UBC Social Ecological Economic Development Studies (SEEDS) Student Report

A strategy for food system sustainability in the University Boulevard Neighbourhood: Initiatives within the residence buildings

Laura Chan, Jeff Friedrich, Katie Garthwaite, Sundeep Khakh, Sarah Morrison, Meredith Seeton

University of British Columbia

AGSC 450

April 12, 2006

A strategy for food system sustainability in the University Boulevard Neighbourhood: Initiatives within the residence buildings

Source: UBC Planning website, 2006

UBC FOOD SYSTEM PROJECT, SCENARIO 6

Group 21: Laura Chan, Jeff Friedrich, Katie Garthwaite, Sundeep Khakh, Sarah Morrison, and Meredith Seeton

Executive Summary

Our task in the UBC food systems project was to suggest implementation strategies to enhance food sustainability in the residential area of UBC's proposed University Boulevard Neighbourhood. UBC's current expansion plans give us the opportunity to showcase a model of urban agriculture that can influence greater communities. Through an analysis of the plans that guide development at UBC, we saw many opportunities to enhance food system sustainability in the new area. An analysis of the current development processes, however, saw constraints that could hinder student attempts to make recommendations to the project that would be taken seriously.

As a basis for our recommendations, we looked at two eco-villages, and concepts of permaculture design. From this, we developed a strategy to enhance food sustainability within the residences of UBN, through rooftop gardens integrated with residential commons space. We concluded with recommendations that UBC Campus and Community Planning develop standards and a framework to implement some of our proposed ideas. We recommended that next year's AGSC 450 class for them to work with development stakeholders to develop an action plan, but also to develop indicators of food sustainable planning.

The UBC Food System Project (UBCFSP) is an ongoing and collaborative project, which broadly aims to improve the sustainability of the food system at UBC. We, Group 21, constitute just one part of a team, which includes the AGSC 450 teaching team and previous year's classes. The UBCFSP project is broken into seven scenarios, ours being Scenario 6: to develop a strategy for food system sustainability in the University Boulevard Neighbourhood (UBN) in UBC's University Town. Each of the four groups working on scenario 6 has further refined the area of research and the scope of their recommendations; our proposal is focused on improving the food system sustainability of the new residential housing in UBN.

This paper will describe the current development plans for UBN, identify opportunities and constraints within the current planning documents regarding food system sustainability, and identify constraints in the policy-formation and planning process. We also describe the eco-village model and how it is a manifestation of food system sustainability, elaborating on two specific examples that apply to UBC. We go on to make recommendations in the area of composting, community centres, rooftop gardens, and a permaculture demonstration site within UBN. Our recommendations will be targeted to UBN as well as the development of the University Town in general.

Problem Statement

There is a strong need to address the food system in all types of human settlement. Ecological and social damage is being caused by our disconnection from and disregard for our food system. Productionist agriculture has caused soil degradation, water pollution, the loss of biodiversity, and air pollution. Public health crises such as undernourishment and obesity, both forms of malnutrition, exist throughout the world. A

broader engagement and integration of citizens, institutions and governments could alter the direction of our food system and improve ecological and public health.

Food system sustainability is increasingly being addressed in urban and peri-urban areas: Vancouver has recently created a Food Policy Council that addresses food security within the city. The "Community Food Security Coalition", a North American non-profit organization, outlines what is encompassed in a food system in its mission statement. The organization is:

> "Dedicated to building strong, sustainable, local and regional food systems that ensure access to affordable, nutritious, and culturally appropriate food for all people at all times. We seek to develop self-reliance among all communities in obtaining their food and to create a system of growing, manufacturing, processing, making available, and selling food that is regionally based and grounded in the principles of justice, democracy, and sustainability" (CFSC Homepage).

In the above outline the relocalization of the food supply becomes an apparent goal in addition to reconnecting citizens with their food system. Even though food needs cannot be fully met by urban agriculture and treasured small farms within cities, urban food system sustainability can be addressed and improved in a variety of ways.

Sustainability has been recognized as a vital part of the development process at UBC. In addition to the university's sustainable development policy, new campus development has to go through the Residential Environmental Assessment Program (REAP) and "institutional buildings … must achieve Leadership in Environment and Energy Design (LEED) green building rating of Silver or better" (UBCFSP 2006 16, 17). However, the issue of food system sustainability has thus far gone unaddressed in new development.

The University Boulevard Neighbourhood, which can be seen as a microcosm for urban communities, will be one of eight neighbourhoods in the UBC's University Town

(The Eight Local Areas). In the current stage of planning, there is still some room for student input; this presents a unique opportunity to present stakeholders in the development with recommendations to enhance food system sustainability.

The UBCFSP Vision Statement

We support the seven principles outlined by earlier researchers in the UBCFSP vision statement (UBCFSP, 2005). The vision statement describes the goals of a sustainable food system as protecting and enhancing the diversity and quality of the ecosystem, and improving social equity, by adhering to a number of principles. Among these was the promotion of localized food systems, waste reduction and nutrient cycling, food and environment education, enhancement of community, and consideration of other social and ecological dynamics.

Our only concern about the UBCFSP's vision statement came from some members who felt it was important to recognize the potential economic costs of wide-scale food self-sufficiency. Given the current world trade system, where many poorer countries have comparative advantages in agricultural products, emphasizing localized food systems should be balanced with the responsibility of acting as good global citizens, and not used as an excuse for trade barriers harmful to developing countries.

Our general support of these principles, and of the larger vision statement, is probably influenced by of our association and studies within the Faculty of Land and Food Systems, where many of the principles form the foundation of the faculty's research and learning. Recognizing that we are affected by these value assumptions, we discussed a need to be cognizant of other considerations and limitations in the planning of UBN.

Methodology

For our paper, we used various resources and methodologies, including the insights of past AGSC 450 groups, a further literature review, a review of existing food system sustainability initiatives, and insights gained from the eco-village movement. We also conducted interviews with planners and stakeholders in Campus and Community Planning, University Town, the AMS, and the UNA, to assess current plans and the implementation and practicality of our ideas.

The University Boulevard Neighbourhood

The UBN extends along University Boulevard between Westbrook and East Malls (P-3 Roads Context). The mixed-use development will have land designated for commercial, residential and institutional uses. The UBN is also designated as a greenway in the Official Community Plan (OCP). It is envisioned as an architectural gateway, one that will serve to welcome visitors to UBC and serve as a village center. An alumni center, new administration building, buildings with student social space, an open University Square, and a transit station handling UBC's approximately 50,000 daily transit trips, are all planned for the neighbourhood. The residential use which we have focused our paper on will consist of as many as 326 residential units located on the upper floors of buildings in the UBN (Friedrich).

The project has been delayed by escalating construction costs and a new phasing plan established a revised completion date of the residence buildings estimated between 2009 and 2010. A University Town Committee comprised of various stakeholders has steered the process and is required to take all plans and revisions to the Board of Governors for approval. An understanding between the Greater Vancouver Regional

District (GVRD), who has jurisdiction over UBC, also commits UBC to providing meaningful consultation with the public (Friedrich).

Opportunities and Constraints in Current Planning Documents

Research by groups in 2005's Land Food and Community III class helped us to define opportunities and constraints that currently exist in the planning framework for the University Boulevard area. Three groups worked on Scenario 4, which looked at "exploring existing opportunities that enhance and/or barriers that impinge on the sustainability of the UBC food system within current campus development plans" (Rojas et Al. 11).

The Official Campus Plan (OCP) was published in 1999 and looked at non-institutional development and the creation of a community at UBC. Group 5 noted several opportunities for enhancing food system sustainability in this document, notably an emphasis on "green spaces" and development based on ecological principles of working with, rather than against, the natural environment (Group 5). Group 12 also noted the emphasis on green space in the Community Campus Plan's 'Principles for Public Open Spaces', however while they noted that proposals such as greenways, public green areas such as parks, as well as storm water management and drainage systems could all "indirectly contribute to a sustainable food system", they were concerned that proposals lacked "a direct definition of the ecological functions of green space" (Group 12). Group 5 also cited a desire in the OCP to "build community that is inspiring and interactive by attracting a variety of community members and creating a varied range of building developments and landscapes" (GVRD 22 in Group 5) as an opportunity for people concerned with food systems to have a space at the table during development.

One of the largest challenges to improving UBC's food system sustainability is the opportunity cost of land in the University Endowment Lands. Land in the Lower Mainland, particularly in the Point Grey region, has astronomically high market values, and residential developments on campus can bring in millions of dollars for the university. This is important, since as Group 5 found, "a priority will be placed on responsible development and utilization of land resources since it will help to build an endowment to sustain UBC's goal of maintaining status as a leading education institution" (GVRD 13).

A serious obstacle to the implementation of new ideas is that the municipal governance structure at UBC is still evolving. In most communities residents could present ideas to elected representatives who are accountable to their constituents. At UBC most planning still happens within the administration, allowing a large amount of discretion to the University in deciding which features or regulations to introduce. UBC is, as mentioned, obligated by the OCP to engage meaningful consultation, but what constitutes "meaningful" is the subject of debate, and the decision to implement recommendations that stem from consultation is left to UBC's judgment. Governance challenges at UBC will continue to constrain the adoption of new priorities such as sustainable food system planning.

Models of sustainability

In order to promote a sustainable food system within UBN we have looked to eco-villages and permaculture for inspiration and as a model. We feel that taking concepts from these movements and applying them to UBN development plans could help enhance food system sustainability in the region.

Eco-Villages

Eco-villages aspire to create a sustainable model for living, and the concept has been applied to a broad range of villages and communities. Eco-villages commonly take a three-pronged approach, focusing on social, ecological and cultural/spiritual sustainability, although the techniques and strategies they employ can differ from one community to another. Notable features of this model can include:

- Supportive social-cultural environment with a low impact lifestyle.
- Enhance biodiversity and work with surrounding ecosystems.
- The use of permaculture techniques.
- Co-housing or other forms of supportive community.
- Consensus decision-making.
- Integrated food production, community garden plots.
- Promotion of poverty eradication by supporting bioregional social economic systems.
- Supports green industries and renewable energies in the creation of jobs.
- Minimize waste and pollutants (Ecovillage).

The sustainable production of food is a paramount part of the eco-village system. Eco-villages attempt to produce much of their food themselves without degrading the health of the environment. However although food production is a key component of the eco-village, it is often not the case that all food can be produced within the locale. For that reason, local and organic food production is also strongly supported by the eco-village philosophy. Composting and sustainable management of wastes are other important aspects of eco-villages (Ecovillage).

Our group focused on two existing eco-villages that are particularly applicable to UBN: the Madison Urban Eco-village and the Berea College Eco-village, in Kentucky. Madison Urban Eco-village is unique as an eco-village without borders. Its philosophy is that members live in their own space, but share a common goal of living and promoting a more sustainable lifestyle. The eco-village structure allows them to connect and share ideas and support each other in their attempt to live sustainably (Madison Ecovillage Without Borders Home Page). This framework would be ideal for UBN because membership is voluntary, but it could help facilitate a more sustainable food system for those residents who were interested.

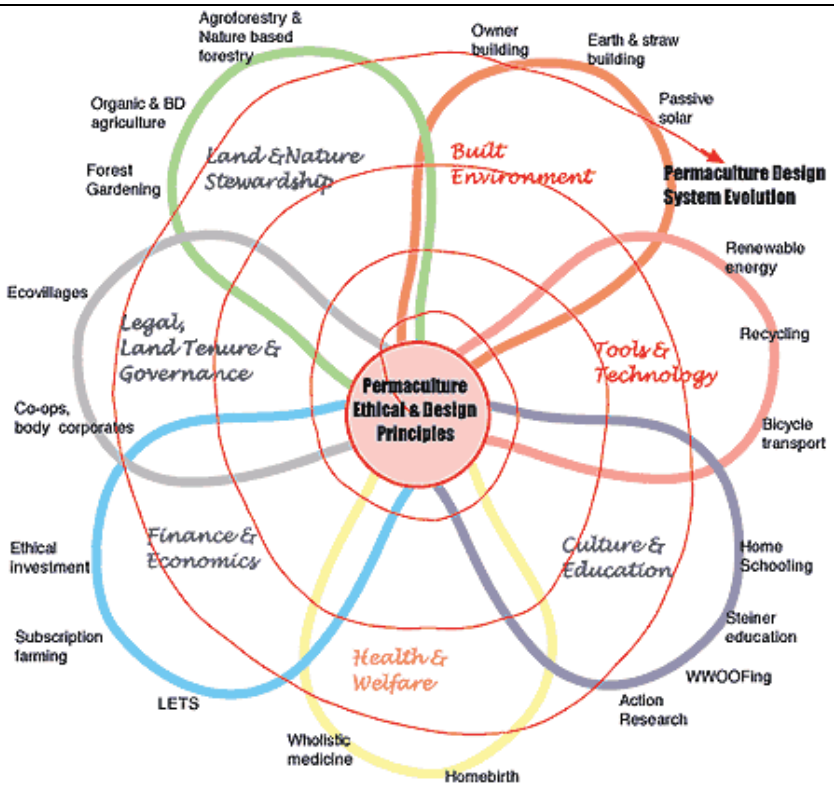
The primary purpose of the Berea College Eco-village is "education through living". Residents live in adjoining townhouses, and participate in projects that increase their environmental education, such as composting and gardening. The eco-village also includes a teaching and demonstration building—a largely sustainable building that students live in and maintain. The eco-village's Commons House acts as a meeting place for educational and community events. The building houses mailboxes, notice boards, laundry facilities, and the office of the residential life coordinator, alongside a community kitchen. There is also a main hall for gathering, adjacent to a playroom so that parents can watch their children while studying (Berea College).

Permaculture

In addition to eco-villages, we have drawn from the concept of permaculture in developing our model. The permaculture movement is very strong throughout the world and is an innovative field that contributes to mainstream agroecology. This complex concept was born in Australia in the 1970s, coined by Bill Mollison and David Holmgren. Bill Mollison offers a brief definition:

"(Permanent agriculture) is the conscious design and maintenance of agriculturally productive ecosystems which have the diversity, stability, and resilience of natural ecosystems. It is the harmonious integration of landscape and people providing their food, energy, shelter, and other material and non-material needs in a sustainable way. Without permanent agriculture there is no possibility of a stable social order" (What Is Permaculture).

David Holmgren uses a flower diagram to explain permaculture and its increasing applications. Permaculture begins on the personal level with Holmgren's twelve ethical and design principles. The spiral moves out as action and change occurs on the community, regional and global levels, wavering slightly to represent the uncertainties of nature and the changing movement. The seven petals are the various areas that permaculture can be applied to, with existing movements, institutions, and actions on the outside of the flower.



(Holmgren)

While permaculture often manifests itself in village and rural settings, especially in intentional communities, the concept is applicable to all communities. As evidenced in Holmgren's flower,

the concept has become more than a farming technique, and can be applied to UBN to increase food security and further the creation of an engaging mixed-use environment. A goal of permaculture is to use "minimum effort for maximum output" (Bell 5), which makes the concept ideal for urban environments and semi-public places.

Applications: Using the models as inspiration for planning concepts

Having discussed some models that account for or address the issue of sustainable food system planning, we will now focus our discussion on recommendations we can incorporate from the models and into the UBN housing plans. This discussion will primarily focus on the development of rooftop gardens and commons space in residential areas, two infrastructure developments that can promote ecological and social sustainability in the food system. The paper will also examine, to a lesser extent, composting and window boxes.

Green Roof & Rooftop Gardens

Our group looked into green roof and biological water filtration systems for food production and energy conservation. Green roofing is a new field that is receiving much attention in countries like Switzerland and Germany, and major cities, such as Toronto and Chicago (Industry). Switzerland has recently passed a new bylaw that states that all new buildings must replace the amount of green space lost with rooftop vegetation, and all existing buildings must convert at least 20 percent of their roofs to green technology (Hobbs 3).

We looked at three main types of rooftop gardens: extensive, hydroponic, and intensive (Daley 6). The extensive garden involves growing plants in containers of soil on a roof (Daley 6), whereas hydroponics involves growing plants in containers of a nutrient solution (Nowak, Urban). Both are cheap, easy to set up, low maintenance, and light (Daley 6) (Nowak, Urban).

In addition, hydroponics tends to have a high production rate (Nowak, Urban) and can be used to produce fruit and vegetables, such as tomatoes, peppers, and strawberries (Nowak, Cornell 28). In the last type, intensive green roofs, plants are grown in soil that lies directly on the roof. These types add extra insulation to the building, which substantially reduces the costs of heating and cooling, and reduce storm water runoff, that alleviates some strain on the city's drainage system (Daley 6).

Intensive green roofs provide many more environmental, financial, and social advantages (Benefits). The most valuable calculable financial benefits are those from reduced storm water flow, improved air quality, lowered direct energy use, and lessened urban heat island effect (Banting et Al, ii). These green roofs decrease storm water flow by absorbing and consuming rainfall, reducing the amount of water that enters the sewage system (Daley 6). They improve the quality of air by consuming carbon dioxide, releasing oxygen, and filtering dust, toxins and pollutants, such as those given off by heavy construction (Air Quality). They lower direct energy use by adding extra insulation, and lowering the cost of heating and cooling. Green roofs reflect 27%, absorb 60%, and transmit 13% of solar energy into the roof (Banting et Al. 8). Finally, green roofs lessen the urban heat island effect often seen in large cities, where temperatures are higher than their neighbouring rural districts. Rural areas have more organic surfaces that contain moisture that uses solar energy for evaporation, whereas urban dwellings have more hard surfaces that reflect solar radiation, contributing to increased temperatures (Urban Heat Island Effect), increasing costs for artificial cooling, and adding to the intensity of the greenhouse effect (Banting et Al. 13).

In 2005, a study by Ryerson University estimated the incremental cost to re-roof a green roof in Toronto to be $75-$90 per square meter of roofing, over and above the costs of a

traditional roof (Banting et Al. 49). Because UBN is yet to be constructed, costs of green roofing will presumably be lower than in this case of retrofitting and existing roof. In addition, these roofs also reduce costs in the short- and long-term. The same study calculated the amount of money Toronto would save if all space available for green roofing were used. This space includes and specifies for intensive roofs that are greater than 350 square metres in area, devoting at least 75% of roof area to vegetation, with a minimum 150mm depth and "maximum runoff coefficient of 50%" (Banting et Al. iii). The total area came to 50 million square metres, and the total initial and annual predicted savings are $313,100,000 and $37,130,000 respectively. Additional incalculable financial benefits include aesthetics, property values, food production, and biodiversity (Banting et Al. ii).

In addition to these environmental and financial benefits, green roofs provide opportunities for social advantages. They reduce the amount off noise that enters the building (Noise and Sound Insulation), give the area a more environmentally-friendly appearance (Aesthetics), improve the mental and physiological well-being of its inhabitants and visitors (Health), and provide opportunities for educational and community programs.

In order to create a rooftop garden, the following factors need to be considered: access to the roof, the total weight ("intensive green roof systems weigh about 80-150lb/ft^2" (Daley 12)), the costs of producing the garden, spatial design of the roof, irrigation drainage, and maintenance (Daley 10).

Irrigation and fencing also need to be considered. Irrigation systems, such as rainwater storage tanks and drip irrigation systems, to keep the thin soil layer well hydrated, and drainage systems, such as gutters, downspouts, and drains, to prevent root rot and leaking. (Daley 14). Glass or fence wind barriers should be implemented to protect the vegetation (Kortright).

Soil depth must be thin enough to reduce weight on the roof, and thick enough to support growth of plants with shallow root systems. If given enough soil depth, for example 12 inches, intensive green roofs can support the growth of vegetables, shrubs, and trees (What Is a Greenroof). For example, potatoes can be produced, as they have a shallow root system and produce a high level of food per area (Thompson et Al. 1,3).

Recommendations:

Our group recognizes the opportunities that these newly developing residence buildings in the UBN have for serving as thriving role models of ways to increase food security and reduce energy consumption. We envision residence buildings that demonstrate communal involvement and continuing education about the current food system. Such demonstration projects could include a permaculture demonstration site, green roof farming, a Living Machine, a community kitchen, and a composting demonstration site.

For the green roof-farming project, we recommend an intensive-type green roof for its many sustainable-minded benefits, such as improved insulation, reduced storm water runoff, enhanced mental well-being, and increased community involvement.

The green roof would be divided for three purposes: rented space to residents, a permaculture demonstration site, and the community-based food production space that could grow a variety of shallow root fruits and vegetables, like potatoes, that would be used for the community kitchen. Since vegetables are susceptible to water stress from inadequate watering (Sanders), we would recommend that the residence invest in a part-time staff member to maintain the gardens. We also suggest that a committee for the rooftop garden be established to maintain and expand the garden and educational programs into the community.

To educate the residents about reducing waste, we would maintain rooftop-composting bins. To transport larger loads of gardening material such as soil, fertilizer, and compost, a wide, exterior staircase should be incorporated. We would also recommend an interior staircase for residents from within the building to access the garden. To protect crops from windy weather and people from slipping off the sides of the building, the rooftop would need a wind barrier, made of glass or fencing, around its border.

To construct this green roof and the building that supports it, we would need to estimate weights, such as that of the vegetation, soil, total human body weight, snow, and rainwater. A team of professionals, like green roof contractors, engineers, landscape architects, and plumbers, should be involved in the planning process.

Composting

Composting is an important and effective way of disposing, but also using, food wastes. Beginning a composting program would be an easy way to promote food system sustainability and sustainable waste management in the UBN. When developing a composting program it is important to make it easy and efficient for the residents to follow, otherwise individuals that are less committed to it may not comply.

Plans to implement a composting strategy within the UBN may be facilitated by the fact that UBC has already begun a composting program. In 2000 the UBC Compost Project was launched to reduce waste through composting and to provide composting information and education. Since 2004 there has been an in-vessel composting facility at South Campus. There is currently a program in place, in which UBC Waste Management collects food scraps and other waster and takes it to the in-vessel composter at South Campus. It would be very easy to incorporate the UBN into the existing program ("Composting").

The plans for the University Boulevard Neighbourhood development already have a strategy in place to equip each dwelling with a recycling box. Residents could simply be given a composting box or biodegradable composting bags along with their recycling box. A larger communal compost container could then be placed in an accessible common area in each building. There residents could, with very little inconvenience, dump their household food waste. It could then be arranged for UBC Waste Management to add the residences to their existing waste pick-up route and transfer the compost to the in-vessel composting facility at South Campus. Another alternative would be for the waste to be composted on site and perhaps used in the rooftop gardening endeavour.

Window Box Gardening

Window box gardening is another way that could residents to produce some food themselves. Although the amount of food that they could produce would not be large, window boxes would be a perfect way for residents of the neighbourhood to cultivate herbs, and or small fruit and vegetable plants.

Community Centres and Common Space

Community centres within residences can be a forum for education, stimulation and involvement in the food system. Centres can be either in the form of a formal centre or common space that is already available in lobbies, for example. Drawing from the emphasis in various eco-villages on community cohesiveness and life-long learning, community centres can be seen as focal points for action, awareness, and change.

Community centres can provide a gathering place for socializing and meal sharing. They can provide a space for the sharing of food knowledge, either formally, through cooking courses, or informally, from the sharing of recipes and techniques during community dining events.

Community centres also act as a connection point, providing notice board space where one can find out about local food resources.

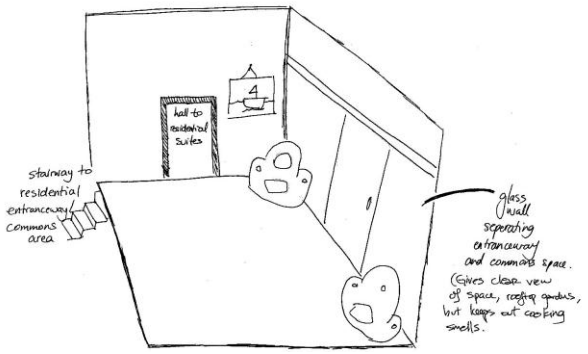
When residents move into the new UBN development, they will already be well served by numerous resources around campus that help improve food system sustainability. On the campus, already established programs such as UBC's Continuing Studies offer various culinary arts courses in cooperation with Land and Food Systems' Food, Nutrition and Health program (UBC Continuing Studies). The AMS Mini School offers courses in wine and beer tasting and has offered cooking courses in the past. The UBC Botanical Garden also coordinates workshops and courses in gardening, including gardening for small spaces (UBC Botanical Garden Homepage).

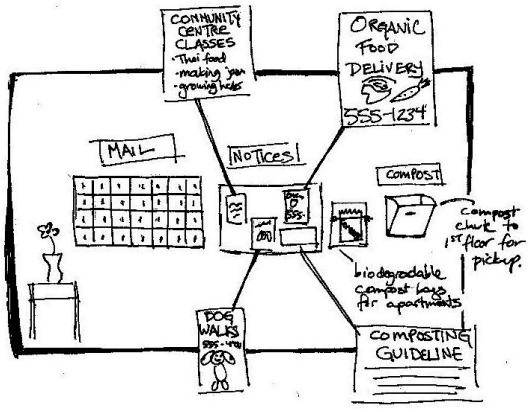
The University Neighbourhoods Association (UNA) is an important resource for non-student campus residents, and provides a number of services that new residents of UBN can take advantage of in order to enhance their food system sustainability. This includes a community services card that offers discounts and free membership at the UBC Botanical Garden, numerous committees residents can take part in, such as the Sustainability Committee, as well as a quarterly newsletter, "In Your Neighbourhood", which provides residents with information about community events and activities. The UNA has expressed interest in increasing interaction with students, Sprouts Food Co-op, and the UBC Farm. A community centre, or community focused programming, particularly in such a central part of campus, could help facilitate these relationships and promote food and environmental education.

The Berea Commons House demonstrates that commons space can have multiple uses. Public spaces where community members can interact are extremely valuable: "It is the shared ground, responsibilities, and systems at the community scale which offer the potential for a more

benign form of human settlement, both socially and environmentally" (Calthorpe and Van der Ryn xiv). Although ideally communities will be linked to the UBC Farm and will be able to use that venue as an educational tool, food growing and food education could occur within the residences as well.

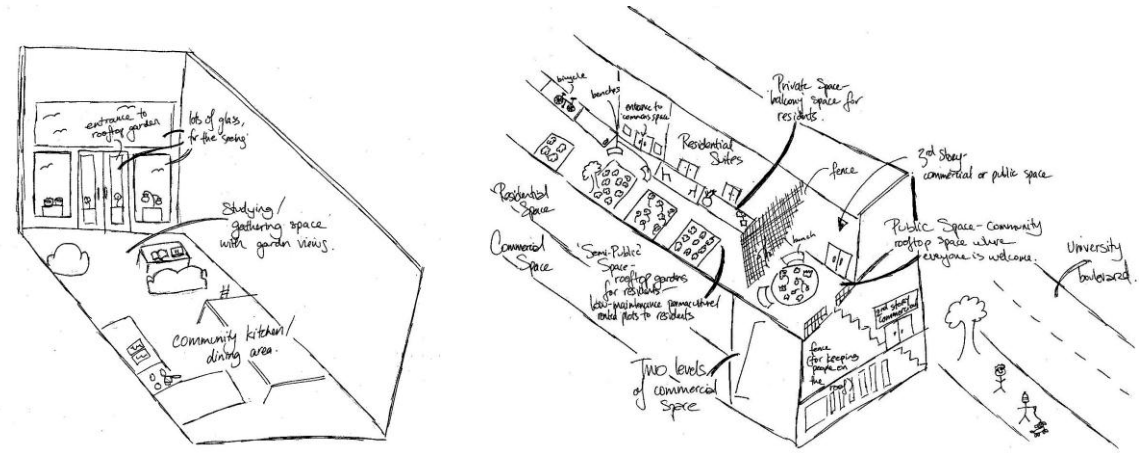
While the benefits of community centres have been explained above, residence 'Commons Spaces' are excellent spaces for targeting and educating people that might not otherwise go to the community centre, either because they lack time, sufficient interest, or knowledge of what is offered around campus. A model for residence commons space is based on the eco-village residences at Berea College, but also on the commonly used "Commons Blocks" in university residences such as Acadia Park and the Marine Drive Residences. These buildings provide space for community gathering; the benefits that would accrue to the food system would be by-products of an attractive development features.





Utilisation of the residence common space for food system purposes can be limited, or extensive, depending on space and design constraints. It could be as minimal as a sign directing people where to dispose of their compost, or extensive as a community kitchen where residences can cook occasional meals together.

We envision this “Commons Space” developed in conjunction with the rooftop gardens, the entranceways themselves an entranceway to the rooftop gardens. This would serve to create a sense of ‘place’ with an indoor/outdoor space. Creating indoor space adjacent to the rooftop gardens would ensure that all residents were very aware of the outdoor space; if the space was aesthetically well-designed, marketers of the new housing developments could advertise this space as one of the key drawing points of residential complexes—doing so could attract residents who would be more likely to utilize the space.



Much of the decisions about the utilization would have to be left to residence councils and tenants, as the running of programs would be up to them. The University Neighbourhood Association is an important resource for long-term support. The Faculty of Land and Food Systems could potentially supply information and ongoing assistance and volunteers. If the infrastructure was put in place in a residence, it could be a drawing point, attracting people who would be interested in participating or taking a leading role in these programs.

A Summary of Recommendations

In order to develop sustainable housing at UBN, we believe that planning must first identify food system planning as a core priority. Campus and Community Planning, UBC Properties Trust, University Town, and other relevant departments at UBC should seek to set

standards and requirements for the development of green roof tops, composting plans, and window boxes. They should also explore the possibility of using common spaces in residences to integrate rooftop gardens into the community. The university should additionally explore best practices at various eco-villages and/or permaculture sites, and explore ways of integrating concepts from them.

Recommendations to Next Year's Colleagues:

Revision of the Main Campus Plan in the coming year represents a great opportunity to introduce food security planning at UBC. Students should explore ways to be involved in this process.

We feel it necessary to further define objectives and indicators for what constitutes sustainable food system planning at UBC. Establishing these would allow planners to have clearer goals and understanding.

We recommend working with Campus and Community Planning, University Town, the Campus Sustainability Office, or other UBC departments to develop mutually agreed upon action plans with commitments from stakeholders.

Conclusion

The University of British Columbia prides itself in being a leader in sustainability. If the UBCFSP continues to be successful and leads the university in the re-localization of its food system and integration of new sustainability initiatives, UBC can be considered a model for movement towards greater levels of sustainability within a food system. The globalized food system's unsustainable practices and inefficiencies have warranted this movement towards sustainability and the UBCFSP is the method of choice possibly cut that sentence too. As the students of UBC are the global citizens of tomorrow, by educating them and instilling awareness

within them regarding food sustainability, they will be able to use their knowledge and skills to create positive changes within the global food system.

Work Cited

Aesthetics. Livingroofs.org. Accessed 4 April 2006 <http://www.livingroofs.org/livingpages/benaesthetics.html>.

Air Quality. Livingroofs.org. Accessed 4 April 2006 <http://www.livingroofs.org/livingpages/benairquality.html>.

Banting et Al. "Report on the Environmental Benefits and Costs of Green Roof Technology for the City of Toronto." Ryerson University. Accessed 31 Oct. 2005 <http://www.toronto.ca/greenroofs/pdf/fullreport103105.pdf>.

Bell, Graham. The Permaculture Garden. London: Thorsons, 1994.

Benefits. Livingroofs.org. Accessed 4 April 2006 <http://www.livingroofs.org/index.html>.

Berea College. Van Der Ryn Architects. Accessed 4 April 2006 <http://www.vanderryn.com/va/pub-3.2.m.3.html>.

CFSC Homepage. Community Food Security Coalition. Accessed 4 April 2006 <http://www.foodsecurity.org/index.html>.

"Composting" UBC Waste Management Home Page. University of British Columbia. Accessed 6 April 2006. <http://www.recycle.ubc.ca/compost.htm>

Corbett, Judy and Michael. Designing Sustainable Communities: Learning from Village Homes. Washington D.C: Island Press, 2000.

Daley, Richard M. "A Guide to Rooftop Gardening." The City of Chicago. Accessed 21 March 2006 <http://icma.org/upload/library/2003-06/%7BEC554F94-5F6D-4536-BA9A-2B7A0D0158D1%7D.pdf>.

Ecovillage. Wikipedia. Accessed 4 April 2006 <http://en.wikipedia.org/wiki/Ecovillage>.

The Eight Local Areas Forming the CCP. The University of British Columbia. Last reviewed 16 Mar. 2006. Accessed 4 April 2006 <http://www.planning.ubc.ca/corebus/pdfs/pdf-landuse/Eight_Local_Areas.pdf>.

Friedrich, Jeff. Personal interview. 4 April 2006.

Health. Livingroofs.org. Accessed 4 April 2006 <http://www.livingroofs.org/livingpages/benhealth.html>.

Hobbs, Heather. “Greening Rooftops in the Garden City.” Lifecycles. Updated 4 April 2002. Accessed 4 April 2006 <http://www.lifecyclesproject.ca/PDF/Rooftop_Gardening_Hobbs.pdf>.

Holmgren, David. Permaculture: Principles and Pathways Beyond Sustainability. Victoria, Australia: Holmgren Design Services, 2002.

Industry Support. Greenroofs.com. Accessed 4 April 2006 <http://www.greenroofs.com/Greenroofs101/industry_support.htm>.

Kortright, Robin. “Evaluating the Potential of Green Roof Agriculture.” Urban Agriculture Notes. City Farmer. Last Updated Oct. 2001. Accessed 4 April 2006 <http://www.cityfarmer.org/greenpotential.html>.

Madison Ecovillage Without Borders Home Page. Madison Urban Ecovillage. Accessed 6 April 2006 <http://www.outtathebox.org/ecovillage/ecovillage.html#top>.

Noise and Sound Insulation. Livingroofs.org. Accessed 4 April 2006 < http://www.livingroofs.org/livingpages/bennoiseameliorate.html>.

Nowak, Michelle. “Urban Agriculture on the Rooftop.” Cornell University. Last Updated May 2004. Accessed 4 April 2006 < http://www3.telus.net/public/a6a47567/roofgarden_thesis.pdf>.

Nowak, Michelle. “Urban Agriculture on the Rooftop.” Urban Agriculture Notes. City Farmer. Last Updated 15 July 2004. Accessed 4 April 2006 <http://www.cityfarmer.org/rooftopthesis.html>.

P-3 Roads Context. The University of British Columbia. Last reviewed 29 Aug. 2005. Accessed 4 April 2006 <http://www.planning.ubc.ca/corebus/pdfs/pdf-landuse/UB_P-3.pdf>.

Rojas et Al. The University of British Columbia Food System Project (UBCFSP). Faculty of Land and Food Systems. Accessed 4 April 2006 <http://www.landfood.ubc.ca/research/documents/rojas_UBCFS_Project_overview_ppt.pdf>.

Sanders, D.C. Vegetable Crop Irrigation. North Carolina State University. Accessed 4 April 2006 <http://www.ces.ncsu.edu/depts/hort/hil/hil-33-e.html>.

Thompson, R.D. et Al. “Potatoes for the Home Garden.” Colorado State University. Last Updated Nov. 2003. Accessed 4 April 2006 <http://www.ext.colostate.edu/pubs/garden/07610.pdf>.

UBC Botanical Garden Homepage. UBC Botanical Garden and Centre for Plant Research. Accessed 4 April 2006 <http://www.ubcbotanicalgarden.org/>.

UBC Continuing Studies. "Summer Institute on French Cuisine." Online posting 22 Aug. 2005 <http://reg.cstudies.ubc.ca/courses_long.cfm?groupid=BC&description=Culinary%20Arts%20and%20Understanding%20Wine>.

Urban Heat Island Effect. Livingroofs.org. Accessed 4 April 2006 <http://www.livingroofs.org/livingpages/benheatisland.html>.

Van der Ryn, Sim, and Calthorpe, Peter. Sustainable Communities: A New Design Synthesis for Cities, Suburbs, and Towns. San Francisco: Sierra Club Books, 1986.

What Is a Greenroof. Earth Pledge. Accessed 4 April 2006 <http://www.earthpledge.org/GreenRoof.html>.

What Is Permaculture. The Permacluture Research Institute. Accessed 4 April 2006 <http://permaculture.org.au/?page_id=20>.