is for 10% of water consumed on campus coming from an onsite supply, 10% of sewage produced on campus treated onsite, and 10% of storm water on campus filtered and reused onsite by 2005. The undesirable outputs of effluent wastewater and ecosystem degradation are progressively being met by following recommendations from Energy and Water: Targets and Action Plan (CSO, 2002).

Land

Use, quantity and economic value, of UBC owned land, is essential to its sustainability and landscape architecture, land use and production can all be manipulated to ensure a healthy land component (CSO, 2003). The Sustainability Targets for Buildings (CSO, 2003) is a current initiative to reduce the inappropriate use of land and to reduce environmental degradation, with pesticide use as an indicator.

Air

Monitoring and maintaining air quality and quantity, to buildings and occupants, helps create a safe and healthy environment in which the UBC community can interact and work. The CSO (2003) has targets for reducing energy in buildings, finding and using transportation alternatives, and for reducing the amount of cement used in construction, however, some of these methods have yet to be implemented.

Food

Evaluating the source, quality and health of food can help in identifying the sustainability of the UBC food system (CSO, 2003). The CSO (2003) has pioneered a movement to target waste management and create action plans to accurately assess the system, however, much research and work is still required in order to reduce undesirable waste outputs and soil degradation.

Materials

When a system creates more waste than it can re-use, it requires new and innovative management, including recycling and litter and compost, therefore waste management is a significant factor in the sustainability of a community (CSO, 2003). The CSO (2003) is focussed on monitoring the source, quality and quantity of materials used, in order to minimise the energy and material intensity of university activities with a target of 20 percent reduction in waste while increasing the reuse and recycling of building materials and content.

Human

The biggest player in the sustainability of a system is the human component. Increasing the quality of the experience all students, faculty and staff have, is a major determinant in the long-term success of a program, therefore illness, loss of productivity, and lack of security are indicators of social stability in the workforce (CSO, 2003). UBC focuses on enhancing its capacity to teach, research and practice sustainable development principles, while increasing the ecological / social / economic literacy and practices among faculty, staff, students, and the public at large (CSO, 2003).

Finance

The last sphere of sustainability, as defined by the CSO (2003), is the financial component, since a community must be able to support itself through funding, donations, and endowments, while supporting its members through fair wages and at the same time, reducing the costs on utilities and facilities. UBC aims for responsible and effective management, the development of a comparative advantage in its educational and research activities, innovative methods to calculate and account for external costs, to identify cost-savings and new sources of revenue through innovative partnerships with the larger community (CSO, 2003).