UBC Social Ecological Economic Development Studies (SEEDS) Student Report

UBC Farm Pilot Food Processing Center

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Scenario 7
UBC Farm Pilot Food Processing Center - Group 12

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Abstract

The UBC Farm Pilot Food Processing Centre project as part of the greater UBC Food Systems Project in LFS 450 aims to: facilitate teaching and research on food processing and its connections to the broader food system; enhance UBC Farm's income and program diversity through value-adding; and enhance awareness of the various components of a sustainable food system at UBC within the context of the Lower Fraser Valley regional food system. With support from community partner UBC Climate Action Plan, The Center for Sustainable Food Systems at the UBC Farm has identified the need to include a food processing center as a component of the future Farm Centre, which is in early stages of the design process. The research conducted by our group of UBC students focuses on 4 key research components: academic connections, regulations review, equipment needs, and a product market analysis.

The methods for conducting the research in this report followed ethical research standards and included the creation of a survey, internet searches, interviews conducted via email, telephone and in-person, market research as well as informal discussion with community partners. All data was collected and shared via Google documents within the group members. Important results of this research are summarized in easy to follow tables.

The main results contained within this report suggest a high level of interest from the Faculty of Land & Food Systems, specifically within the Food, Nutrition and Health program, with several courses making direct connections to the processing facility. The regulations required to run the facility are provided by Vancouver Coastal Health, who provide guidelines and inspection for the following: formulation of product, product ingredients, process of manufacture, cooking, holding, and storage time, and product labeling (VCH, 2012). A variety of products are of interest to both the Faculty and stakeholders, however to ensure economic viability of the processing centre, only products that add value should be produced using UBC Farm produce. Connections to local BC growers associations should be made for community building as well as produce procurement.

Based on the research our group recommends that a broader part of the UBC community be involved beyond the FNH programs and the LFS Faculty. For future phases of this scenario, we recommend that more work be done with community partner Liska Richer and the UBC Climate Action Plan. Another future scenario could involve LFS 450 students developing a product line in collaboration with Food and Resource Economics students or students from the Sauder School of Business to further research break-even points.

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Introduction

Background: UBC Food System Project

The University of British Columbia (UBC) Food System Project (UBCFSP) was established in 2001 to work towards a sustainable campus food system in collaboration with key food system stakeholders. The project is run through the fourth year capstone course in the Faculty of Land and Food Systems (FLFS): LFS 450 - Land, Food, and Community III. Each year, the project coordinator identifies issue areas in collaboration with project partners. A set of issue areas are chosen for elaboration into "scenarios". Groups of LFS 450 students are tasked by the project coordinator with investigating a chosen scenario in collaboration with the specified project partner. Research goals, methods, outcomes, evaluation framework, recommendations and in some cases implementation of recommendations are specific to each scenario, but follow the general principles of community based action research (CBAR).

Statement of Research Paradigm: Community Based Action Research (CBAR)

CBAR seeks to embed academic research within the context of addressing community-identified issues or problems. Academic researchers play the role of experts with specialized knowledge who can help address community-identified issues. The processes of setting the research agenda, conducting the research, evaluating the results, generating understanding and/or knowledge, and implementing solutions are shared between community stakeholders and the research team.

The UBCFSP employs a modified version of CBAR. Issues to be addressed and scenario development is directed by project partners in collaboration with the project academic investigators. The student teams then act as "experts in training" in their collaboration with community partners in addressing the issues identified in their scenario. Student teams do not engage with the entire UBC food system community; rather they focus their work on the issues identified by a select subset of the community. The UBCFSP fulfills the CBAR requirement of engaging the community as a whole by integrating results generated by student teams and hosting community stakeholder meetings to facilitate whole-community discourse and input.

Scenario 7: Pilot Food Processing Centre at the UBC Farm

The Centre for Sustainable Food Systems at UBC Farm is in the initial phases of designing a new Farm Centre that will serve as the hub of the Centre's academic, field, and community outreach activities. This integrated vision for the centre fits with the UBC Farm's vision of integrating, rather than compartmentalizing, the various aspects of the food system and with the "heads, hands, heart" pedagogy (Sipos et al. 2008) developed in the Faculty of Land and Food Systems and elsewhere. A key component to be included in the new Farm Centre is a pilot food processing facility.

Low capacity for food processing has been identified as a barrier to creating a sustainable regional food system in the Lower Fraser Valley as well as at UBC (Yu et al. 2011; UBCFSP 2012). Food processing plays material, economic, and social-educational roles in food system sustainability. Materially, food sovereignty in our region will only be possible by preserving food for the winter. While this material aspect may be an important medium to long term goal of the food movement, in the short to medium term food processing may contribute importantly to the economic enhancement of the local food system by allowing more food dollars to stay in the local community. The social-educational aspect of re-integrating food processing into the local food movement has the potential to play an important role in developing food citizenship amongst our region's eaters, garnering broader and more diverse support for the goal of creating a sustainable regional food system.

Project Methods

Stakeholder Identification and Creation of Research Agenda

We identified Andrew Riseman, Academic Director of the Centre for Sustainable Food Systems at UBC Farm, and Andrew Rushmere, Academic Coordinator of the Centre for Sustainable Food Systems at UBC Farm, as our primary community stakeholders by consulting the LFS 450 Teaching Team. Liska Richer, representing the UBC Climate Action Plan (CAP), was also identified as a potential primary community stakeholder. However, after our initial meeting with the UBC Farm stakeholders and discussion with the Teaching Team, we decided to limit our investigations to the set of issues identified by the UBC Farm stakeholders. The CAP goal of evaluating carbon intensity of local versus imported processed goods is relevant to the UBC food system in general, but we determined that this area of research will be more useful at

later stages of project development when products to be produced at the food processing centre have been identified. We also identified that the information required to calculate carbon intensity (production emissions at UBC Farm) are not available, making this analysis difficult at this stage.

Through consultation with the UBC Farm stakeholders, we formulated the overall research agenda into a problem statement and then identified specific research components for our group to investigate.

Problem Statement

The Centre for Sustainable Food Systems at UBC Farm wants to create a mid-scale food processing facility to:

a. Facilitate teaching and research on food processing and its connections to the broader food system;
b. Enhance UBC Farm's income and program diversity through value-adding;
c. Enhance awareness of the various components of a sustainable food system at UBC within the context of the Lower Fraser Valley regional food system.

Our stakeholders at UBC Farm have requested that we conduct research to inform strategies to achieve these goals. Because the Farm Centre is in the initial phases of development, they have put special emphasis on the need to assess and build academic interest in the processing facility. Such interest and support will be necessary to justify the Farm Centre to the broader UBC community.

We identified "academic connections," "regulations review," "equipment needs," and "product market analysis" as the research components of our team's work. Each of these is presented below with their goals, methods, results, and component-specific discussion.

Research Components: Goal, Methods, Findings and Outcomes, and Discussion

Academic Connections

Goal

To collect and analyze relevant information about UBC faculty interest in using the processing centre to enhance their academic goals.

Methods

The initial step we took in investigating academic connections was to identify potential courses related to the processing facility by navigating the course list on the UBC Student Service Center (www.students.ubc.ca/ssc). Some of the key words we used in the search included: food processing, food engineering, food marketing, food regulations, food science, food analysis. Apart from food science and food and nutrition courses, a list of courses that could contribute to the construction and operation of the processing plant was also included. Therefore, we broadened the search to courses that related to waste management, building construction, teaching, business administration, and marketing management. We also consulted the UBC Farm stakeholders in developing the list of courses. Finally, information including course number, name, description, link of courses to processing facility and instructor contact information of each of the identified courses was tabulated into an Excel spreadsheet (See Appendix A for table and link to online Google document). After a meeting with stakeholders, we added another 2 columns indicating student enrollment last year and this year in the course.

Next, we designed a UBC Faculty Interest Survey using Fluid Surveys, an online survey tool (See Appendix B for website, username and password). The aim of the survey was to estimate the types of academic involvement, food products, equipment, and other relevant interest areas suggested by our stakeholders. We sent the survey to 14 faculty members and professors identified in the previous step on March 21, 2012 at 14:58. We received 3 responses within the first week resulting in a 21% response rate. Subsequently, we sent the survey to Rebecca Lee, Dean's Office Coordinator at the Faculty of Land & Food Systems, on Sunday March 25, 2012 at 08:44, who then sent it to all faculty members (approximately 45). This resulted in 8 additional responses giving an overall final response rate of 21%. Overall the survey was administered to 52 UBC faculty members with 11 responses. We then reviewed the responses we received and consolidated relevant information.

Findings and Outcomes

The survey yielded primarily qualitative data. The results of each of the 8 questions are presented below.

The instructor name, position, faculty, and department were provided by all respondents. Despite sending the survey to a variety of UBC Faculties, the only faculty responses collected came from the Faculty of Land & Food Systems. Department responses varied from Food

Science, Food and Resource Economics (FRE), Food Nutrition and Health (FNH), Wine Research Centre, and Applied Biology.

Question 1: "What are potential curricular uses for this processing plant?" The most common chosen response indicated that professors would use the facility for specific courses (80%). The courses identified by professors were then used to expand the Excel spreadsheet if they were not already present (Refer to Appendix A). The next most common responses indicated that professors would use the facility for directed studies (70%) and graduate research (70%). The least chosen response indicated interest in undergraduate research (60%). Furthermore, suggestions for other curricular usage of the facility were: advanced food processing, advanced food biotechnology, product development, LFS 250 professional development for teachers and pre-service teachers within the Think&EatGreen@School project, production of beer, food science club, and community outreach.

Question 2: "Are there academic programs, courses or research projects you are currently unable to carry out and that you would otherwise have the capacity to carry out with adequate facilities and equipment in existence? If so, please describe those programs/projects." Six responses were given to this question. Five respondents gave specific examples of latent demand and one response did not indicate any requirement for the facility in their course. Examples given by respondents included a requirement for demos and equipment in various courses. A complete list of responses can be found in Appendix B.

Question 3: "If deemed valuable to you, how frequently do you imagine using this facility for course-based work?" The two most frequently chosen options were occasionally (40%), and monthly (30%). 10% of the respondents indicated they would use the facility weekly, while no respondents indicated they would use it daily. Further, 20% of the respondents commented that it would depend on the class and/or project.

Question 4: "What types of foods or food products do you think the facility should support?" All responses were supported by the respondents: jams, jellies, chutneys, soups, stews, mustards, cheeses, yogurts, granola, trail mixes and condiments at 45%, juices at 36% and baked goods at 18%. 82% of respondents suggested other foods that could be produced such as dried herbs, dried fruits, fruit/vegetable leathers, beer, and packed fresh salads.

Question 5: "What food processes would you be interested in participating in at the processing center?" The most popular responses were drying and fermenting at 78%. Canning,

smoking, vacuum packaging, freeze drying and curing had a response rate of 56%, 44%, 44%, 33%, and 22%, respectively. Baking was not chosen. Other comments included food formulations, roasting, food product development, blanching, and pasteurization.

Question 6: "What non-food processes would you be interested in participating in at the processing centre?" The most popular response was waste management at 71%. Alternative energy, system analyses, small business planning, and marketing were all selected at 57%. Finance had a 43% response rate and event location was 14%.

Question 7: "What equipment, machinery, and infrastructure should the food processing lab include to make it a flexible and broadly used facility?" This topic yielded 6 responses and we review it below in the section on equipment needs.

Question 8: "Please list any other courses, activities, or individuals that may be supported by or interested in this facility?" There were five responses to this question. One respondent referred to British Columbia Institute of Technology (BCIT). Another, referred to the facility being able to provide physical resources that could be rented by small-scale producers. The other respondents indicated specific courses that were previously mentioned.

Lastly, there was a comments portion of the survey that yielded the following responses:

> *"Looking forward to the development of this project! Will be a great addition to UBC and will be a useful tool to incorporate the local community by providing locally produced products and will be an excellent learning tool for students."*
> - Erin Friesen, Postdoctoral Fellow, FNH.

> *"I would recommend connecting with food processors association, with the development of Food Innovation Centre, a good functional pilot plant would be a valuable asset and it can be used as a revenue generator for the faculty- please see the link on Guelph pilot plant: http://www.gftc.ca/research-and-development/pilot-plant/"*
> - Azita Madadi Noei, Sessional Lecturer, FNH.

> *"It will be critical to have a top notch manager for the facility to maintain hygiene and keep all equipment in operating condition. A budget will need to include maintenance and repair of equipment. Even limited use of the kitchen facilities in the FNH building have left the facilities dirty and poorly maintained."*
> - Christine Scaman, Associate Professor, FNH.

Discussion

As one of the main purposes of the pilot processing centre is to offer the UBC campus community a food processing learning experience, it is important that we know which professors

would like to integrate the processing centre into their course curricula. Facility products, processes, and equipment purchased for the centre are partly dependent on the needs of these professors and their students. The electronic survey allowed our team to collect information from a wide range of faculty members.

The responses to our survey all came from professors in the FLFS. The survey our team created was primarily directed towards the Faculty of Land & Food Systems; 7 requests to participate in the survey were sent to professors in other Faculties but received no responses. How this facility is presented to each faculty is critical to its success. However, as we will recommend later, if multiple surveys geared specifically towards the needs and wants of each Faculty were created, the survey could have reached a wider audience. Specific examples of courses in various faculties and a column stating the specific "links to the processing centre" can be found in Appendix A. One example is the Faculty of Commerce that can be included in the marketing and financial aspects of the Centre.

An area of substantial importance to our stakeholders was to determine latent demand by UBC faculty members for a food processing facility. Our survey identified instances where courses could not be undertaken due to lack of facilities and specific examples of courses that could not be undertaken without the use of the food processing centre. Our team felt that the responses to this question was significant because it confirmed the existence and need for the processing facility. Furthermore, according to our stakeholder this was the area of greatest importance at this point in the development of the project.

The survey questions that identified specific food products, processing methods, and equipment resulted in data that we compiled into a spreadsheet. We found that these three categories of data were interdependent. Therefore, Appendix F integrates the equipment list and a set of specific food processes that were determined through our survey. We did not get to connect the food processing methods with food products but this area of investigation could be expanded upon in future years of this LFS 450 scenario.

Lastly, our survey results show there is interest in non-food processes at the facility, such as technologies applicable in the developing world. These responses suggest interest in uses of the processing facility outside of food processing. Such interest and support may prove essential for the processing centre to move into further stages of development.

Regulations Review

Goal

The goals of our regulations review were to provide a framework of regulations relating to the selected proposed products and to help to identify future barriers that might be encountered.

Methods

We identified the food types for which to review regulations based on consultations with our stakeholders and through responses to the survey. We carried out research to identify policies and regulations regarding food safety and food processing that are relevant for the management and operation of the pilot processing facility.

1. *Online research:*

   The online research began with Google's (www.google.ca) search engine; the key search terms used were "food policy Canada" and "food regulations Canada." The Google search helped to direct subsequent online research to government websites including the Canadian Food Inspection Agency (CFIA) (http://www.inspection.gc.ca), Vancouver Coastal Health (http://www.vch.ca/), and Health Canada (http://www.hc-sc.gc.ca).

2. *Telephone interview:*

   A telephone interview was carried out with Joan Soriano, a Food Inspection Specialist of the CFIA, on March 19, 2012 at 14:00. The interview focused on food safety regulations for small-scale and local food production in Vancouver. Soriano also sent a follow-up email later that night for web-links related to local food production in Vancouver.

3. *Interview and tour of BCIT food processing facility:*

   On March 24, 2012 at 10:30, we conducted an interview at the BCIT Burnaby campus with Dr. Gary Sandberg, program head of Food Technology, School of Health Sciences at BCIT. The interview focused on food products, machinery and equipment, government regulations, and academic involvement; a list of interview questions is available in Appendix C. The interview was followed by a tour of the BCIT Food Processing Resource Centre introducing facility design and equipment.

Findings

4. *National versus Provincial Food Regulations*

The CFIA food regulations listed in the Canada Agricultural Products Act regulate the marketing of agricultural products for internationally and inter-provincial trade including food inspection and grading, and the registration of the establishment (Canadian Food Inspection Agency, 2012). Since the UBC Farm pilot processing centre will be a small-scale facility and provide food products to local communities, the focus should be on local food regulations.

5. *Local Food Regulations*

The food regulations for Vancouver food processors are provided by Vancouver Coastal Health (Vancouver Coastal Health [VCH], 2012). The VCH provides guidelines and inspection for the following: formulation of product, product ingredients, process of manufacture, cooking, holding, and storage time, and product labeling (VCH, 2012). To improve the food processing standards, VCH recommends a food processing manager work directly with a food lab to maintain food safety and product quality (VCH, 2012).

6. *HACCP and GMP*

Hazard Analysis Critical Control Point (HACCP) and Good Manufacturing Practices (GMP) are two management systems that are available for maintaining high food safety standards (VCH, 2012). HACCP addresses food safety based on the analysis and control of biological, chemical, and physical hazards associated with raw material production, handling, manufacturing, distribution, and consumption of the final product (VCH, 2012). GMP, on the other hand, is a production and testing practice that ensures products are of high quality (Health Canada, 2011). Additional resources regarding HACCP and VCH are listed in Appendix E.

Discussion

Although the CFIA food regulations listed in the Canada Agricultural Products Act are not the scope for small-scale and local food processors not oriented towards interprovincial or international markets, the regulations can be used as a reference for high standards of food production. A summary of the CFIA food regulations along with online regulation documents is available in Appendix D.

Regarding food safety and food quality control, the processing plants can seek advice from professionals at UBC, including food scientists, to work on their HACCP and/or VCH plan. It is recommended that food safety plans be incorporated in building design which will allow the processing plant to facilitate food safety practices. In addition, the processing centre can work closely with Food Science faculty and students in product formulation and food testing because

they have the expertise and resources, to assist with the development of food safe products and processes at the processing facility.

Lastly, future regulation reviews should focus on standards pertaining to specific food products to be made at the facility once they are identified. Furthermore, regulations related to waste management and workers' safety should be investigated as the development of the processing facility proceeds.

Equipment Needs

Goal

To collect information about equipment that would be needed for the UBC pilot processing centre considering the facility's objectives mentioned in the problem statement.

Methods

In the early stages of our project, we conducted a preliminary online literature review to gather information about different food processes and the required equipment for these processes. Information regarding specific pieces of equipment was collected from the University of Nebraska-Lincoln Food Processing Center's online Equipment section (University of Nebraska-Lincoln, 2012). On March 24, 2012 at 10:30, our group met with Dr. Gary Sandberg. Dr. Sandberg answered interview questions about the food processes that occur at BCIT and gave us a tour of BCIT's food processing facility. The interview was recorded with a recorder borrowed from the UBC LFS Learning Centre. Dr. Sandberg also sent us a link to BCIT's online Facilities, Equipment and Service page where a complete list of all available equipment in the processing centre can be viewed (Appendix F). This information in addition to specific food process and processing equipment requested by LFS faculty on Fluid Surveys was then used to construct a food processing equipment table (Appendix F).

Findings and Outcomes

Results are outlined in Appendix F, which includes: food processes, process descriptions, equipment needed for each food process and links to pictures of suggested/needed equipment. The equipment outlined in Appendix F should be considered as possibilities and not as specific suggestions for the processing centre.

Discussion

As Appendix F suggests, a range of food processes can be carried out at the pilot food processing centre if it has a wide array of equipment. Since one of the main objectives of the UBC Farm pilot processing centre is to facilitate teaching and research programs, an appropriate selection of machinery will need to be available according to faculty, staff and student needs. Since the UBC Farm plans to sell some of its products and open the facility up to community processing, an appropriate selection of machinery will need to be available to efficiently process larger quantities of food beyond the experimentation stages. This equipment should be selected according to what products will add value to produce, which is covered in our Market Analysis section.

Product Market Analysis

Goal

The goal was to collect and analyze product data in order to make informed decisions regarding product selection, on an economic basis; and to provide an informed decision making framework regarding collaboration between the UBC Farm and other small-scale BC growers.

Methods

We compared revenue streams derived from fresh sales of produce to those that would be derived from processed products made with UBC Farm produce. Products for comparison were chosen based on recommendations from project stakeholders as well as product availability from the UBC Farm and types of processing methods.

We went to Whole Foods Market to collect price data from comparable products. We calculated the cost per unit to UBC Farm to make each processed product based on Saturday Farm Market prices for the key ingredients in each processed product (UBC Farm Market price data obtained from Kayla McIntyre - UBC Farm Marketing Coordinator) and using relevant recipes to determine yield of processed product per unit of produce (Krissoff, 2010).

Analytic assumptions: Our calculations were only based on cost of key ingredients (based on UBC Farm's Saturday Farm Market pricing) not including labour, capital costs, energy usage, and other processing costs. Additional ingredients (sugar, vinegar, jars etc) were also not included in the analyses. These assumptions will generate a lower estimated cost of production compared with actual costs.

Findings and Outcomes

Table 1: Results of the product market analysis.

Product	Retail Price	Cost to Produce	Difference
Raspberry Jam	$18.68-$35.96/L	$43.20/L (@$4.50/ ½pint)	(-$24.52) to (-$7.24) /L
Apple Sauce	$5.89/L	$4.80/L (@ $2.00/lb) $9.60/L (@ $4.00/lb)	$1.09 to (-$3.71) /L
Pickles	$6.65-$8.52/L	$3.00/L (@$2.00/lb)	$3.65 to $5.52/L
Sauerkraut	$13.32/L	$4.38/L	$8.94/L
Pickled Green Beans	$17.32/L	$7.50/L	$9.82/L
Veggie Soup	$9.29-$9.99/L	$4.87/L	$4.42 to $5.12/L

Raspberry Jam: This product was selected for analysis as a request from project stakeholders. Raspberries are also a product that the UBC Farm produces in abundance.

- The farm sells fresh raspberries for $4.50 for a ½ pint in the summer season.
- 3 lbs raspberries yields 5: ½ pint (250ml) jars of jam = 1250ml jam
- 1 pint raspberries = ½ lb
- Jam sells retail for $18.68-$35.96/L
- Cost to make jam (at $4.50 per ½ pint) = $43.20/L

The Farm is able to make a higher profit margin selling raspberries as a raw/fresh product. It would only be advised to use raspberries that were not of quality to sell fresh/whole. They could connect with the BC fruit growers association (http://www.bcfga.com/).

Applesauce: Apple sales are abundant in BC, and with the Botanical Garden's Apple Fest as well as the establishment of the UBC Farm's heritage orchard, we felt applesauce could be a viable product.

- 6 lbs apples yields: 5 pint (500ml) jars = 2500ml
- Applesauce sells retail for $5.89/L
- Cost to make sauce (at $2.00/lb) = $4.80/L, (at $4.00/lb) = $9.60/L

We recommend that the farm use their apple seconds, or apples not fit to sell to market into applesauce, but to sell the quality apples whole. Last year the UBC farm orchard sold 432.5 lbs.

@ $2/lb, which is a very low price compared to other organic apples (normally around 4$/lb-4.50/lb). A list of BC Orchards can be found at http://www.orangepippin.com/orchards/canada/british-columbia. Spud.ca sells a case of apples for $78.54-$99.96. Apple seconds can be purchased from local farmers for ~ $0.50-$1.00/lb.

Pickles (cucumbers): Selected as a popular pickle product, as well as the UBC Farm's ability to grow cucumbers. The Farm sells pickling cucumbers for $2.00/lb.

- 1.5lb cucumbers yields 1L
- Pickles sell retail for $6.65-$8.52/L
- Cost to make pickles (at $2.00/lb) = $3.00/L

Profit margin is high for this product. There is potential for value added as profit is higher a processed product than whole raw product.

Sauerkraut: A classic product of the lacto-fermentation food preservation method, we chose to analyse sauerkraut because of a resurgence of interest in traditional lacto-fermented vegetables.

- 1.75 lbs of cabbage yields enough for 1 liter of sauerkraut
- Certified organic, lacto-fermented (unpasteurized) sauerkraut (Karthein's) sells for 13.32/L.
- Cost to make sauerkraut (@ $2.50/lb, plus cost of salt and Mason jar): $4.38/L.
- Difference between retail revenue and cost to produce: $8.94/L.

According to our calculations, the potential profit margin for sauerkraut is high compared to market revenue from cabbage. Although the UBC Farm does not produce large amounts of cabbage due to concerns about clubroot virus, cabbage could be sourced locally over a long season.

Pickled Green Beans: Specialty pickled green beans, with garlic, herbs, and spices, are a "hot" item right now at upscale grocery stores. UBC Farm also has a large capacity for growing fresh green beans.

- 1.5 lbs of green beans yields enough for 1 liter of pickled beans
- Certified organic, specialty pickled green beans sell for $17.32/L.
- Cost to make pickled green beans (@ $5.00/lb): $7.50.
- Difference between retail revenue and cost to produce: $9.82/L.

According to our calculations, there is potential for increased value by processing green beans into pickled form at UBC Farm.

Veggie Soup: Second quality vegetables and those that are produced in abundance at UBC Farm could "find a home" in the form of a soup sold at Saturday Markets through the fall. "Fresh" (i.e., not canned; for purchase and immediate consumption) soups are growing in popularity at upscale markets around Vancouver. Additionally, these calculations could be pertinent if a food service component is incorporated into the new Farm Centre. A sample recipe for a vegan soup using summer veggies is presented here, though the recipe could be flexible depending on availabilities. The recipe assumes stock is made on-site using second quality vegetables.

Ingredient	*Quantity*	*Unit*	*Price/Unit*	*Cost*
Veggie Stock	0.5	liter	2.5	0.625
Onions	0.25	lb	3	0.75
Carrots	0.25	lb	5	1.25
Green Beans	0.25	lb	12	0.5
Garlic	2	cloves	2	0.5
Potatoes	0.25	lb	3	0.75
Zucchini/squash	0.25	lb		0.5
Herbs				

- Cost to make veggie soup (@ Saturday Farm Market prices): $4.87/L
- Difference between retail revenue and cost to produce: $4.42 - $5.12/L.

Discussion

UBC Farm currently specializes in producing high quality/high value fresh produce and captures a high price point for it because of its niche position in the local food movement. We suggest that UBC Farm pursue processing where it will add value to their products. We suggest using second quality produce where possible to produce high quality value added products while not cutting into revenue potential from sales of fresh products. Products which utilize ingredients that are present in abundance at the Farm, such as green beans, also have good potential as value added products.

An important finding of our research is that processing may not always result in added value. Raspberry jam, for instance, will cost the Farm substantially more to produce than would be gained through fresh raspberry sales (Table 1). Apple sauce is also close to "break-even," i.e., no net benefit to processing. Further, our calculations only take into consideration the cost of the

main ingredient used. Production costs will be substantially higher when other ingredients, labor, and capital costs are considered.

The high cost of processing UBC Farm's own produce, owing to its market positioning and high price points, opens up the opportunity of connecting with other farmers and producers in our region who are also working to create a sustainable regional food system. We suggest connecting with regional grower associations to source wholesale produce for processed products that would not be economically feasible to make with UBC Farm produce.

Stakeholder Recommendations

Potential products to process

Considering the results from our market analysis, the UBC Farm needs to carefully select which products they intend to make at the processing facility. It is recommended that the Farm only process products that add value to its produce. In some cases, such as the raspberry jam, value is lost through processing. Further investigation into the highest value-adding products for the Farm is required, potentially through further LFS 450 scenarios.

Making connections to the regional food system to enhance sustainability

If the Farm does not generate enough produce to be commercially processed, we recommend that the UBC Farm make connections with the local growers associations and open the facility up to the rest of the broader food producing community. By involving more producers from the Lower Mainland, the UBC Farm would be increasing and supporting local capacity to produce food. Unique marketing approaches to communicate the benefits of purchasing locally grown, locally processed food products from the pilot processing centre as well as other programming related to creating a sustainable regional food system could be created around these connections.

Local/Responsible Certification

In our research we found a certification for local sustainable food products called 'Certified Local Sustainable'. Local Food Plus is a Canadian non-profit third party organization that certifies food producers and processors who are environmentally responsible and support the local economy (Local Food Plus, 2012). UBC Farm could propose a future LFS 450 scenario in which students investigate different certifications and labels that would be appropriate for the

UBC Farm's products. This scenario could also outline the benefits and logistics of implementing these certifications and labels.

Product line development

Another future scenario could involve LFS 450 students developing a product line in collaboration with Food and Resource Economics students or students from the Sauder School of Business to further research break-even points. The specific design of these product lines could be developed with visual arts students and marketing students.

Scenario Evaluation and Feedback

Course Feedback/Recommendation

A major shortcoming in our group's work is that we did not present our proposed project framework, including the evaluation framework, to our stakeholders in a consolidated form. Instead we consulted with our stakeholders in a more piece-by-piece fashion. In the future, we believe it would make sense to require student groups to make a formal presentation of their research proposal(s) to their stakeholders in order to obtain feedback and guidance on the direction of the research and to increase the relevancy of the research outcomes.

Evaluation Framework

Academic Connections:

Criteria: Did we obtain the approval of our stakeholders and others who are proficient in survey creation?

Evaluation: Yes, survey was approved by the project stakeholders and reviewed by the LFS 450 Teaching Team.

Criteria: Did we receive survey responses?

Evaluation: Yes; 11 responses were received out of a total 52 invitations to participate in the survey.

Criteria: having developed a relevant evaluation framework in consultation with stakeholders, did we generate a report of our findings for presentation to the stakeholders?

Evaluation: We have prepared a report for presentation to our stakeholders in line with the evaluation framework we developed. However, stakeholder feedback on our evaluation framework was limited due to time constraints.

Regulation Review:

Criteria: stakeholder confirmation that prepared report is informative and meets their needs.
Evaluation: Report has yet to be presented to stakeholders in final form; it would have benefited from increased communication with stakeholders.

Equipment Needs:

Criteria: spreadsheet generated and presented to stakeholders?
Evaluation: Yes; data from the survey were used to generate the spreadsheet and it is ready for presentation to stakeholders.

Market Analysis:

Criteria: report/spreadsheet generated and presented to stakeholder?
Evaluation: Yes; products were analysed and data has been presented in this report.

Criteria: does the Farm have a clearer picture of the economics of producing various products?
Evaluation: Yes; important to note the assumptions made in our analysis.

Scenario Recommendations

Greater depth to academic involvement research

In future iterations of this scenario, we recommend that a broader part of the UBC community be involved beyond the FNH programs and the LFS faculty. LFS 450 students could further develop academic connections and try to include more faculties, more professors and classes. Research opportunities could be tailored to approach different faculties and to justify why other faculties may want to get involved with the UBC food processing centre.

Approaching other members of the UBC community

We recommend that UBCFSP approach other faculties at UBC to address aspects of the processing centre (and the new Farm Centre) that are not directly connected to the curriculum of

LFS. For example, if the processing centre needs to be powered by renewable energy to decrease its carbon footprint, clean energy engineering students could help develop potential solutions. It would be wiser to delegate the processing center's design process to a professional designer or an architecture course/project (ARCH 500/501) instead of appointing it to inexperienced LFS 450 students. Furthermore, the Faculty of Education could incorporate the processing facility into the curriculum of pre-service home economics teacher cohorts.

Climate Action Plan

For future phases of this scenario, we recommend that more work be done with community partner Liska Richer and the UBC Climate Action Plan. It may be of benefit to CAP to pursue investigation of the carbon balance associated with the processing facility. The UBC Farm, however, appears to be interested in the processing facility for sustainability reasons other than those specifically related to GHG emissions, specifically social-educational goals related to regional food sovereignty. A future scenario could research which processes and specific food products would have a positive impact on carbon emissions, and those that would not. This research would require production emissions data from UBC Farm, and hence would require cooperation with UBC Farm to collect this data. Outlining which data should be collected for this research could be a component (though not the entirety) of this future LFS 450 scenario.

Looking to the Future

As the development process of the UBC Farm's pilot food processing center will most likely be stretched out over a very long period of time, it is recommended that stakeholders clearly disclose the general timeline of the entire project. If the processing center isn't destined to be built in the next 5 years, it may be ideal to put this scenario on hold and bring it back to LFS 450 closer to the processing center's building time. Once future phases of this scenario start to become more focused and demand a lot more detailed recommendations, it will be difficult for LFS 450 students to make those recommendations if the processing center hasn't already been built. It is also crucial that stakeholders make concrete goals for each phase of this scenario and clearly communicate them to the LFS 450 students who will be working on those scenario phases to avoid confusion.

Media Release

The UBC Farm Pilot Food Processing Centre project as part of the greater UBC Food Systems Project in LFS 450 aims to: facilitate teaching and research on food processing and its connections to the broader food system; enhance UBC Farm's income and program diversity through value-adding; and enhance awareness of the various components of a sustainable food system at UBC within the context of the Lower Fraser Valley regional food system. With support from community partner UBC Climate Action Plan, The Center for Sustainable Food Systems at the UBC Farm has identified the need to include a food processing center as a component of the future Farm Centre, which is in early stages of the design process. The research conducted by our group of UBC students focuses on 4 key research components: academic connections, regulations review, equipment needs, and a product market analysis.

The main results contained within this report suggest a high level of interest from the Faculty of Land & Food Systems, specifically within the Food, Nutrition and Health program, with several courses making direct connections to the processing facility. The regulations required to run the facility are provided by Vancouver Coastal Health, who provide guidelines and inspection for the following: formulation of product, product ingredients, process of manufacture, cooking, holding, and storage time, and product labeling (VCH, 2012). A variety of products are of interest to both the Faculty and stakeholders, however to ensure economic viability of the processing centre, only products that add value should be produced using UBC Farm produce. Connections to local BC growers associations should be made for community building as well as produce procurement.

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Appendices

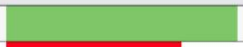
Appendix A: Course Listing for Involvement in Processing Facility

Course	Course Name	Student Enrollment 2010/2011	Student Enrollment 2011/2012	Course Description	Professor	Professor Contact	Link to Processing Plant
FNH 200	Exploring Our Food	522	476	Chemical and physical properties of foods; issues pertaining to safety, nutritive value and consumer acceptability; government regulations pertaining to food safety, quality and additives; preservation techniques and transformation of agricultural commodities to food products; foods of the future.	Azita Madadi-Noei	amadadi@interchange.ubc.ca	Give demos of the food processes and safety aspects that are involved in a food processing facility
FNH 300	Principles of Food Engineering	44	73	Units and dimensions, mass balance, energy balance, steady state and transient heat flow, fluid handling and measurement.	Erin Friesen	efriesen@interchange.ubc.ca	Give demos areas such as mass balance, energy balance and other topics that are involved in a food engineering
FNH 313	Microorganisms in Food Systems	69	62	Microorganisms of importance in safety, spoilage and preservation of foods; factors affecting growth, survival and inactivation of microorganisms in fermented food systems; food processing plant cleaning and sanitation.	Kevin Allen	Office Tel:(604)822-4427 Email:kevin.allen@ubc.ca	Demonstrate the importance of food safety by demonstrating a physical example of safety, spoilage and preservation in food processing
FNH 330	Introduction to Wine Science	360	173	Principles of viticulture, enology, and wine microbiology and chemistry; marketing, regulation and classification of wines from selected regions of the world; social, economic and health aspects of wine consumption; wine appreciation.	David McArthur	Office Tel: (604)822-4274 Email: mcarthur@interchange.ubc.ca	Fermentation of wine
FNH 309	Food Process Science	59	72	Preservation of tissue and fluid food systems by selected physical and chemical treatments with emphasis on product-process interactions.	Erin Friesen	efriesen@interchange.ubc.ca	Display real life examples of preservation techniques used in the food processing facility
APBI 318	Applied Plant Breeding	16	20	Small-scale classical (i.e., non-biotechnological) plant breeding. Hands-on, application-oriented approach to techniques and procedures for managing seed inventories, designing and implementing a simple plant breeding program, and evaluating the impact of selection on breeding populations and desired outcomes.	Andrew Riseman	ariseman@mail.ubc.ca	Create breeding program to develop cultivars ideal for processing.
FNH 425	Food Science Laboratory III	24	15	Integrated course designed to illustrate principles of research and product development in the food industry.	Erin Friesen	efriesen@interchange.ubc.ca	Food Production Issues
BUSI 335	Information Systems	243	207	Introduction to information technology related to business use: design, implementation, and application of information systems.	Yau-Man Cheung	ym.cheung@sauder.ubc.ca	Business management and information technology
BUSI 354	Cost Accounting	285	242	The provision and analysis of cost accounting information that will assist management in making operating decisions and in evaluating operational performance.	Peter Norwood	peter.norwood@sauder.ubc.ca	Business Planning and budgeting
BUSI 370	Business Finance	240	218	An introduction to the basic principles of financial valuation and an examination of corporate enterprise decisions including working capital management; capital budgeting; capital structures and dividend policy.	Aziz Rajwani	aziz.rajwani@sauder.ubc.ca	Business Planning and budgeting
BUSI 465	Marketing Management	4	6	Basic considerations affecting the domestic and international marketing of goods and services.	Ann Stone	ann.stone@sauder.ubc.ca	Marketing
CEEN 523	Energy and the Environment	22	25	Energy/environment/society interactions; development of energy resources; energy demand and its determinants; policy dimension of energy and climate change; impacts on ecosystems; life cycle analysis; impact assessment and other tools for quantitative and qualitative evaluation of alternative energy sources; case studies.	Xiaotao Bi	604-822-4408	Energy resources
CIVL 406	Water Treatment and Waste Management	135	149	Processes used in water and wastewater treatment. Conditions which necessitate treatment of water or wastewater, water and wastewater treatment processes and plant design. Municipal services required and associated with solid waste management.	Victor Kwang Lo; Pierre Berube	kvlo@interchange.ubc.ca; berube@civil.ubc.ca	Waste management and pollution
CIVL 322	Project Based Learning in Civil Engineering Materials	135	146	Some topical problems will be identified and students in groups will carry out experiments to study the materials involved. Site visits, external consultations are an integral requirement	Nemkumar Banthia	banthia@civil.ubc.ca	Building design and management
CIVL 400	Construction Engineering and Management	151	351	Project delivery systems: traditional; construction management; turnkey; project management. Network planning methods. Activity planning, including construction methods selection. Estimating, bidding and bonding. Project control tools and procedures. Safety considerations and quality control.	Sheryl Staub-French; Thomas Froese	tfroese@civil.ubc.ca	Building design and management
FRE 302	Small Business Management in Agri-food Industries	43	55	Emphasizes the building of a business plan by exploring topics such as the planning process and financing, marketing and human resource concepts, as applied to an agri-food business, domestically and internationally.	Kelleen Wiseman	wiseman@interchange.ubc.ca	Finance, marketing, and human resource concepts
FNH 302	Food Analysis	43	40	Principles of and procedures for analysis of the chemical, physical and sensory properties of food; proximate analysis; introduction to instrumental analysis; introduction to anatomy and physiology of sensory perception, reporting and analysis of data.	Madadi-Noei, Azita	amadadi@interchange.ubc.ca	Added upon survey request
FNH 325	Food Science Laboratory I	18	17	Integrated laboratory introducing techniques used in food processing and analysis. Enrolment restricted to Food Science students.	Christine Scaman	cscaman@interchange.ubc.ca	Added upon survey request
FOOD 523	Advances in Food Microbiology	8	5	Advances in Food Microbiology	Kevin Allen	Office Tel:(604)822-4427 Email:kevin.allen@ubc.ca	Added upon survey request
APBI 260	Agroecology I	14	15	Introduction to the biophysical and socioeconomic factors affecting systems management and production in selected agroecosystems. A fee will be assessed each student to cover field trip costs.	David McArthur	Office Tel: (604)822-4274 Email: mcarthur@interchange.ubc.ca	Added upon survey request
FRE 490	Current Issues in Food and Resource Economics	10	11	Current Issues in Food and Resource Economics	Chris Bennett	cpabenn@interchange.ubc.ca	Added upon survey request
	Google Doc Link: https://docs.google.com/spreadsheet/ccc?key=0At_xxwWV7Pm3dDNYb05DaHEwZ19kR01lRlRsT3cyS3c#gid=0						

Appendix B: Survey Results

Credentials to access survey:
Website: http://fluidsurveys.com

What are potential curricular uses for this processing plant?

Response	Chart	Percentage	Count
Course(s), please specify:		80%	8
Undergraduate Research		60%	6
Directed Studies		70%	7
Graduate Research		70%	7
Other, please specify:		50%	5
	Total Responses		10

What are potential curricular uses for this processing plant? (Course(s), please specify:)

#	Response
1.	FNH 300, 309, 425
2.	FRE 490 and FRE 302
3.	Advanced Food Processing, Advanced Food Biotechnology
4.	fnh 313; food 523
5.	FNH 425, FNH 325/325,
6.	Land, Food Community I (LFS 250)
7.	FNH 425
8.	APBI 260

What are potential curricular uses for this processing plant? (Other, please specify:)

#	Response
1.	product development-Industrial training-
2.	Production of beer
3.	Food Science club
4.	Possible Professional Development activities for teachers and pre-service teachers involved in our Think@School Projectt
5.	Community Outreach

Are there academic programs, courses or research projects you are currently unable to carry out and that you would otherwise have the capacity to carry out were there adequate facilities and equipment in existence? If so, please describe those programs/projects.

The 6 response(s) to this question can be found in the appendix.

If deemed valuable to you, how frequently do you imagine using this facility for course-based work?

Response	Chart	Percentage	Count
Daily		0%	0
Weekly		10%	1
Monthly		30%	3
Occasionly		40%	4
Other, please specify:		20%	2
	Total Responses		10

If deemed valuable to you, how frequently do you imagine using this facility for course-based work? (Other, please specify:)

#	Response
1.	This would be monthly for the lecture based classes. However with the FNH 425 course, the purpose of the course is to have students work on industry related projects. I could see FNH 425 supporting the facility at the farm by having some of the students work on projects to develope products for the farm. Such as developement of jams. For FNH 425, this would then require students to work at the farm 1/week for both spring and fall semesters.
2.	For FNH 425, it will depend on the specific project. Some projects mayuse the facilities on a regular basis (every week) while some may only use the facilities occassionaly during the term

What types of foods or food products do you think the facility should support?

Response	Chart	Percentage	Count
Jam, jellies, and chutneys		45%	5
Juices		36%	4
Mustards and condiments		45%	5
Soups and stews		45%	5
Cheeses and yogurts		45%	5
Granola and trail mixes		45%	5
Baked goods		18%	2
Other, please specify:		82%	9
	Total Responses		11

What types of foods or food products do you think the facility should support? (Other, please specify:)

#	Response
1.	All, I don't think there should be a limit. I would like to see undergraduates in the Food Science program utlize products grown at the farm and develope products. Therefore in addition to the products above, I would also suggest dehydrated products.
2.	I did not understand the support part? Are you intending to sell the product or it is for academic purposes- If it is intended for sale an approved HACCP plan is required, it should comply with the food processing
3.	beer
4.	some food safety risk in these products
5.	fruit / vegetable leathers
6.	dried herbs and sliced vegetables
7.	Packed fresh salads mixes
8.	Dried fruits or herbs. Fish or other local seafoods
9.	Uncertain

What food processes would you be interested in participating in at the processing center?

Response	Chart	Percentage	Count
Drying		78%	7
Fermenting		78%	7
Curing		22%	2
Baking		0%	0
Smoking		44%	4
Freeze Drying		33%	3
Vacuum Packaging		44%	4
Canning		56%	5
Other, please specify:		44%	4
	Total Responses		9

What food processes would you be interested in participating in at the processing center? (Other, please specify:)

#	Response
1.	All of above
2.	nut roasting,
3.	All the above are of potential interest
4.	Food formulations or food product development,Blanching and pasteurization
5.	Uncertain

What non-food processes would you be interested in participating in at the processing center?

Response	Chart	Percentage	Count
Waste management		71%	5
Alternative or conventional energy use assessment and optimization		57%	4
System analyses and redesign		57%	4
Small business planning		57%	4
Marketing		57%	4
Finance		43%	3
Event location		14%	1
Other, please specify:		14%	1
	Total Responses		7

What non-food processes would you be interested in participating in at the processing center? (Other, please specify:)

#	Response
1.	Technologies applicable in the developing world

What equipment, machinery, and infrastructure should the food processing lab include to make it a flexible and broadly used facility?

The 6 response(s) to this question can be found in the appendix.

Please list any other courses, activities, or individuals that may be supported by or interested in this facility?

The 5 response(s) to this question can be found in the appendix.

Any other comments.

The 3 response(s) to this question can be found in the appendix.

Appendix

Instructor Information | Name

#	Response
1.	Erin Friesen
2.	Kelleen Wiseman
3.	Azita Madadi Noei
4.	Hennie JJ van Vuuren
5.	kevin allen
6.	Christine Scaman
7.	David McArthur
8.	Alejandro Rojas
9.	Eunice Li-Chan
10.	Sean Smukler
11.	Jim Vercammen

Instructor Information | Position

#	Response
1.	PostDoc/Instructor
2.	Lecturer
3.	Instructor
4.	Professor and Eagles Chair
5.	assistant professor
6.	Assoc Prof
7.	Lecturer
8.	Associate Professor, Instructor LFS 250 and Principal Investigator of Think@School Project
9.	Professor
10.	Assistant Professor
11.	Professor

Instructor Information | Faculty

#	Response
1.	FNH
2.	Land and Food Systems
3.	Land and Food Systems
4.	LFS
5.	lfs

6.	LFS
7.	LFS
8.	Land and Food Systems
9.	LFS
10.	LFS
11.	LFS

Instructor Information | Department

#	Response
1.	Food Science
2.	Food Resource Economics
3.	Food Nutrition and Health
4.	WRC
5.	food scie
6.	FNH
7.	Agroecology/FNH
8.	Applied Biology-Food Programt
9.	FNH
10.	Applied Biology
11.	FRE

Are there academic programs, courses or research projects you are currently unable to carry out and that you would otherwise have the capacity to carry out were there adequate facilities and equipment in existence? If so, please describe those programs/projects. |

#	Response
1.	It would be nice to include demos and show equipement operating. Especially in FNH 300 and 309.
2.	This plant would likely provide a stage one product and my courses would likely work in stage 2 (after the prototype product is developed) on aspects of market opportunities, financial planning, market research and business plan strategy.
3.	I was in charge of Advanced Food Biotechnology and due to lack of facilities the course was not carried out the way I wanted
4.	no
5.	More pilot scale processing equipment would be incorporated into lab exercises for FNH 325/326. Facilities and equipment to produce cheese would be used by the Food Sci students to make cheese for public sale. The space would provide scale for the new processing faculty members to house larger scale equipment to support their research
6.	We have not been able to include food processing experientla knowledge in our LFS 250 and in the school projects that Tghink@School conducts in Vancouver Schools. To include the dimension of food processing in the schools where we are involved would be a major enrichment of our work .

What equipment, machinery, and infrastructure should the food processing lab include to make it a flexible and broadly used facility? |

#	Response
1.	Dehydrator/dryer, oven, pasteurizer, retort, smoker (if the aquaculture portion moves forward), extruder, mixer (both a large one and small one for pre-mixes), and depending on the volume of product to be produced, some type of automated packaging line
2.	pilot plant is considered a small scale food manufacturing, therefore it depends what is the purpose and what type of service is provided, to name a few, retort, can sealer, steam kettle, air and oil roaster, cold storage, freezer dryer, vacuum packaging, plastic bag sealer, air drying oven, oven, fermentor, cheese processing vat, pasteurizer, spray dryer a good working space, storage
3.	pilot scale beer brewery
4.	NOTE: we are hiring a Food Processor shortly who can provide good info on this; Also, this will depend on product you select to focus on
5.	large capacity air dryer; smoker; steam kettles; pasteurizer vat; recording thermometer; temperature controlled rooms (-18 to 40°C); small analysis/wet lab with a scale, pH meter, variety of glassware, pipettemen); can sealer; retort; lab model dishwasher;HObart Chopper; Hammer mill; ice cream maker; ice machine; decanter/centrifuge; vacuum packaging sealer
6.	Driers, heat exchangers or kettles, cold room, freezers ...

Please list any other courses, activities, or individuals that may be supported by or interested in this facility? |

#	Response
1.	As mentioned, I believe you could begin to incorperate the Food Science undergraduate program into developing products for the farm
2.	I would recommend sending this to everyone in the faculty-A comprehensive input is going to help you in your final decision
3.	Facilities could provide a physical resource that could be rented by small scale food producers for product formulation/development - could contact the small scale food producers association to see what interests/needs they may have.
4.	FNH courses and LFS 350 and 450
5.	Bcit bcft perhaps?

Any other comments. |

#	Response
1.	Looking forward to the developement of this project! Will be a great addition to UBC and will be a usefull tool to incorperate the local community by providing locally produced products and will be an excellent learning tool for students.
2.	I would recommend connecting with food processors association, with the development of Food Innovation Centre, a good functional pilot plant would be a valuable asset and it can be used as a revenue generator for the faculty- please see the link on Guelph pilot plant-http://www.gftc.ca/research-and-development/pilot-plant/
3.	It will be critical to have a top notch manager for the facility to maintain hygiene and keep all equipment in operating condition. A budget will need to include maintenance and repair of equipment. Even limited use of the kitchen facilities in the FNH building have left the facilities dirty and poorly maintained.

Appendix C: Questions for BCIT Food Processing Resource Center Interview

1. Products
   - What products do the BCIT Food Processing Resource Center process?
   - Are any of these products marketed? Are they primarily processed for research?

2. Machinery and equipment
   - What are the main food processing methods that occur in your facility?
   - What are the main pieces of equipment that are used in your facility?

3. Government regulations
   - What government regulations does your facility need to abide by (design, inspections of facilities, especially pertaining to multi-product and multi-use facilities?

4. Academic involvement
   - What academic involvement is associated with your processing plants?
   - What research is currently occurring in this facility?
   - Does your facility offer students other opportunities to get involved outside of their classes?

Appendix D: CFIA Food Regulations

Food Products	**Agency and Link to Regulation**
Dairy products	CFIA Dairy Products Regulations Regulations regarding the registration of establishments, the operation, the grading, inspection, packing and labeling of dairy products http://laws-lois.justice.gc.ca/PDF/SOR-79-840.pdf
Fresh fruits and vegetables	CFIA Fresh Fruit and Vegetable Regulations Regulations regarding the grading, packing and marking of fresh fruit and vegetables http://laws-lois.justice.gc.ca/PDF/C.R.C.,_c._285.pdf
Organic products	CFIA Organic Products Regulations Regulations regarding the registration of establishments, the operation, the grading, inspection, packing and labeling of organic products http://laws-lois.justice.gc.ca/PDF/SOR-2009-176.pdf
Honey	CFIA Honey Regulations Regulations regarding the grading, packing and marking of honey http://laws-lois.justice.gc.ca/PDF/C.R.C.,_c._287.pdf

Eggs	CFIA Egg Regulations Regulations regarding the grading, packing, marking and inspection of eggs http://laws-lois.justice.gc.ca/PDF/C.R.C.,_c._284.pdf
Processed eggs	CFIA Processed Egg Regulations Regulations regarding the grading, packing, marking and inspection of processed eggs http://laws-lois.justice.gc.ca/PDF/C.R.C.,_c._290.pdf
Processed products	Processed Products Regulations Regulations regarding the grading, packing and marking of processed products http://laws-lois.justice.gc.ca/PDF/C.R.C.,_c._291.pdf

Appendix E: Additional Resources for GMP and HACCP

1. Guidelines of GMP
A set of guidelines provided by Health Canada http://www.hc-sc.gc.ca/dhp-mps/compli-conform/gmp-bpf/index-eng.php
2. Guidelines of HACCP
A set of guidelines provided by CFIA http://www.inspection.gc.ca/food/fsep-haccp/eng/1299855874288/1299859914238
3. Small Scale Food Processor Association A local organization that support small scale agri-food processing and provide assistance with food safety through offering food safety courses to producers. http://foodsafety.ssfpa.net/

(Health Canada, 2011a; 2011b; Small Scale Food Processor Association, 2011)

Contact Information – Food Regulations:
Jasmina Egeler
Regional Food Safety Coordinator
Vancouver Coastal Health
Website: www.vch.ca/environmental

Joan Soriano
Food Inspection Specialist
Canadian Food Inspection Agency

Acknowledgement:
Thank you Gary Sandberg from BCIT for the interview and the tour at the BCIT Food Processing Resource Center.

Appendix F: Food Processing Equipment Table

UBC FSP Food Processing Center Equipment Table

Food/Food Processes	Description	Equipment/Machinery	Web Resources
Fermenting	Fermentation is the conversion of a carbohydrate such as sugar into an acid or an alcohol. More specifically, fermentation can refer to the use of yeast to change sugar into alcohol or the use of bacteria to create lactic acid in certain foods. Fermentation occurs naturally in many different foods given the right conditions, and humans have intentionally made use of it for many thousands of years.	• fermenter	http://www.binder-behaelterbau.de/uploads/pics/fermenter02_02.jpg
Cheese		• cheese processing vat	http://www.kleenflo.us/images/cheese-vat.jpg
Drying/Roasting	Dehydration-or drying-is the nearly complete removal of water from solid foods. One of the oldest methods of food preservation, it was traditionally carried out by the sun.	• freezer dryer • air drying oven • air and oil roaster • spray dryer • large capacity air dryer • oven	http://www.bcit.ca/files/health/foodproc/img/virtis_freeze_dryer.jpg http://www.bcit.ca/files/health/foodproc/img/double_drum_dryer.jpg http://www.bcit.ca/files/health/foodproc/img/niros_spray_dryer.jpg
Thermal Processing/Canning	Thermal Processing destroys all pathogenic and spoilage micro-organisms in foods and inactivates enzymes by heating.	• retort • can sealer	http://www.bcit.ca/files/health/foodproc/img/vertical_still_retort.jpg http://www.bcit.ca/files/health/foodproc/img/pressure_cooker.jpg
Cooking/Heating/Blanching/pasteurizing	Blanching is a slight heat treatment, using hot water or steam that is applied mostly to vegetables before canning or freezing. Pasteurization is the process of heating	• steam kettle • HTST pasteurizer (vat)	http://www.bcit.ca/files/health/foodproc/img/tilt_kettle.jpg http://www.bcit.ca/files/health/foodproc/img/vacuum_kettle.jpg

	a food-usually a liquid-to or below its boiling point for a defined period of time. The purpose is to destroy all pathogens, reduce the number of bacteria, inactivate enzymes and extend the shelf life of a food product.		http://www.pladot.co.il/minidairy/pics%5Cgallery%5Cequipment%5CHTST%20pasteurizer%20-general%20view.jpg http://www.bcit.ca/files/health/foodproc/img/htst_pasteurizer.jpg
Smoking	Many foods such as meat, fish and others are processed, preserved and flavored by the use of smoke mostly in big smoke houses. This process is very simple as the combination of smoke to preserved food without actually cooking it and the aroma of hydro-carbons generated from the smoke processes the food and makes it even tastier to eat.	• Smoker (if the aquaculture portion moves forward)	http://www.ourpetsandus.com/gallery/albums/freshwaterfishing/Fish_Smoker_2_s.jpg
Size Reduction/Mixing		• HObart Chopper • Hammer mill • mixers (both a large one and small one for pre-mixes)	http://www.bcit.ca/files/health/foodproc/img/hobart_mixer.jpg
Extrusion	Extrusion is the process in which a food is compressed and worked to form a semi-solid mass. This mass is then forced through a restricted opening, or die, to create a desired texture or shape. The purpose of this application is simply to provide a greater variety of textured foods to consumers.	• extruder	http://www.asia.ru/images/target/photo/50519127/Compounding_Extruder__Thermoset_Compounding_.jpg
Eggs and salad mixes		• Egg processing equipment → washer and dryer • Various sinks and metal surfaces for cleaning and sorting	http://www.rozendaal.ca/back_side_of_clean_egg_smaller_size.jpg http://dcmetalwork.net/newimages/str/TasteTable.jpg

			http://www.elkayfoodservice.com/pics/B1C24x24.jpg http://www.advancetabco.com/product_images2/k7_convenience_sink.jpg
Packaging/Storage		• vacuum packaging (sealer) • plastic bag sealer • cold storage • storage • temperature controlled rooms (-18 to 40°C) • some type of automated packaging line (depending on the volume of product to be produced)	http://www.bcit.ca/files/health/foodproc/img/vacuum_sealer.jpg http://www.bcit.ca/files/health/foodproc/img/foster_freezer.jpg http://www.easymealprep.com/main/kitchenthyme/52a.jpg
Other equipment		• recording thermometer • pH meter • small analysis/wet lab with a scale • variety of glassware, pipettemen • lab model dishwasher • decanter/centrifuge • ice machine • ice cream maker • a good working space • Laundry equipment	

Sources:
Ministry of Agriculture, Food and Rural Affairs. (2011). *Food Processing an Preservation*. Retrieved March 26th, 2012 from http://www.omafra.gov.on.ca/english/food/industry/food_proc_guide_html/chapter_5.htm

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