

Management Practices at the LFS Orchard Garden

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AGSC 450

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UBC Food System Project

AGSC 450 2009

Management Practices at the LFS Orchard Garden

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Abstract

The LFS Orchard Garden Project is an interactive group assignment lead by the vision statements and guidelines of the UBC Food Systems Project. The UBC Orchard Garden faces a number of challenges. These include: finding a permanent committee of volunteers and staff; creating a production plan to serve stakeholders in peak seasons; securing funding for the garden; creating a sense of place; and becoming established as a permanent and sustainable space. In order to maximize productivity the above tasks were assigned to various groups within the project. Designated the problem of garden production management, this paper will outline the defined tasks, a discussion of findings, and future recommendations that focus on soil, pest, waste, and production organization.

Introduction

The LFS Orchard Garden is a student-driven initiative located on the south side of the MacMillan building. Since its conception, the overall vision for this garden has expanded to become a micro-scale demonstrational garden of a localized food system. Within the scope of the 2009 UBC Food Systems Project, key components of the garden have been categorized and delegated into four central focus points: production and management; resources and budget; education and community outreach; and an integrated garden enclosure. This paper will focus on a production and management plan and long-term recommendations for the continuity of this project. Our objective is to create a production plan that addresses the following: production, harvesting, and distribution, and management of pests, irrigation, waste and soil. In addition, our tangible contribution to the garden will be a three-bin compost system located on site.

Within the scope of the UBC Food System Project, our group focused specifically on production, distribution and waste management within the orchard garden. In order to fully address production, we have designed a crop rotation plan for the garden in addition to a waste management plan. These plans were created logistically based on the previous

year's layout of the garden and advice from Directed Studies student Jian Cheng. This was added to using our collective ecology of knowledge and through research carried out during this course. Moreover, our group consulted various stakeholders in the garden such as members of UBC Farm, Agora, AgUS, and Sprouts in order to identify potential demand for crops in these outlets. Thus, our project is a unique subsystem of the greater UBC Food System because it is incredibly localized in everything from planning to production to distribution and consumption. Aside from the UBC Farm, the LFS Orchard Garden is the only closed-loop food system on campus where stakeholders at every level can be actively involved.

Problem Definition

Our problem definition is to further the design and implementation of a garden that operates on sustainable food system theory and practice. More specifically, we seek to accomplish a more viable crop production plan that maintains and enhances the ecological health of the garden while building its socioeconomic infrastructure and capacity. We also recognize that in doing this, we need to accept and work with the various constraints, limits and barriers that exist for this young, developing project.

While this garden is a small-scale project and cannot produce mass yields of food, we see it as a valuable tool to promote and demonstrate community gardening and urban agriculture. In addition to food production itself, this garden exhibits the necessary “field to fork” links of distribution, networking and building relationships between production and consumption. Produce from the Orchard Garden is distributed to various stakeholders within the UBC food system; this projects aims to address the needs of stakeholders like

the UBC Farm, Agora Cafe, the AgUS, and Sprouts, in order to enhance and strengthen these essential connections. Because of its size, this garden has the ability to act as a living laboratory, being both accessible and applicable to diverse communities. We believe this garden is a microcosm representing larger realities, challenges, and exciting new prospects within the broader food system context.

Group Reflections

As a group, our values are more or less aligned with the principles of the vision statement, though we felt that a few aspects deserved more attention. In general, we felt the terms included in the statement were very subjective (affordability, local, etc.) and deserved more definitive, quantitative measurements. Affordability was important to each of us although our definitions of what is affordable varied based on our individual value systems. While the vision statement included the idea of ecologically and socially sustainable producers we identified a lack of emphasis on the demand side of this food system; consumers in the UBC food system should be engaged and informed.

Management Plan

Soil

Findings

Healthy soil is fundamental to a productive garden ecosystem and is an essential component of management of the LFS Orchard Garden. Roughly two years ago, (2006/2007), a couple of temporary buildings were removed from parts of the site which the garden now occupies. To replace the soil that had been removed in the process, a

mixture of sand and compost was used. Therefore the garden is made up of a native soil and non-native soil (see Appendix A).

The native soil in the LFS Orchard Garden is considered a Bose soil (Duric Humo-Ferric Podzol) which formed on glaciofluvial deposits overlying moderately coarse-textured glacial till. It has a gravelly sandy loam to gravelly loamy sand texture (B.C., MoE, 1981). This soil profile is consistent throughout Vancouver, allowing soil management in the LFS Orchard Garden to be extrapolated to community and backyard gardens throughout the city. Generally, Bose soils are not ideal for agricultural use and require active management to increase suitability for crop growth. The soil is naturally acidic and the stony, coarse structure with low clay content results in low Cation Exchange Capacity (CEC) and poor water holding capacity (B.C., MoE, 1981). Retaining soil moisture and building soil stability is an issue for management in the LFS Orchard Garden as it has been at the UBC Farm, which shares the same soil profile.

Discussion

In February 2008 and March 2009 soil samples were taken by AGSC 450 students and analyzed by Pacific Soil Analysis Inc (see Appendix B). For the sake of comparison, these soil tests have included separate samples for native and non-native areas of the garden.

February 2008 Soil Tests:

Soil tests conducted in February, 2008, showed that the Organic Matter (OM) content was approximately 10%, which can be considered sufficient in these soils. However, whether or not the OM is going to mineralize or immobilize Nitrogen (N) is an important interpretation of the results. To answer this, we look to the C/N ratio. The

native soil had a narrower C/N ratio than the non-native with a value of 17.7 (values <20 will probably mineralize N on decomposition, making it available for uptake by plants) while the non-native showed a higher ratio which would likely result in very little mineralization or immobilization (Bomke, 2009). In fact, N was considered to be deficient, and this was confirmed after a modest yield of potatoes showed signs of a deficiency. Potato tissue cultures were tested in 2008 (see Appendix C) and returned inadequate levels of available N.

Soil tests also showed that Magnesium (Mg) was also low while Potassium (K) was considered adequate in the non-native and low in the native soil.

To address the low levels of Mg and K the whole garden was fertilized with Langbinite, a sul-po-mag granular fertilizer (N-P₂O₅-K₂O-MgO).

In an effort to increase available of mineralized N, a winter cover crop of Hairy Vetch and Fall Rye were planted and will be incorporated into the soil this spring.

The pH was considered adequate for potatoes, which like a slightly acidic soil, and no lime was applied.

March 2009 Soil Tests:

There were a few notable changes in this year's soil test data. Firstly, pH has decreased slightly but remains within an acceptable range (5.4-6.6), especially considering that potatoes will once again be planted.

Still the C/N ratio is increasing while total N levels have not improved, however, it is difficult to assess available N at this time of year as soil microbes have yet to mineralize N that is present in the soil and the Hairy Vetch will not be incorporated until May.

Boron (an essential plant nutrient) is considered low at 0.3 ppm, according to the B.C. Ministry of Agriculture soil test interpretations. Mg and K were at levels that merit some amendments in order to increase their availability.

Recommendations

Following the March 2009 soil test results, Art Bomke and a student from this AGSC 450 group analyzed the data and referenced amendment recommendations. It was determined that another application of Langbinite should be added to the whole garden while doubling the application for the native soil (because of its significantly lower proportion of both K and Mg). Quantity of application is being calculated and will be recorded in the soil management log.

Additionally, 0.12kg of Boron should be added by way of two separate applications once the potatoes have been planted.

Because the soil could benefit from increased N content, it is recommended that fish emulsion be added to the rows of potatoes before they are hilled up to make up for the deficiency. However, this input is not considered a sustainable and reliable source so future managers should try to increase N content so that external inputs are not needed on a yearly basis (Bomke, 2009).

The Boron, Langbinite and fish emulsion will be acquired from the farm manager Tim Carter at no cost since it is merely a fraction of the quantity the farm uses in its amendments.

To maintain sufficiently high OM content (around 10%) garden managers will want to secure a quality form of input, while considering that some compost has relatively high C content which can increase the C/N ratio to an undesirable level. This

AGSC 450 group is completing a 3-bin compost system for on-site implementation, so careful management of this compost could yield the benefit of available OM input given the C/N ratio is properly monitored. It is also noted that nutrient availability to plants is not the same as nutrient content in a soil as not all nutrients present are in a form that is readily used by plants.

The soil at the LFS Orchard Garden site, much like the UBC Farm, will require consistent monitoring to increase the appropriateness of the soil for agricultural purposes. It is recommended that soil tests be carried on a yearly basis, or whenever possible, so that long-term data can correlate changes in chemical indicators of productivity with management practices.

Soil sampling must be done according to standard protocol so that as much consistency can be realized as possible, making data analysis of results as significant as possible. All soil tests, amendments and pertinent information should be recorded in the soil management log (Appendix D) and kept well organized for future garden managers to reference and contribute to.

Weather Monitoring

Discussion & Recommendations

As part of the monitoring and management component of the LFS Orchard Garden, this AGSC 450 group would like to express interest in cooperating with and encouraging the faculty members behind the Climate@UBC Project. We feel that the proposed real-time measurements of microclimate sites as proposed in the *UBC TLEF Project* brief (<http://www.geog.ubc.ca/~achristn/tlef.pdf>) could be of tremendous benefit

if installed in the LFS Orchard Garden and streamed to a monitor in Agora. This project, spearheaded by professors Andy Black and Andreas Christan, involves recording measurements from microclimate sensors then combining this data with physical models and historical data to reiterate themes learned in the classroom and to provide a database of pertinent climate information (Black & Christan, 2008). This will provide students (and perhaps eventually broader community members) with a source of interactive learning; data from this program could be used to assess indicators like soil temperature, moisture, wind, precipitation and radiation. It would be desirable to track this information along with any amendments and management practices carried out so that proxies could be developed to improve the effectiveness of management practices.

A variation of this project is already implemented at the UBC Farm. We recommend that the potential opportunities of this project be further explored and collaboration with Black and Christan be continued.

We would also like to suggest to other groups that finding a way to make this information available to the public would greatly benefit the many community gardeners that share similar soil and climate conditions as the LFS Orchard Garden. We see potential benefits in the areas of integrated pest management, soil management, and timing (based on soil temperature) for sowing seeds and harvesting.

Irrigation

Findings

Currently, the irrigation system of LFS garden is inadequate as there is no permanent water supply to the garden. A mobile overhead sprinkler is the primary source

of irrigation. We recommend devising a more efficient irrigation system in the garden.

Discussion & Recommendations

In speaking with Directed Studies student Jian Cheng, we have found a number of potential irrigation plans for the Orchard Garden. Initially, we recommended that the garden be watered through a drip irrigation system. A drip irrigation system is a method of irrigation where hoses are brought close to the plants and water slowly trickles from pores present in the hoses (Cramer et. al, 2006). However, the Orchard Garden is a temporary site, and investing in drip irrigation may be inappropriate, as the garden may eventually change location (Cheng, 2009). A second proposal is to use a general multi-sprinkler system. However, the multi-sprinkler system uses increased water-pressure, a luxury not currently available at MacMillan Building. According to Jurgen Pehlke, Operations Manager of MacMillan Building, there is not adequate water pressure through the building's water supply (Pehlke, 2009). The nearest permanent source of water is located at an out-of-service outdoor tap on the south-side of MacMillan Building (Pehlke, 2009). If the tap could be fixed, a trench would be dug to install a water line, which would terminate at a faucet. From the faucet, water can be distributed to other points in the garden. There are many advantages of a trenched waterline; including the eliminated need for hoses and the presence of a fixed and reliable water source in the garden. Currently, Jurgen Pehlke has requested that UBC Plant Operations work to fix the south-side tap.

Dr. Sietan Chieng, a soil and water engineer with a specialty in drainage and irrigation, also made a number of recommendations with respect to irrigation. He worries that each plant will have different water requirements at different irrigation frequencies.

Ideally, drip irrigation could be used to cater to summer crops such as broccoli without affecting adjacent areas. However, when crop rotation practices are employed, the permanence of drip irrigation may pose a major problem (Chieng, 2009)

A final consideration for garden irrigation is the use of recycled rainwater. A small underground water reservoir could be constructed at the upper end of the garden (Chieng, 2009). The garden's natural land slope could cause gravity to deliver the water. Water can be stored during the rainy season and used throughout the growing season to irrigate the garden. This could serve to irrigate the Orchard Garden in an energy efficient and sustainable manner.

Pest

Findings

Currently, the LFS Orchard Garden does not have a focused strategy for pest management. Based on soil samples from 2008, wireworm is present in the garden and at higher population levels around the edges on the garden (see Appendix B). Observations in the second garden present near the south-side of MacMillan Building indicate that aphids may also become a pest of concern in the Orchard Garden.

Discussion

The goal of using an Integrated Pest Management (IPM) plan in the LFS Orchard Garden is to develop strategies for pest management that will serve as preventative practice to stop pests from becoming a problem in the garden. Planned crop rotations can create habitats for both beneficial species and pests. By carefully monitoring crops, pest populations can be kept at levels that are either not damaging to crops or do not pose a

threat to crops (NAIS, 2001). In order to effectively manage pests already present in the area such as wireworms and aphids, strategies to avoid population increases and crop damage based on IPM principles will need to be developed.

The strategies used in and developed in the LFS Orchard Garden can serve as an example for UBC students and home gardeners in the community. In this way the garden will become a “living laboratory” and a valuable tool for demonstrating and learning strategies for monitoring and managing pests. The ability for students in the Faculty of Land and Food Systems to be able to use the garden for class work will be a valuable “hands-on” component of education.

Recommendations

Monitoring is essential to a good pest management plan (Flint & Gouveia, 2001). It is achieved by keeping detailed, accurate, and current records of the garden. These records include management strategies employed, their results, and current pest problems (Flint & Gouveia, 2001). We have created two separate monitoring spreadsheets for LFS students and community gardeners to use for pest management (see Appendix E). The first will be used to keep a record of regular monitoring and pest management strategies practiced by those caring for the Orchard Garden. The second spreadsheet will be a continual record of what species of pests are present in the garden and important information about their history and behavior.

Soil samples which test for wireworm population size as well as visual observations of the soil after practices such as tilling or turning up of the soil should be continued to make sure they are managed effectively (BC MoF, 2007).

Waste

Findings

To face the challenge of waste management, we determined that a compost system would be ideal for sustainably and ecologically managing waste from the garden and MacMillan Building. There are numerous benefits to composting. Composts can benefit the soil by fostering the slow and steady release of nutrients, providing a wide range of micro-nutrients, and increasing the soil's water-retention capacity (Composting Council of Canada, 2006). In addition to soil benefits, a compost system at the LFS Orchard Garden could serve as a crucial component of a sustainable food system. Compostable food and waste from Agora, the AgUS "Wednesday Night BBQs", as well as staff and student waste could all contribute to the viability of the compost. Finally, the compost could further serve the Orchard Garden's potential as a "living laboratory" and be used as an educational tool LFS students and community members.

Discussion & Recommendations

The three-bin compost system was built in adherence with the GVRD's recommended design for a three-bin pest resistant compost system (see Appendix F). We communicated our compost plan to stakeholders and other interest groups, such as those working on the enclosure plan. With their approval, we determined that the compost could be built for the garden. We also accounted for pest control, proper ventilation, ease of use, size, and proper materials (mainly yellow cedar) all which were inherent to the design specifications. If managed properly by ensuring that only designated materials enter the compost, pests should not be a problem.

The purchasing of materials was made possible by obtaining a grant from the AMS Student Environmental Society in the middle of March (see Appendix G). Shortly after approval of the funding application, construction of the compost began. Construction, gathering of supplies, and transportation and installation of the compost at UBC took approximately 22 hours.

Additional to building and installing a composter in the LFS Orchard Garden, we also compiled information on how to compost effectively in a reader-friendly format for the Orchard Garden Website, created by group 17 of the UBCFSP. This will serve to help community members and LFS students to learn proper composting practices.

Production/Harvesting

Findings

In the 2008 growing season, crop selection and varieties for the LFS Orchard Garden were chosen for their suitability for a late season (September to November) harvest as well as to over-winter due to time and seasonal constraints (Cheng, 2009). The majority of the crops were very successful; however, it is interesting to note that the winter squash (Delicata and Early Butternut) and beets did not fair well. After speaking with Tim Carter of the UBC Farm and Travis Forstbauer of Forstbauer Family Farms in Chilliwack it is recommended that if winter squash is to be attempted it should be started and transplanted earlier – possibly by May (Forstbauer, 2009). The poor yield of beets may have been due to the soil being non-native soil. This specific soil had been observed earlier in the season to give poor yields of other crops. In the upcoming season, there will be a final planting of crops in the non-native soil to determine if it has any growing

potential. The over-wintering crops also had difficulty growing due to severe amounts of snow (Cheng, 2009). However, it is recommended that broccoli be attempted again in 2009 as it would add to the amount of harvestable produce in the spring. The garlic and kale held over well through the winter (Cheng, 2009).

For the early part of 2009 growing season, potatoes are again being seeded for an early summer harvest. This will hopefully yield large enough quantities to sell potatoes at the UBC Farm's Saturday Markets in the summer. The UBC Farm has been unable to grow potatoes due to the high worm pressure in their soil.

The original production plan included rotating the crops that had been planted last year, with small changes to varieties within crop families. An additional goal is to improve crop yield through better space management (Cheng, 2009).

The decision of Agora Café to incorporate a student summer position has also affected the original production plan. The new position will allow the opportunity to plant more mid-season crop varieties (harvested in the summer season) for Agora to use through food preservation and storage. If a suitable preservation system is put in place, crops such as corn, tomatoes and cucumbers could be planted and used by Agora Café.

Discussion

Throughout the term, we spoke to various food outlets such Agora Café, the AgUS, and Sprouts to determine their needs for the upcoming school season. We asked them to indicate what they would like to see planted in the Orchard Garden. Based on their input and previous production manuals, we have created a comprehensive Production Guide (see Appendix H) that could be used as a reference for future garden coordinators, LFS students, and community members. The manual includes crop type,

planting season, harvesting season and recommendations, and preservation techniques. In addition to the Production Guide, we have also created a blank Production Data Sheet (see Appendix I) for the caretakers to record their planting dates, harvesting data, and other information.

Recommendations

Our recommendation for future UBCFSP Orchard Garden teams is to investigate if the crops planted in the garden will grow in the current soil condition based on our soil analysis report. Also, it may be beneficial to focus on maximizing yields of current crops, rather than increasing crop variety. As the garden expands, more crops such as fruits, flowers, and fungi can be added into rotation. We are hoping that the Production Guide could be continually expanded to become a useful tool for the garden staff and students. We also encourage the Orchard Garden continued relationship with Agora Café, the AgUS, Sprouts, and the UBC Farm, with the vision to cooperate with other food service outlets on campus. Effective communication and cooperation will ensure continual and reliable supply of produce to its users and maximize food production in the space.

Distribution

Findings

As stated in our harvest plan discussion, we identified Agora, the UBC Farm, and Sprouts as key distribution outlets for crops grown in the LFS Garden. Additionally, a partnership with the AgUS is a very important relationship to maintain for the garden. Throughout the past year, potatoes were sold at the UBC Farm's Saturday market and kale and broccoli were sold and/or used for cooking at Sprouts, Agora Cafe, and by the

AgUS. In November 2008, kale grown from the garden was served at the annual LFS Community Dinner, symbolizing a significant and exciting manifestation of a tangible "field to fork" connection for the faculty. Despite these fairly secure connections, most of the distribution was fairly impromptu and limited due to the small scale of the garden (J. Cheng, personal communication, January, 2009).

Discussion & Recommendations

As the LFS Orchard Garden grows in its production and organizational capacity, directors of the garden should also begin to consider growing specifically for the needs and desires of the outlets the garden partners with. Once strong working relationships have been built, production and distribution planners will be able to assess what the market demands in the LFS garden's context are, and how to best meet them. Coordinating the AgUS and Agora meals with a production plan for growing food that is seasonal when students are attending fall and winter semesters exemplifies this. Overall, the logistical planning for distribution should be improved by employing more organization and securing working relationships with food outlets. It is mandatory to maintain open and consistent contact with the stakeholders, as well as ensuring a level of continuity between people operating the various outlets and the garden. Distributors must also be made aware that adaptability and acceptance are critically important to the business relationship with the garden. Unexpected shortcomings and issues may arise with harvest plans due to weather and soil difficulties. Thus, fostering relationships with communities of learners is absolutely essential in a model like this and a good future recommendation is to expand and nurture such relationships.

Methodology

Our methods for gathering information and producing recommendations were not systematically organized. However, we made sure to base our research and discussion on open, transparent, and consensus-based strategies. We actively sought out stakeholders connected to the garden and met with them in person or communicated via email in order to shape our production, distribution, and waste management plan. We each created and maintained working relationships with these stakeholders throughout the term. Additional to our interviews and correspondence were literary reviews through a myriad of resources such as local Vancouver manual, AGSC 450 UBCFSP reports, and other sources. We also used the existing connections to student organizations on campus to obtain a grants and funding for building our compost system.

We also used the inter-faculty connections to perform thorough soil samplings and testing in the garden. Not only did this help us to generate sound results, but it also encouraged a community-based learning problem by involving all members of faculty, student body, and food producers. These soil samples were essential for proper planning for the future of the garden as they reveal nutrient levels, pH values, and other important growth factors. This group's collective knowledge of agroecology and soil methodology were useful in the soil collection practices. Eight soil samples were collected from both native and non-native soils in the garden and compiled into separate buckets. The two composite soil samples were then mixed thoroughly and a 500 gram sample was taken from each. These were sent to Pacific Soil Analysis Inc. where the samples were analyzed and the results were returned.

Conclusion

The goal of this AGSC 450 team was to research the development of the LFS Orchard Garden, organize existing information including soil test results and production plans, and to carry out further investigations into soil, IPM, irrigation, waste management and production and distribution aspects of managing the garden. A production and management portfolio has been created to enhance the efforts of future garden managers and enable continued collection and organization of pertinent data. Aside from the portfolio, we have built a 3-bin composter for the garden which will improve the long-term sustainability of the LFS Orchard Garden by closing the loop of food production by means of inclusive waste management on-site. Finally, all data collected and all charts created have been submitted to the formal website created by the business management sector of the LFS Orchard Garden Project. The website will serve as an informative online database for future caretakers of the garden or community members.

The LFS Orchard Garden has experienced a great degree of growth and improvement in the two years since its inception, and it is our hope that the recommendations made in this paper can further the productivity and sustainability of this unique and valuable “living laboratory”. Though the garden has no permanent tenure at the time of writing, we hope that the efforts made by this (and future) AGSC 450 groups will result in securing the garden site as an interactive learning facility for the UBC and greater community.

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Pehlke, Jurgen. Personal communication. March 2009

Appendix A: Arial photo of LFS Orchard Garden prior to building removal



Appendix B: Soil Data Analysis Records

February 2008 Soil Test Results:

Feb 18/2008

PSAI

UBC *Pric Cheng*
+ Art Bonki.

SAMPLE	pH	Buffered pH Determine limit to achieve pH 6.5 (lb./1000 ft ²)	C/N Carbon-Nitrogen Ratio	E.C.	O.M.	N	AVAILABLE NUTRIENTS (ppm)														
							P	K	Ca	Mg	Cu	Zn	Fe	Mn	B	S					
<i>LFC Standard</i>																					
<i>NATIVE</i>	<i>5.8</i>	<i>50</i>	<i>17.1</i>	<i>0.36</i>	<i>10.1</i>	<i>0.33</i>	<i>49</i>	<i>75</i>	<i>700</i>	<i>80</i>	<i>3.1</i>	<i>12</i>	<i>30</i>	<i>23</i>							
<i>NON NATIVE</i>	<i>7.0</i>		<i>27.9</i>	<i>0.40</i>	<i>9.6</i>	<i>0.20</i>	<i>51</i>	<i>145</i>	<i>3000</i>	<i>165</i>	<i>3.2</i>	<i>13</i>	<i>110</i>	<i>67</i>							

March 2009 Soil Test Results:

03/30/2009 13:01 IFAX 1c7301@landfood.ubc.ca
 03/30/2009 12:24 2738082

PACIFIC SOIL ANAL
 + Winnie Pang

001/001
 PAGE 01/01

March 30, 2009

Faculty of Land and Food Systems for Dr. Aris Bomke

SAMPLE	pH	Buffered pH	Lime to achieve pH 6.5 lb./1000 ft ²	a. Tons/hec	Carbon Nitrogen Ratio C/N	E.C. Salts (mmhos/cm)	O.M. Organic Matter (%)	N Total Nitrogen (%)	AVAILABLE NUTRIENTS (ppm)										
									P Phosphorus	K Potassium	Ca Calcium	Mg Magnesium	Cu Copper	Zn Zinc	Fe Iron	Mn Manganese	B Boron	S Sulfate-Sulfur	
Native LFS Garden	5.4		85	4.1	20.2	0.32	9.6	0.28	85	105	850	65	1.3	7.2	33	24	0.3		
Non-Native LFS Garden	6.6				28.4	0.32	10.9	0.22	70	130	1450	135	2.7	15.5	80	77	0.3		
COMMENTS:																			

Appendix C: Tissue Culture Results

02/25/2008 12:58 IFAX 1c7301@landfood.ubc.ca
 02/25/2008 12:18 2738882

+ Winnie Pang
 PACIFIC SOIL ANAL

001/001
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PSAI

Jean

Feb 18/2008

WBC

+ Art Somki.

buc Cheng

SAMPLE	pH	Buffered pH	Normal limit to achieve pH 6.5 (16/100 lb)	C/N Carbon Ratio	E.C. Salts (mhos/cm)	O.M. Organic Matter (%)	N Total Nitrogen (%)	P Phosphorus	K Potassium	Ca Calcium	Mg Magnesium	Cu Copper	Zn Zinc	Fe Iron	Mn Manganese	B Boron	S Sulfate-Sulfur
LFC Gardner																	
NATIVE	5.8		5.0	17.1	0.36	10.1	0.33	49	75	700	80	3.1	12	30	23		
NON NATIVE	7.0			27.9	0.40	9.6	0.20	51	145	3000	155	3.8	13	110	67		

COMMENTS:

June 20, 2008

U.B.C. Faculty of Land and Food Systems for Art Benke and Andrew Rissman

MacMillan Garden Plot

SAMPLE	pH	Buffered pH	C/N Carbon Nitrogen Ratio	E.C. Salts (mmhos/cm)	O.M. Organic Matter (%)	N Total Nitrogen (%)	AVAILABLE NUTRIENTS (ppm)									
							P Phosphorus	K Potassium	Ca Calcium	Mg Magnesium	Cu Copper	Zn Zinc	Fe Iron	Mn Manganese	B Boron	S Sulfate-Sulfur
Upper Shallow Fill	7.0		22.5 ✓	0.18 ✓	10.1	0.26 M	65 M	130 M	2950 SH	135 M	3.3 M	20 M	105 ✓	80 ✓	0.4 L	
Lower Deep Fill	6.8		22.5 ✓	0.36 ✓	9.3	0.24 M	53 M	145 M	2600 SH	130 M	2.8 M	15 M	110 ✓	75 ✓	0.6 M	
Lower Native	7.0		23.0 ✓	0.66 ✓	11.5	0.29 M	90 M	105 M	3450 SH	120 M	0.2 L	4 L	3 VL	17 L	0.2 L	

COMMENTS:

I am trusting that Am will provide guidance in interpretation of the above analyses. Considering that your crop is for potatoes, the current pH values might be considered marginally acidic. I would also highlight a very low available iron level in the Lower Native soil. Overall, the micronutrient levels in the Lower Native site are all low.

Bill Heenan

VL = Very low L = low M = Moderate C = Causticity/alkalinity SH = Slightly high. Dr. Will Heenan, Ph.D.



Pacific Soil Analysis Incorporated

UBC Faculty of Land & Food

Arthur Risman / Bombe

June 20/08

Tissue	TOTAL (%)					TOTAL ppm						S Available Sulphate-Sulphur (ppm)	Fe Active Iron (ppm)	
	N Nitrogen	P Phosphorus	Ca Calcium	Mg Magnesium	K Potassium	S Sulphur	Cu Copper	Zn Zinc	Fe Iron	Mn Manganese	B Boron			Na SODIUM
White Potato	2.74	0.19	1.06	0.26	3.02	.	14	24	149	54	20	71		
Lower Fill
Native	3.17	0.21	0.73	.24	2.86	.	10	19	93	26	17	52		
								
								
								
								
								
								
								
								
								

1. Moisture determined by drying tissue at 105°C overnight.
2. Total Nitrogen, Phosphorus, Calcium, Magnesium and Potassium were determined on a peroxide-sulfuric acid digest. Total Nitrogen and Phosphorus were measured colorimetrically, and the remaining cations were measured on an Atomic Absorption Spectrophotometer.
3. Total Copper, Zinc, Iron and Manganese were determined on a dry ash.
4. Total Boron was determined on a dry ash using Azomethine-H.

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Appendix D: Soil Log Record Sheet

Soil Management for LFS Orchard Garden

Date	Amendment	Indicator (reason for amendment)
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Appendix E: Integrated Pest Management Record Sheet

Management Strategy (if taken)	Pest/Disease Observed			Crop			Location		Weather	Time	Date
	Growth Stage(s) Present	Population density	Pest/Disease Observed	Growth Stage	Variety	Position (edges, center, etc)	Row				

Appendix F: GVRD Composting Plan

Construction Plan for a Home-built Rodent Resistant

Three Bin Compost System

Materials are available at most building supplies stores and will cost around \$300 new. The system will take a weekend to build. Exact dimensions were used whenever possible, but the term “approximately” was used because the actual dimensions of cedar fencing and rough cedar vary from board to board. Redwood is another wood that could be used and is resistant to decay, or you can find excellent pieces of wood for free from the scrap pile found outside of most wood supply dealers.

This system can easily handle 2,000 kg. every 6 months which produces around 700 kg of finished compost.

6 Step Construction Plan

- 1 Build the Back
- 2 Build the Four Sides
- 3 Attach Back to Sides
- 4 Install Supporting Rails and Bottom
- 5 Install Three Fronts
- 6 Build and Install Three Tops and Lids

Materials

- 2x4's - 8 @ 42" (posts), 6 @ 34" (top rails)
- 2x2's - 6 @ 36", 6 @ approx. 27 1/2" (base rails)
- 1x6's - 35 @ 36", 12 @ approx. 30" (sides and tops)
- 1x4's - 4 @ 36", 6 @ approx. 30", 12 @ approx. 16 7/8", 2 @ approx. 32 1/2", 6 @ 27"
- 1x2's - 6 @ approx. 31", 3 @ approx. 30"
- 12' of 2x2 (lid support)
- 1x4's 2 @ 9' (back and top)
- 1x6's 6 @ 9' (back and top)
- 2x4's @ 9' (front cross piece)
- 1x6's - 2 @ 32 1/2" (front slider guides for center box)

Hardware

- 6 boxes bell wire insulated staples (5/8" - 100/box) or 5/8" poultry staples (where available)
- 2 lb. 2 1/4" galv. spiral nails
- 1 lb. 3 1/4" galv. spiral nails
- 80 1 1/4" galv. brass or stainless steel screws
- 3 - 3" strap hinges

Wire Mesh

- 31' of 1/4" galv. wire mesh (hardware cloth 36" wide)

Tools

- Measuring tape
- Drill
- Bit for screws
- Hammer
- Tin snips
- Hand or circular saw
- Carpenter's square

Appendix G: Funding Application



THE STUDENT ENVIRONMENT CENTRE
@ the University of British Columbia



Eco-Initiatives Form: \$100-\$500

Name(s):

Katherine Menzies, Gordon Mok, Katelyn Moore, Andrea Morgan, Shannon Morris, Jamie Moskowitz, Claire Mou, and Carissa Murphy

Club or Group Affiliation (if applicable): Agricultural Sciences 450 class

Name of Project (if applicable): LFS Orchard Garden Project, Production and Management Report

Describe your project and its purpose (approximately 200 words)?

To enhance the UBC food system and contribution to the local food consumption a student driven project has designed and created a garden on the south side of Macmillan building called the LFS Orchard Garden. As a part of this project, our AgSc 450 group has been working on developing a production and management plan for the Orchard Garden that will become an example of what can be achieved in a backyard or community setting. The garden will be an educational and outreach tool as well as a source of local organic food for stakeholders within our Faculty of Land and Food Systems and all of UBC such as Agora Cafe and Sprouts. In our management plan for the garden, we have included a three bin compost system that we plan on building and putting in the garden by the end of this term. Having a compost system in the garden will be important for utilizing plant materials from the garden and surrounding areas and turning them into a valuable, organic soil amendment and fertilizer.

Outline how your project pertains to the environment and sustainability at UBC (approximately 200 words)?

The Orchard Garden will enable the local UBC community to improve its food security by having local organic produce available from the garden for its use. Outreach and education in the community will also allow the garden to improve the food security of the community by allowing people to learn how to grow their own food. Because sustainability is an important feature of the Orchard Garden, having a compost will be necessary for recycling nutrients within the garden. Using plant material from the garden and surrounding area (leaves from the surrounding trees, food scraps from Agora cafe), the three bin compost system will provide compost that will be used to improve the health of the soil in the garden and thus produce healthy crops. The compost will also serve as an educational tool for the community and it will be an example of how to build and use a compost system.

Are you pursuing any other sources of funding? If so, what sources, and for what amount? (SEC Treasurers can help you identify other sources of funding.)

We are not pursuing any other funding sources at this time. However, we may request that supplies such as lumber be donated to us by UBC Farm or a local business

What aspects of your project (purchases, bookings) will SEC funding be used for?

The supplies and materials needed for the building of a three bin compost that will be used in the Orchard Garden.

What is the dollar amount you are requesting from the SEC?

\$300

Appendix H: Production Guide

Crops	Variety	When to Plant	When to Harvest	How to Harvest	Preservation
Beet	Early Wonder	Can be planted in the garden 30 days before frost-free date in the area	52 days to harvest whenever they grow to the desired size	Cut off the tops of the beets one inch above the roots	Beets may be stored in a polyethylene bag in a refrigerator for several weeks. Beets store best at 32°F and 95 percent humidity. Do not allow them to freeze.
Broccoli	Purple Sprouting	Seeding in mid summer for transplanting into the garden in late summer	fall; ~55-60 days after planting	Cut the central head with 5 to 6 inches of stem, after the head is fully developed	
Bush Beans	General	Should be planted when all danger of frost is past in the Spring. Continuous supply by planting every 2-4 weeks until Aug.	When pods are firm crisp and fully elongated ~57-65 days after planting	Pick beans after the dew is off the plants, and they are thoroughly dry. Be careful not to break the stems or branches, which are brittle on most bean varieties.	
Carrots	Scarlet Nantes	Grow best when planted in early Spring also can be planted during midsummer	70 days after planting	Carrots can be harvested or "pulled" when the roots are at least 1/2 inch in diameter. Under usual conditions, carrot tops may not be strong enough to being pulled from the ground and digging helps to remove the roots without damage withstand actually	Carrots may be placed in a refrigerator, buried in lightly moist sand in an underground cellar or stored in the garden in a pit insulated with straw. Under proper storage conditions, carrots keep 4 to 6 months.

Carrots	Minicor		55days after planting		
		Winter rye grass is usually planted in October. A general rule is that when the temperatures at night are consistently around the 60°F range, you are ready to plant in 2008, was planted in Nov. 19			
Cover Crops	Rye Grass		Start to die in early May	Stop watering the grass to let it die out	
Cover Crops	Fall Rye	Sept 1-15 (In 2008, seeded at Nov. 19)			
Cover Crops	Crimson Clover	can occur from July to Nov (planted at Nov. 19 in 2008)			
Eggplant	Dusky	transplant late June (warm soil)	Approx. 80d after planting;2-4 weeks before frost remove flowers	Cut with shears; leave calyx attached	Freeze only
Fennel	Bulb	Start inside in February; transplant in April-July	Fall harvest	Slice the bulb from the root to allow for regrowth	Freeze or dry leaves or fruit; dry fruit only
Garlic	Silver skin	Fall is the best time to plant garlic but some ppl wait until spring. "Plant six weeks before freezing weather starts" is a good general guide.	when the flower cluster begins to deteriorate and the top ¾ of the plant turns yellow	Harvest by digging the bulbs up instead of pulling.	Wipe clean, keep dry, and dry or cure your garlic thoroughly 2-3 weeks in a single layer in a cool, shady place. Keep it at room temperature or lower (40-50°F.)
Herbs	Basil	June (if warm)	before plant begins to flower	frequent harvesting prolongs life; tear off plant	Freeze- small pieces in water for freshness up to 4 months; dry

if possible

Herbs	Oregano	Late spring (warm soil)	when leaves show	tear leaves off plant	Freeze or dry
Herbs	Parsley	Early spring (cold moist soil)	approximatel y 80 days after planting	Cut individual sprigs off plant	Dehydrate; freeze in water- fresh for 4 months
Herbs	Chives	Late summer (warm soil)	Early fall	Cut down to 4cm from ground	Not ideal for preservation
Herbs	Sage	Early spring	Harvest half the plant before purple flowers open in June	Cut back for a second time in spring for fresh leaves	Dry carefully

Appendix I: Production Data Sheet

Crop	Amount planted	Date planted	Date transplanted	Date harvested	Amount harvested

