

UBC Farm Agroforestry Product Lines
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1. Abstract

There is a potential for expanding the types of agroforestry systems at The UBC Farm (UBCF). New agroforestry product lines would add functionality to the UBCF's forested spaces and hedgerows, provide new sources of revenue, and provide an example for how agroforestry systems can be managed and implemented for other BC farms.

The goals of the UBCF Agroforestry Product Lines Project were: to identify potential new agroforestry product lines for the UBC Farm, and to assess their potential for profit. This project was a collaboration between a group of UBC Students from LFS 450, and the UBC Farm (UBCF). The group identified a range of potential agroforestry projects. After consulting with the UBCF, the group decided to focus on the production of medicinal plants on the edges of the forested spaces and hedgerows for a local medicinal plant retailer. The students prepared a business plan to outline the implementation of this project, and to assess its potential for profit.

The group identified three medicinal plants (borage, comfrey, and yarrow) that could be grown and processed by the farm, and sold to the retail partner. They found that the farm has the potential to make \$2800 profit from this project annually. Medicinal plant production has very low fixed costs, so the UBCF does not have to sell a lot of product to cover their costs.

Medicinal plant production at the UBCF has a great potential for being a profitable project for the UBCF. This group recommends that the UBCF integrates medicinal plants into their agroforestry systems. Also, future LFS 450 groups should continue to work on developing new agroforestry projects for the UBCF.

2. Introduction

Background

The University of British Columbia (UBC) Agroforestry Product Lines project is part of the UBC Food systems project (UBCFSP). The UBCFSP was launched in 2001 as an initiative to involve students in developing a more sustainable food system on UBC's campus (Rojas, 2007). The UBCFSP links up members of the UBC community who are interested in sustainable development with teams of students who are enrolled in Land and Food Systems (LFS) 450. In this class, the student teams work with their community partners on projects that work to enhance the sustainability of the UBC Food System. A goal of the UBCFSP is to allow students to draw upon their personal experiences and integrate their learning while collaborating with their peers, creating a community of learning which enhances their university experience (Rojas, 2007).

Our project was a collaboration between the UBCFSP and the Center For Sustainable Food Systems (CFSFS) at the UBC Farm (UBCF). The UBCF is a 24 hectare area of integrated forest and agricultural land that is located on the south end of UBC's campus. Some of the goals of the CFSFS at UBCF are ("cultivating space", 2009):

- to create a space as a living laboratory where students and members of the UBC community can explore topics concerning sustainable food systems
- to facilitate social change by cultivating knowledge and best practices concerning sustainability, and encouraging community members to apply those ideas.

The UBCF is part of the faculty of LFS, and is used as a cross disciplinary teaching resource for UBC. The UBCF is also a working farm that provides the UBC food system with fresh food

through a variety of marketing channels. A large part of the farms revenue is supported by food sales.

We are a group of four undergraduate students from the Faculty of Land and Food Systems at UBC. Three of us are students of applied biology, and one of us is studying Global Resource systems.

The UBCF recently launched an agroforestry program. Agroforestry is a management approach that combines agricultural and forestry practices into land management systems in order to diversify production. Agroforestry systems have the potential to add functionality to forested spaces while providing new sources of revenue for farmers. The UBCF is well-suited to developing agroforestry systems. The UBCF is surrounded by successional forest stand and several hedgerows have been developed throughout the farm. The goal of the UBCF's agroforestry program is to explore how agroforestry can be implemented at the UBCF and to use their programs to show how agroforestry can be used to enhance production and provide new sources of revenue for BC farmers.

Problem Definition

Agroforestry systems have the potential for farmers to decrease their impact on the land while generating new sources of revenue. In North America, increased customer demand for ethically sourced food presents an exciting opportunity for farmers to transition towards more sustainable food production methods ("Organic Farming", 2004). Alternative food production systems, however, generally use more land than conventional systems. Crop yields in organic systems are, on average, 20% lower than in conventional systems (Maeder, 2002). That means that 20% more land is required to grow food organically. Farmers that are

practicing sustainable agriculture should address these impacts by carefully considering how they are using their land. Agroforestry provides an opportunity for farmers to implement good land use practices by integrating systems that preserve the integrity of their surrounding ecosystems.

Agroforestry systems have been shown to provide a range of beneficial ecosystems services including (Shibu, 2009):

- Carbon sequestration
- Biodiversity Enrichment
- Soil enrichment
- Air and Water Quality

Globally, the implementation of agroforestry systems has proven to be a powerful tool that can be used to improve the economic situation of rural communities, while providing valuable environmental services (Current, 1995).

The problem that this project sought to solve was, how can Canadian farmers realize the benefits of implementing agroforestry systems in a way that maximizes their profits? Our project's goal was to examine potential agroforestry product lines, and demonstrate that agroforestry production can be profitable for BC growers.

Value assumptions

All of our groups members are studying in the faculty of LFS. We are all students of agriculture, and we are all personally invested in the idea that sustainable agriculture is an achievable goal. Our biases and beliefs about sustainable agriculture probably had an effect on how we researched and implemented our business plan.

We are all from the west coast of North American, and come from middle-class families. Our ideas about food systems, and the culture of food, have been shaped by the backgrounds in which we grew up. We drew upon our personal and cultural perceptions of food and food systems when participating in this project. Our individual cultural views of food and agriculture could have also limited our ability to fully understand the food system that we were studying. We tend to see food as a given, as none of the members of our group have ever had to struggle with getting enough food to maintain good health.

The UBC Farm has the benefit of having very low overhead costs, and of being able to secure funding through grants. What they would consider to be a successful project, in terms of their return on investments, might be different than many other Canadian farmers.

Reflections on UBCFSP Visions for a Utopian Food System

The UBCFSP Visions for a utopian food system is a document that outlines the goals and vision of the UBCFSP (Rojas, 2007). In preparation for this project, we read and discussed the UBCFSP Visions for a Utopian Food System.

Our group ended up spending the bulk of the discussion talking about the value of the Learning with Life (LWL) pedagogical model that is discussed in the paper. LWL is a pedagogical model that seeks to integrate student's personal experiences, reality as it is (as represented in scholarly articles), and reality as it should be (the students utopian vision of the food system) in the process of examining and understanding the food system.

We agreed that LWL is an interesting approach to learning about the food system, but that, from our own experiences in LFS 450 and other Land Food and Community (LFC) courses at UBC, it has flaws. We agree that it is valuable to examine your own personal paradigm and its

relevance to the global food system. But, we think that LWL needs to put more emphasis on encouraging students to be self-critical and challenge the values and assumptions that make up their paradigms. A danger of the LWL model is that students will use the areas where their experiences, reality and their utopian vision intersect to reinforce their worldview, while ignoring all the places where those difference spheres of reality diverge. Students participating in the LFC series need to constantly be challenged to deliberately examine those discontinuities in order for LWL to be a meaningful model. In our experiences of LFC courses, that does not always happen.

3. Methodology

The methodology for our project consisted of four steps:

1. Primary literature review.
2. Secondary literature review and preparation of proposals for different agroforestry projects for our project partner.
3. Consultation with our project partner to choose which project would best fit the needs of the UBC Farm.
4. Preparation of a business plan to assess the feasibility of the chosen project.

The goals of the primary literature review were to learn about agroforestry and find inspiration for ideas for project proposals. Coming into this project, many members of the group did not know very much about agroforestry and its applications in BC. The first part of our primary literature review was focused on gaining a foundational knowledge about agroforestry. The second part of our primary literature review was focused on generating ideas for projects that could be implemented at the UBCF. Most of the information that we gathered in our primary literature review came from agroforestry guides published by the USDA and Ag Canada, and peer-reviewed articles that we found through the UBC Library website. Our resources were found using Google and the UBC library website. Search terms included “Agroforestry”, “Agroforestry in BC”, and other related terms. Relevant resources were shared using e-mail and Google drive.

After learning about agroforestry through our primary literature review, we met and brainstormed ideas for agroforestry projects that would work on the farm. We narrowed our ideas down to three. Our three ideas were:

1. Mushroom cultivation
2. Mixed systems of trees and crops growing under trees
3. Medicinal Herb production

We chose these three ideas because they seemed like they had the most potential to be feasible projects at UBCF. The mushroom cultivation idea was based on an existing business plan that had been made for the UBCF that was for cultivating mushrooms indoors. We were interested in seeing if the UBCF could produce mushrooms outdoors, in the wooded areas that edge the farm. We chose the mixed systems of trees and crops idea because we thought that it would be interesting to see how we could diversify the types of farming systems being used at the farm. We were interested in medicinal herbs because our project partner told us that the UBCF had been in contact with a medicinal plant retailer about producing medicinal plants at the farm.

We divided our team up to research these three ideas and prepare project proposals for our partner at the UBCF. Our secondary literature review was focused on finding information that would be relevant to determining if these projects would work at the UBCF. We included in our project proposals information about startup costs, where to source materials, how much space would be required for the project, how much time would be needed to implement the project, and other relevant information. This information was found through internet searches. Most of our information for the proposals came from government agricultural agencies, universities, and agroforestry organizations. We summarized this information in our project proposals. Our project proposals are located in appendix A.

After preparing our project proposals, we met with Kate Menzies, our project partner at the UBCF, to present the proposals and consult with her about which project should be chosen for our business plan. We chose to write our business plan about medicinal plant cultivation, because it seemed like it had the potential to be a lucrative project, and medicinal plant production had been previously identified by the UBCF as a project that they were interested in doing.

Our business plan was based on a guide to writing business plans that was given to us by the UBCF. The goal of the business plan was to assess the economic feasibility of medicinal plant production at UBCF. Information for the business plan was gathered from many sources including government reports, the website of the medicinal plant retailer that the farm was planning to sell to, personal communication with stakeholders, and industry analysis reports about the market for medicinal plants. The business plan can be found in appendix B.

4. Findings

We found that the medicinal plants investigated will grow in hedgerows on the UBCF and will make money in an agroforestry system as described, thus the plan is operationally and financially viable. The complementary and alternative medicine (CAM) industry is growing in Canada, and a majority of Canadians have used CAM at some point in their lives (AAFC, 2012). Borage, comfrey, and yarrow would be grown. Borage has use as an anti-inflammatory when ingested, comfrey promotes skin healing when applied as a compress, and yarrow also has anti-inflammatory properties when ingested. All three of these plants are very hardy, so are viable at the UBC Farm where the labor force is limited. There are also minimal input costs needed, and the processing of the plants (drying and testing) can be done at UBC, and will be fairly inexpensive. Our figures show that the UBC Farm can make about \$2800 in a good year – this is a baseline calculation, and assumes that there are no problems that must be faced during the growing season. It is anticipated that if the UBCF were to implement the plan, it would come without any major problems and be successful. This project has a lot of potential to be successful because the UBC Farm has a reputation for producing quality produce, and these medicinal herbs would share this distinction. Further information and plan details can be found in the business plan in appendix B.

5. Discussion

Our research found that borage, comfrey and yarrow can successfully grow in hedgerows at UBC farm and that their production will be financially viable. Part of our initial research however, included background research on agroforestry itself. The various benefits associated with agroforestry systems make it an attractive addition to UBCF. As much of the UBCF is composed or bordered by forested area, the inclusion of agroforestry systems is a good method of utilizing space which is unsuitable for conventional agriculture. The other benefits of agroforestry should not be overlooked either. Agroforestry utilizes intercropping and may consist of a system composed of many species. As such, agroforestry systems are particularly adept at facilitating increased levels of biodiversity, as they provide additional niches and resources which can support higher numbers of species. A well thought out and planned agroforestry system can thus greatly increase agricultural sustainability, which fit within the values of the UBCF.

The current food system and thinking is shifting towards a more permaculture, mixed land-use paradigm – away from the conventional monocrop system. Agroforestry is very much in line with these ideals, as it increases biodiversity and sustainability. This particular project, medicinal herbs within hedgerows, also increases biodiversity and sustainability. Since the plants are all perennials, no soil turnover will be needed after the initial planting, and this will increase the health of the soil – their biomass will also naturally encourage topsoil formation. This mixed land-use will increase the biodiversity of pollinators and foraging species, and will help create a healthier landbase for the UBC Farm. At a local level, British Columbia is interested in moving towards more sustainable methods of production, so these products

would be widely supported. The products will not be sold at a global level, but UBCF's production methods can serve as a template for other farms wishing to produce herbs in sustainable ways.

6. Recommendations

Our main recommendation to our stakeholders is to implement our proposed plan in the coming growing season. The plan could be implemented as soon as the spring of 2014, with preparations being done beforehand (purchasing seeds, designating land for herb growth, preparing the land, etc.). The plan could be implemented very soon, due to the ease and potential profits of the recommended medicinal herb project. The business plan we created has all of the financial numbers and accounting done, as well as other research such as suppliers, amounts, and locations of these plants. While we did not have specifics on some of the numbers, such as labor costs and exact seeding amounts, the template for these is done, and the UBCF managers can refine the numbers where needed. The majority of planning left for this project is to simply decide on how many people are needed and who they will be to manage these plants, but as they all grow quite well on their own; we do not feel that this will be difficult. This is a relatively straightforward venture, with the potential to earn the farm profits as soon as next fall.

The only other recommendations we feel we need to make are for whoever will be creating the next round of scenarios. At the beginning of our project, what was wanted of us was extremely vague, and all we were told was to research agroforestry possibilities. We could have spent years doing this, and still been nowhere near understanding all of the potential uses of an agroforestry system. When it did finally come time to present our proposals to our community partner, we were told that basically the project would be chosen by ease of implementation and quick profits. We understand that part of the project was to learn more about general agroforestry, but having some idea of what the UBCF was interested in, or even

their selection criteria would have really helped guide our preliminary research and project proposals. If there were to be future agroforestry scenarios created for LFS 450, we would recommend that the project be a great deal more specific.

We have researched a number of possible agroforestry projects; perhaps the next scenario could focus on one of these proposals or topics such as tree-field crop intercropping potentials, or mushroom cultivation. Each different topic has so many possibilities and potential that having the subject narrowed down would really serve to allow the students much more time to really go in-depth in their research and proposed project. Having a list of the UBCF's selection guidelines in terms of what they can realistically implement would also help guide the project's research.

7. Scenario evaluation

Through our preliminary proposal research and resulting business plan for agroforestry products at the UBCF, we were able to meet the required objectives of our project. We feel that our work will be truly validated if the farm is able to implement our proposed work for the medicinal herb production. The cornerstone of our project is the business plan. Through dedicated research, we produced a practical and useful resource for the UBCF. The plan not only shows how feasible the project is, but also that it has great potential to make significant profits.

8. Successes and Challenges

This project is seemingly straightforward. Research is the primary method, and all the findings are very fact based. However, being so open-ended, challenges did arise. At the beginning of the project, we only had a general idea of what agroforestry was - we were unsure how to merge our understanding with agroforestry with creating a product line. We found it difficult to narrow down the broad subject of agroforestry into specific product lines that could be created. With guidance from our community partner we were eventually able to do this. Once we had chosen medicinal herbs as our project topic, some of the information about the complementary and alternative medicine (CAM) field was difficult to find, as it is such a niche market. There were also not many guides to choose from that explicitly stated how to grow such herbs.

This is not to say many successes weren't had, we were able to produce a cohesive business plan revealing that growing medicinal herbs was in fact a viable and feasible option. The challenges we faced helped us to better understand why agroforestry is often a difficult thing to undertake, and to better appreciate all the planning that goes into starting a new business venture within a farm setting.

9. Media Release

This project endeavored to produce a business plan outlining a potential agroforestry product for the UBC Farm. We were successful in identifying three medicinal herbs that could be grown at UBC Farm and have the potential to be quite profitable: borage, comfrey, and yarrow. These herbs would be dried and sold through a medicinal herb dispensary, with UBC Farm as the wholesaler. This is an exciting opportunity for UBC Farm, as it can become a model for other farms in the area wishing to produce similar products, it can give teaching and learning opportunities at the farm, and it will enhance the revenue that the farm generates.



10. Works Cited

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11. Appendices

Appendix A

Product name:

Intercropping Black Walnut Hybrid (Eastern crossed with California Black Walnut) and Corn

Pros:

- Intercropping trees and vegetable crops is a great way to interest people in the farm and provide more products at the market garden
- Added biodiversity
- Potential to increase yields in both crops, more capital/products with black walnut being harvestable for timber and the walnuts
- Can also grow Christmas trees (Douglas-fir) within the walnut rows instead of corn
- Deeper tree roots can take advantage of deeper, nutrients that vegetable crops cannot reach

Cons:

- Any tree plantation is going to take a number of years to establish, especially if growing for timber
- May take more space in fields as corn especially needs plenty of light so would have to space the trees and crops out more the bigger the trees get, can grow up to 50 to 75 ft. high and wide
- This variety of black walnut tree has been shown to work in this system in Oregon, but may have trouble here?

Expected costs of producing product:

- Tree seedlings can be expensive at local nurseries, may find cheaper ones in bulk, from the US, but may also be an issue to get the specific hybrid to Vancouver.
- Mostly seen in added water to the trees in summer time, and less corn space the larger the trees get.
- If grown correctly, the walnuts themselves have a variety of marketable possibilities, either directly or processed into some other product. The timber has a high market value and demand at the moment.

Resources:

<http://www.extension.umn.edu/distribution/naturalresources/dd0505.html>

http://www.aftaweb.org/intercropping_black_walnut.php

<http://www.advancedtree.com/timber/timber-Black-Walnut.aspx>

<http://www.arborday.org/Shopping/Trees/TreeDetail.cfm?id=104>

<http://www.artsnursery.com/default.aspx#.UTY6ITCsiSo>

Product Name:

Grow Fuji Apples with a mustard cover crop understory

Pros:

- Mustard cover crop has been proven to suppress weeds as efficiently as regular herbicides and plastic mulch in a Fuji apple orchard
- Must plant other apple varieties with Fuji's so they will grow, since there are already some apples being grown, this will save external costs
- Saves money with weed control, while offering more diversity to the farm

Cons:

- Both Fuji apples and Mustard crops prefer warmer climates with less rain, but can grow in temperate zones
 - May receive less yields from the apples since they are not in their ideal climatic zone
- Once again, trees take time to establish, especially if you buy smaller, younger seedlings

Expected Costs of Producing Product:

- Can range from \$8 to \$140 per seedling depending on the size and desire of reproduction speed.
 - May cost more to ship to Vancouver
- Extra watering costs and care for the apple trees should be factored in

Resources:

<http://willisorchards.com/product/Fuji+Apple+Tree#.UTY7QzCsiSo>

<http://www.gurneys.com/product.asp?pn=06814>

<http://www.agroecommerce.com/agroecom/BriefInfo/Crops/MustardInfo.asp>

Paulus, J.R. 1993. Contributions of the cover crop Brassica kaber to the establishment of apple trees under conversion management. UC Santa Cruz, Proquest, UMI Dissertations Publishing.

Product Name:

Medicinal Herbs: Shade Crops such as Ginseng, Goldenseal, Cascara, Yew Bark, St. John's Wort,
Landcaping/Ornamentals: Salal, Sword Fern Bear grass, Cedar Boughs

Pros:

- Most are native to this area
- Some may even be already growing in the surrounding forest
- Relatively cheap purchase and easy care, once area is established
- Added diversity to farm and market garden products

Cons:

- Labor intensive site preparation, would have to clear part of the understory of the forest
- Added labor to take care of crops in forest, and plan and rotate some crops, ginseng can have disease problems if not rotated

Expected Costs of Producing Product:

- Seed prices vary depending on bulk or local nursery purchases
- May save money on naturally growing products
- Labor and extra water care will add up, market potential may make them worth it, especially with a wide range of different products

Resources:

<http://www.artsnursery.com/catalog/herbs>

<http://www.westcoastseeds.com/product/Herb-Seeds/>

<http://aftaweb.org/>

Mushroom Cultivation

Overview

Mushroom cultivation can be a lucrative business, with minimal monetary inputs. Mushroom inoculated logs will incubate for about nine months, and will naturally fruit in the fall or spring. This is an operation that can easily be scaled to suit the space available on the Farm and the amount of labor available.

A ten-log operation is a typical size for a family, whereas 200 to 500 logs is a manageable size for a small commercial operation.

Expected Cost

The startup cost will include:

- Cost of drill (approximately \$100) and drill bit (approximately \$10) if the proper size is not included with the drill;
- Cost of the inoculation material, whether plugs (\$35 for 1000) or sawdust (\$19 for 1 kg);
- Cost of cheese wax to seal the inoculants (\$3 for 1 lb, which can coat approximately 10 logs) and a wax application tool;
- Cost of gravel or concrete blocks to raise the logs off the ground (approximately \$5 for 50 lb of gravel);
- Potentially the cost of the logs, if no suitable ones are present on the farm.

During production, the logs will need to be watered using a sprinkler for 2 to 3 hours once or twice a week, or immersed in water for 8 to 12 hours every two weeks. During this spawn run, costs will be:

- Cost of the sprinklers or water immersion containers;
- Cost of water.

Expected Selling Price

Organic Shiitake mushrooms sell for about \$12 to \$14 per pound.

Human Resources

At least one dedicated worker would be needed to do the watering that the log need, working 6 hours per week. During the inoculation and harvesting periods it may be useful to have additional help, in order to hasten the processes.

Benefits

The logs would pay for themselves over time, and give a substantial return on investment. This would be one more product that the UBC Farm could sell through the various outlets: the Saturday markets, CSA boxes, and bulk orders. These mushrooms would expand the organic and natural products that the UBC Farm already produces.

The mushroom cultivation could also be used as a teaching aid to the elementary aged students who tour the UBC Farm, as well as University students that are taking classes in fungi.

Drawbacks

If there are suitable trees at the UBC Farm, some would need to be cut down to create these inoculation logs. A section of the UBC Farm will also need to be dedicated to production, which would impact the local flora and fauna – the logs would need to be raised off the ground, by covering the area with gravel.

Nearly all the investment is up-front, and due to the long spawn-run period (9 months for fast growing species), the return on investment will not occur until a significant amount of time after inoculation.

References

<http://nac.unl.edu/agroforestrynotes/an13ff02.pdf>

<http://www.mushroompeople.com/how-to-cultivate-mushrooms-in-natural-logs/>

<http://www.cityfarmer.org/OysterShiitake.html>

<http://www.shroomstore.ca/>

Proposal for Herb cultivation in the Hedgerows at the UBC Farm

A number of different medicinal herbs can be grown in the UBC farm's hedgerows. Herbs can be sold to herb retail stores, or sold by the UBC Farm as herbal tea blends. The UBC Farm has been in contact with Gaia Garden (www.gaiagarden.com) about selling herbs from the Farm.

Examples of herbs that could be grown in the UBC farm's hedgerows:

-Calendula, Borage, Lavender, Yarrow, Fennel, Mint, Chicory, Alfalfa ,Oregon Grape,
Fennel

Pros of growing medicinal herbs

-The herbs could be grown in hedgerows that have already been established at the farm.

-Herbs generally wholesale for around 10 to 20 dollars a pound

-Herbs are easy to grow

-Some herbs have properties that could be beneficial to nearby plants

Cons of growing medicinal herbs

-how the plant reacts to the surrounding environment needs to be considered

If we write our business plan about growing medicinal plants in the garden, we will select a few plants that would be well suited to growing in the hedgerows at the UBC Farm, and write a business plan which will outline how medicinal plants will be marketed and produced.

Startup costs:

-Seeds or cuttings: This cost will depend on what you decide to grow

-Herb Dryer: You could either buy or make your herb dryer

-Kits range from 30 to 400 dollars

Appendix B

**UBC FARM AGROFORESTY LINES PROJECT
Business plan for Medicinal Plant Production
Prepared for: Kate Menzies**

By: Daniel Scheppke, Catherine Rawsthorne, Elliot Morton, Graeme Northrup

LFS 450

4/5/13

1. Executive Summary

The UBC Farm has been approached by a medicinal plant retailer in Vancouver that is interested in purchasing medicinal plant products grown at the UBC farm. This is an exciting opportunity for the UBC Farm to introduce new production systems, and generate revenue. Medicinal plants can be grown in the hedgerows and in and around forested spaces at the UBC Farm. This would add functionality to the forested spaces, and would allow an opportunity for the UBCF to experiment with agroforestry production systems.

The goals of the UBCF medicinal plant production project are:

- Enhance the productivity of forested spaces at UBCF
- Cultivate best practices for medicinal agroforestry products production
- Provide opportunities for learning for the UBCF community

For the purpose of this plan, 3 different medicinal plants are examined: Borage, Comfrey, and Yarrow. These plants are discussed because they are plants that the retail partner has expressed interest in, and they have been identified as plants that can be grown in agroforestry systems. There are other medicinal plants that could be grown at the UBC farm, and there is the potential for the UBC farm to expand their medicinal plant production in the future.

UBCF has the sustainable competitive advantage of being one of the only medicinal plant producers in Vancouver. Selling truly local medicinal plant products will give a marketing advantage for the UBCF and its retail partners.

This report has found that medicinal plant production has the potential to provide the UBCF with an additional \$2,800 of annual profits.

This report shows that medicinal plant production has the potential to generate revenue for the farm, and provides an opportunity for the farm to broaden the scope of their agroforestry production systems.

2. Company Description

This business proposal examines the feasibility of growing medicinal herbs at the UBC Farm. The herbs will be marketed to herbal retailers who supply Vancouver's market for complementary and alternative medicine (CAM). This is a growing industry in Canada. A majority of Canadians have used CAM at some point in their life. In a 2006 survey, 81% of British Columbians responded that they had used alternative therapies. Canadians spend over 8 billion dollars a year on CAM. 19.3% of expenditures on CAM are for herbs and vitamins (AAFC, 2012). Selling medicinal plants to CAM businesses could be a future source of revenue for the UBC Farm.

The Center for Sustainable Food Systems (CSFS) will produce medicinal herbs at the UBC Farm (UBCF). Medicinal herbs will be grown and dried by CSFS and sold wholesale. These herbs will be locally sourced, grown sustainably, and will follow the vision for the CSFS at UBCF.

The CSFS at UBCF encompasses 24 hectares, of which 12 are dedicated mixed-use farmland. The mixed crops and livestock at the farm are intended to represent the diversity of food, fiber and fuel production that are possible in the Pacific Northwest (CSFS, 2009). This plan assesses the possibility of introducing herbs that are well suited to the Pacific Northwest to enhance the diversity of products grown on the Farm.

Mission Statement

The mission of this business is to create a successful product line of natural, locally sourced, sustainably grown herbs at the Center for Sustainable Food Systems at UBC Farm (CSFS at UBCF). This product line will keep with the overall mission of the CSFS at UBCF, and will help to develop new business opportunities.

Goals and Objectives of the Business plan

The goal of this project is to create a successful product line of medicinal herbs that will be sold by the CSFS at UBCF to a retail partner. This project will create educational opportunities for members of the UBCF community. The UBCF's medicinal plant project will be a model for other farms, which will help the UBC Farm "create an innovative living laboratory" (CSFS, 2009). This project will meet our retail partner's demand for high-quality medicinal herbs, and will foster new relationships with distributors of our product.

Business Philosophy

The CSFS and UBCF's medicinal plant project strives to provide high quality herbal products for wholesale, and enhance educational opportunities at the UBCF. Medicinal plants at UBCF will

be produced in accordance with the goals described by CSFS in their strategic academic plan, *Cultivating place* (South Campus Academic Planning Committee, 2009).

This project will:

- Cultivate knowledge about the best practices for the sustainable growth of medicinal plants
- Provide educational opportunities for members of the UBC community
- Engage new community partners in developing best practices to support sustainable and healthy living
- Enhance the productivity of the UBCF

Market

Medicinal Herbs grown at UBCF will be marketed to a local retail partner of specialty herbal and alternative medicines. This plan examines the feasibility of marketing to one herbal retailer that the farm has been in contact with. If this project is successful, CSFS at UBCF could expand their medicinal herb production to supply to other retailers.

The demand for medicinal plants in Canada is growing. Medicinal plants are used for their medicinal or therapeutic properties. They are widely sold as dietary supplements or in a variety of forms (Geisler 2012). Canada's aging population is expected to be the main cause of growth in the medicinal plant industry (Geisler 2012). An older population is expected to increase demand for herbal remedies that treat ailments associated with aging. There is a correlation between an aging population and an increased demand for dietary and medicinal supplements (Geisler 2012). In addition to the older demographic, there has been a substantial increase of younger people who use medicinal plants and other such supplements (Oliveira 2004).

Core Strengths

The CSFS at UBCF is well-known within Vancouver as being a producer of high quality, sustainably produced products. This product line would benefit from being associated with the UBCF brand. The wholesale of medicinal plants has the potential for enhancing the UBCF brand by creating new relationships with community partners, and by increasing the visibility of the UBCF brand within Vancouver.

This project will be enhanced by the resources and expertise of CSFS at UBCF. The CSFS at UBCF is supported by a large community of students, academics, and community members. The CSFS at UBCF will draw on the skills and knowledge of their community members in the development of this project. The CSFS at UBCF is located on the campus of the University of British Columbia (UBC). UBC offers a wealth of resources that can be used to enhance this project.

Ownership

The Center for Sustainable Food Systems is an academic center within the Faculty of Land and Food Systems, and the land of the UBC Farm is owned by the University of British Columbia (CSFS, 2009). This project would be managed as a long-term initiative by the CSFS at UBCF.

3. Products and Services

This plan will examine the feasibility of growing borage, comfrey, and yarrow at UBCF. These plants have been selected because they have been identified by our retail partner as being herbs that they would be interested in sourcing from UBCF. These plants can be grown along the edges of forested area and hedgerows (Hobbs & McGrath, 1998). Growing these herbs will improve the functionality of the hedgerows and forested space at UBCF.

These harvested products would be dried and sold wholesale to the UBCF's retail partner.

Borage (Borago officinalis)

Borage is a highly prolific, self-seeding annual herb. The plant is native to the Mediterranean bioregion, and is "well suited to cultivation in western Canada" (Blade *et al* 2002). The plant reaches heights of 60 to 100 cm. Borage can be harvested beginning in late July, or it can be left to grow up until mid-September (Blade *et al* 2002). All parts of the plant are edible and can be marketed. This includes the roots, leaves, seeds, and flowers of the plant. Despite being an annual, due to borage's prolific nature, reseeding is not required. The crop will sustain itself after its initial seeding. The plant is hardy and is able to grow in a variety of conditions (Blade *et al* 2002). Plants may grow in dense clumps of 25-30 plants per square metre. Borage can effectively subdue weeds (Blade *et al* 2002).

Comfrey (Symphytum officinale)

Comfrey is a perennial shrub, native to Europe, that can grow up to 1.5 m tall. Comfrey plants can live for up to 20 years, and its leaves are harvestable once the plant reaches 30 to 45 cm in height, prior to flowers blooming. Comfrey is well-suited to most soil types. Comfrey is most easily propagated by planting root cuttings. Comfrey is highly resistant to diseases and pests, and its thick fibrous root system will prevent any weeds, once the plant is established (Bubel, 1974).

Yarrow (Achillea millefolium)

Yarrow is a herbaceous perennial 0.2 to 1 meters tall. One plant will last for 3 to 5 years. It is harvestable between June and September, when the plant is flowering. The leaves and flowers

are both marketable as end products. Yarrow is grown from seed (Grieve, 2013). Yarrow prefers well-drained soils and full sun, and is generally a hardy plant (Simonetti, 1990).

Product Advantages & Disadvantages

Advantages

The retail partner has expressed an interest in sourcing a specific amount of these herbs. Working in collaboration with the retail partner will ensure that there will be a market for these products.

Producing these products will add functionality to the UBCF's forested spaces, and provide educational opportunities about agroforestry production at UBC. Agroforestry projects, such as these, will create new opportunities for student projects and employment.

By growing medicinal herbs, the CSFS at UBCF will provide an example of small scale medicinal plant production that could be used as an example for other growers in the region that are interested in similar systems of production.

The CSFS at UBCF has the distinction of being well-known for producing high quality, sustainably grown products. These medicinal herbs will also share this distinction, which will give them an advantage when marketing their product.

Disadvantages

The harvesting times for these plants are approximate, and harvested yield is limited by what the plant can produce. There may be variations in the yields of these plants depending on the quality of the growing season. Because the UBCF's production scale is smaller than that of most commercial producers, they may be more affected by variations in yield.

The drying process will add costs to the production process of medicinal herbs at UBCF. Because the CSFS at UBCF does not have its own dryers, the logistics of processing may be difficult to establish.

These products will need to be tested for coliform, E.Coli, salmonella, yeast and mold, moisture content and pesticide and herbicide residue before they are sold to our retail partner. Testing could be costly, which would it difficult to grow herbs at a small scale.

Pricing

The wholesale prices used in this plan are estimated as being 70% of our retail partners retail prices for these products.

- Borage will be sold for \$39.54 per pound, \$76.20 per kilogram.
- Comfrey will be sold for \$52.70 per pound, \$101.57 per kilogram.
- Yarrow will be sold for \$55.34 per pound, \$106.66 per kilogram.

4. Marketing Plan

Industry Trends

Medicinal plant production in North America is valued at over 10 billion dollars, annually (Agriculture and Agri-Food Canada 2012).

It is anticipated that the natural health product market, which includes the medicinal plant market, will grow due changes in the demographics of medicinal plant users. Marketing medicinal plants to Canadian youth is an area of expected growth (Oliveira 2004). Young medicinal plant users are expected to continue using medicinal plants throughout their lives (Oliveira 2004). Canada's aging population is also expected to lead to an increase in the demand for medicinal plant products. Older consumers are expected to demand herbal products that treat ailments associated with aging.

Over the last decade, the medicinal plant industry has seen growth due to the low cost of medicinal plants compared to conventional pharmaceuticals, conventional drug resistance, limitations of medicine, and the medicinal value of plants have sparked interest in herbs. In 2004, it was estimated that 20% of Canadians had used medicinal plants and this number is expected to rise (Oliveira 2004).

Consumer acceptance and brand recognition are factors that limit the growth of the medicinal plant industry. Medicinal plants have been portrayed in a negative light by the media, experts within the industry say, and that this has made consumers wary of their use (Oliveira 2004). These products are not well known to the public in their uses and benefits. More education about the benefits of medicinal plants is needed to ensure the continued growth of the medicinal plant industry.

Product Features and Benefits

Borage

Borage has various culinary and medicinal purposes. The light taste of borage foliage, which is often described as being similar in taste to cucumber, makes it a suitable choice for various uses including salads and cocktail garnishes (Alberta Agriculture 2011). Borage flowers are unique as they are one of the few edible blue items occurring in nature and have a sweet honey like taste which can be used to decorate salads and desserts (Blade *et al* 2002). Products of borage, including the seeds, roots, leaves, stems, and flowers, all have high nutritional value and antioxidant properties. Borage offers itself as an attractive, versatile, and novel ingredient.

Medicinally, borage has been described as having many uses. Most commonly, the seeds of borage are used for their high gamma linolenic acid content which is used effectively to treat rheumatism, arthritis, and PMS (Alberta Agriculture 2011). The foliage of borage has been shown to positively affect various gastrointestinal, respiratory, and cardiovascular disorders through its antispasmodic, bronchodilator, vasodilator and cardio-depressant agents (Farhadi *et al* 2012). Foliage can also be used for its potent anti-inflammatory and sedative properties (Farhadi *et al* 2012). Within alternative medicine circles, borage is often touted as having other medicinal properties and as being effective in treating various other ailments, however scientific evidence is often lacking to support these claims. Research into other alternative medicinal uses of borage is ongoing. Consumers can use borage products to treat ailments which borage is known to be effective in treating.

Comfrey

Comfrey leaves contain allantoin, a substance which helps new skin cells to grow, along with other substances that reduce inflammation and keep skin healthy (UMMC, 2011). Comfrey is harmful when ingested, due to the presence of pyrrolizidine alkaloids, so should only be used in topical forms. The leaves are ground up and used in ointments and tinctures (UMMC, 2011).

Yarrow

The flowers of a Yarrow plant can be dried and used as a diaphoretic, astringent, tonic, stimulant and mild aromatic. This part of the plant also slows blood flow from cuts and wounds. Younger leaves can be used as spinach subst. or dried and used as an herb in cooking. Yarrow Tea can be a remedy for severe colds as well. A potion made from the whole plant is good for kidney disorders. Yarrow is also used as a cure for baldness, if the head is washed with it. Yarrow is used in Norway for the cure of rheumatism (Grieve, 2013). It is important to note that some of these health claims may not be substantiated.

All of these products will have the benefit of being high quality, locally sourced, and sustainably produced.. Consumers will be able to know where the product comes from, and will feel a part of the growing local, sustainable movement.

Customers

The businesses that this product will be sold by are stores specializing in complementary and alternative medicine (CAM), a sector of the healthcare industry. Currently this market is \$10 million in North America (Agriculture and Agri-Food Canada 2012), and has seen growth in the last decade. There are quality standards that must be met to be sold at these stores which include testing for pesticides, as well as pathogenic microorganisms (WHO 1998). Our retail partner is a small medicinal plant store that is located in the city of Vancouver.

The largest demographic group of herbal users in Canada are females ages 46-55 followed by females ages 56-65 (Oliveira 2004). The fastest growing demographic in 2004 was males under 26 who reportedly take herbs to improve performance, health and appearances (Oliveira 2004). Females under 26 were another significant herb consuming demographic that showed significant growth who similarly to males under 26 took herbs to improve health, appearances, and to promote weight loss (Oliveira 2004). There are trends showing that these younger herb-using demographics will continue to use herbs throughout their lives so it can be assumed that the herb market will see growth in the future (Oliveira 2004).

The main demographic to target is females 46-55. This group is the fastest growing demographic in Canada and comprises the largest amount of herb users (Oliveira 2004). They are also characterized as being financially stable, interested in remaining active and in their own health, and they also use the widest variety of herbs (Oliveira 2004).

Competition

Sample competitors:

Horizon Herbs, LLC
PO Box 69
Williams, OR 97544 USA

Wildcraft Forest Wild Tea Plantation
1981 Highway 6
Lumby, British Columbia CAN

It is difficult to find information about the specific wholesalers that the retail partner sources their product from. For the Purpose of this report, two sample wholesalers of medicinal plant products are used to examine the competitive advantages of this project.

Table 1: Competitive Analysis

Factor	Medicinal plants at UBCF	Strength	Weakness	Horizon Herbs	Wildcraft	Importance to Customer
Products	Local, organic	X		Organic, not local	Local, wild sourced	3
Price	Competitive	X		Competitive	Competitive	5
Quality	High quality, local	X		High quality, not local	High quality, local	1
Selection	Limited		X	High selection	High selection	4
Service	Good, local and available	X		Good, not local	Good, local	3
Reliability	Small scale, yield is highly variable		X	Large scale, reliable	Large scale, wild sourced - not as reliable	2
Stability	Small scale, high turnover of staff		X	Large scale, established company	Large scale, established company	3
Expertise	High, backing of UBC	X		High, established company	High, established company	4

Company Reputation	Renowned, UBC Farm brand	X		Not a local company, no brand recognition	Strong brand, not known in the area	2
Location	Good, local, small scale	X		Good, own their own farm land	Good, wild sourced herbs are plentiful	4
Appearance	Average		X	Have their own brand	Have their own brand	3
Sales Method	Wholesale, directly to distributor			Wholesale, directly to distributor; sell online	Wholesale, directly to distributor; sell online	4
Image	Renowned, UBC Farm brand	X		Not a local company, no brand recognition	Strong brand, not known in the area	2

The major competitive advantages of medicinal plants at UBCF are that they are locally sourced, and come from a farm that has a recognizable brand in Vancouver. Buying locally sourced plants is advantageous to the retail partner because it gives them an opportunity to be involved in the production of the product, and it allows them to market these plants as being sourced from Vancouver. The UBCF also has a strong brand that is recognized in Vancouver. This will also be advantageous to the retail partner when marketing these products. There are high barriers to entry into the market for producing medicinal plants in Vancouver. Being a truly local medicinal plant producer will be the UBCF's most important sustainable competitive advantage

Niche

This business will find its niche as a local supplier of unique medicinal herbs for use as alternative medicines and more specifically as an ecologically and socially sustainable supplier. The product, medicinal herbs, will be dried and then sold to the distributor where the product will then move further into the market, eventually reaching the consumer. This business will be a primary producer in this market.

Strategy

Pricing

The pricing of the product will be a topic of negotiation with retailers. For the sake of this plan, wholesale prices are assumed to be 70% of the price at which these herbs are sold by our partner retailer. Pricing is important to this product line, as our retailers will not be willing to buy the product if the price is not competitive with other suppliers.

Proposed Location

The Center for Sustainable Food Systems at UBC Farm will be providing the location for this product line. The exact location within the farm will depend on what product is being grown, and in what quantity. These products will be grown in and around forested areas and in hedgerows.

Distribution Channels

The medicinal herbs will be sold wholesale to CAM retailers. The UBCF's retail partner is located in Vancouver, so the product can be easily transported to them by car.

Sales Forecast

See Appendix A.

5. Operational Plan

Production

Borage

Borage seed can be planted 2 weeks after the last frost, at a density of 1 pound of seed per acre (1.12 kilograms per hectare) (Agriculture Alberta 2011). Reseeding in following years will be unnecessary. Borage grows well in dense clumps of 25-30 plants per square metre as the plant does not require spacing (Blade *et al* 2002). Strong growth is characteristic of borage and it can grow well in dry conditions, but the crop should be monitored for problems. Weed problems are not anticipated as borage easily outcompetes weeds and borage has no major pests of great concern. The plant will mature and be ready for harvest in late July. Then flowers, seeds, and foliage can be collected. Since foliage is the primary target, the entire plant can simply be collected by using a scythe and sent for drying before being it is accepted by the distributor.

Comfrey

Comfrey is typically grown from root cuttings, but in this case they will be grown from seedling. These should be planted in a grid pattern at a depth of 5 to 10 cm, one meter apart in all directions, to give the plants enough space to grow. Good soil is needed to grow comfrey, and as such the soil should be fertilized and kept enriched with organic matter (Bubel, 1974). seedlings should be planted before September, to give yields the following year. Since comfrey is a fleshy plant, it will need plenty of water, and planting it in a soggy patch will be a benefit (Harrison, 2012). Once the plant reaches 30 to 45 cm in height, the leaves can be harvested. The entire plant is cut off about 15 cm above the ground and the leaves are stripped from the stem. Once the attains this height, it can be cut again (Harrison, 2012). The comfrey can be propagated from the existing plants, it is easy to make root cuttings by pulling up a portion of the center of a plant, and making root cuttings and planting these as you did before (Harrison, 2012). Comfrey will be planted in the south-western part of the UBC Farm, due to the topography leading to wetter soil in this area. Comfrey can also be planted underneath the shade of fruit trees.

It is difficult to source live comfrey root cuttings. The most cost effective way for the UBCF to source root cuttings would be to buy comfrey seedlings, and plant these the first year. Subsequent plants can be grown from root cuttings.

Yarrow

Yarrow can directly sowed in the ground in early spring or early autumn, or when soil temperatures reach 15-18°C, and can take anywhere from 10 to 100 days to sprout. The seeds can also be planted indoors, and should be done eight to ten weeks before transplanting under bright lights. The seedlings should be put into the soil 60cm apart (westcoastseeds.com). Yarrow can survive in a range of soil and climatic conditions, but prefers a loamy, well-drained soil with a pH range of 5.5 to 7.0, and full sunlight (Botanical.com). Once established, Yarrow does not require fertilizing, and only needs watering under severe drought conditions. The plant can be affected by botrytis mold and powdery mildew (Achillea millefolium, 2013). Harvesting should be done when the plant is flowering, from June to September, and both the flowers and the leaves can be dried and sold (westcoastseeds.com). Our retail partner only sells the flowers, so at the start of the operation that will be the main focus. The yarrow plants will be planted in the south-eastern and southern hedgerows on the UBCF.

Location

Due to the nature of this project, it can easily be scaled to fit any location. Depending on the size of land that the UBCF has to allot, different amounts of herbs will be planted. One of the

goals of the agroforestry line at the UBCF is to add functionality to forested areas and hedgerows. The ideal location would be within or along hedgerows and forested areas.

The UBCF is located along major streets, so transporting the medicinal herbs to the retailers would be easy.

The secondary location for this product is the drying facilities, which are located at Totem Field at the University of British Columbia. This location houses the drying ovens, and is located just off a main road, so transport of the plant material to the ovens will be need to be arranged. The UBCF and Totem Field are 2.4 km apart, across major roads.

The tertiary location is a lab for samples to get tested for quality control. This will take place at the UBC Chemistry department Shared Instrument Facility, and the Kevin Allen Research Lab.

Legal Environment

The UBCF is zoned as a farm which will allow the CSFS to produce the intended products on site.

Canada has strict laws regarding alternative medicine products which are outlined in the *Natural Health Product Regulations*. While the product is a medicinal plant, it is unprocessed and does not fall under the definition of a natural health product (Agriculture and Agri-Food Canada 2013). Before the medicinal herbs can be sold to the retail partner, toxicology tests must be performed to ensure that the product falls under safe limits.

Because the UBCF does not have organic certification, it cannot be marketed as “organic”. It would be marketed as sustainably produced. Organic certification, for this product, would be required through the Certified Organic Association of British Columbia (COABC).

Personnel

Seeding, maintenance, and harvesting will be organized and performed by current UBCF employees and UBCF volunteers. Kate Menzies will organize the production of medicinal plants, and oversee all work that needs to be done. An additional agroforestry intern could be hired, for the summer, to help oversee agroforestry projects at UBCF.

Seeding will take only a day and will require minimal labor. Maintenance of the plants will involve mainly visual monitoring of growth rates and presence of pests - any unhealthy plants or visible pests will need to be taken care of. Additional labor and time may be necessary if

unanticipated problems with the crop arise such as issues with climate or pests. Harvesting will require the most labor as the crop will need to be collected, processed, and transported.

Inventory

Inventory which can not be sold to the distributor due to insufficient demand can sold at the UBCF market. All the inventory will be processed and dried before it is sold.

Suppliers

Seeds for borage, comfrey and yarrow can be sourced, locally, at West Costs Seeds and Vancouver Seed Bank.

West Coast Seeds Retail Store

4930A Elliott Street

Ladner, BC V4K 2Y1

or online at: www.westcoastseeds.com

Type of inventory: borage seeds

Credit and delivery policies: no credit, cash in advance only; pick-up is available, or shipping via Canada Post.

Richter's Catalog, online

www.richters.com

Type of inventory: comfrey seedlings

Credit and delivery policies: no credit, cash in advance only; shipping via Canada Post.

American Meadows, online

<http://www.americanmeadows.com/>

Type of inventory: yarrow seeds

Credit and delivery policies: no credit, cash in advance only; shipping via Canada Post.

6. Management and Organization

Kate Menzies will be in charge of managing and implementing this project. Starting in the summer of 2013 there will be an agroforestry intern to look after the day-to-day operations. If Kate is unable to continue managing the product line, someone else on the CSFS board will head the operation.

The UBCF will have to find someone who knows how to test for pesticide and herbicide residue using chromatography to test samples before selling the medicinal plants to the retail partner. Testing will have to be done one time a year and will take about an hour.

7. Startup Expenses and Capitalization

The start-up costs will include: seeds, labor to sow the seeds, fertilizer, labor to monitor the growth of the plants, harvesting, and drying of the products.

Seeds

Borage

The fresh weight yield per hectare is approximately 3500 kilograms (Hafid *et al* 2002) - this translates into 218.75 kg dry weight (Dwivedy *et al* 2012). The retail partner is interested in sourcing 11 kg of borage from the UBCF annually, or 11,000 grams. In order to produce this amount, the UBCF would need to cultivate 520 square meters of borage (Hafid *et al* 2002). This area would need to be planted at a seed density of 4.5 kilograms per acre (1.12 grams per square meter). This would require approximately 580 grams of seeds (Alberta Agriculture 2011). 600 grams of seeds costs \$97.90 from West Coast Seeds.

Comfrey

The dry weight yield of comfrey seen in Oregon was an average of 5 tons per acre (Teynor *et al* 1992) - this is 450 g per square meter. The highest amount that the retail partner would be able to buy from UBCF is 16 kg of comfrey annually, or 16,000 grams. This would require 36.3 square meters of comfrey, planted at a density of 1 plant per square meter. plant seedlings would be needed to cultivate this area. Richters herb Products sells comfrey seedlings for \$1.95 per seedling.

Yarrow

Yarrow can yield 27.2kg dry weight of flowers if planted in .25 acres at rows with 30 cm centers. This amount of planting requires 1 kg of seed, or about 2 lbs (Planning for Profit, 2002). The retail partner is interested in sourcing up to 12 kg of yarrow flowers, or 12,000 grams. The UBCF will need to plant one eighth of an acre, 500 square meters, with the same row width. This would require half a kilogram of seed (500g) to reach the desired demand. We have tried to source seeds from local Pacific Northwest companies but none could match the prices of certain East Coast American seed companies, so the UBCF should purchase 1 lb of white yarrow seeds from American Meadows at a price of \$57 including shipping.

Fertilizer

A nitrogen fertilizer is recommended for comfrey, and the 36 square meters would require about 6.5 pounds (3 kilograms) of fertilizer. Depending on the brand, 3 kg of fertilizer is about \$10.

Drying

Using the drying oven for one day costs 6 dollars for a UBC affiliate (S. Trehearne, personal communication, March 14, 2013). Comfrey, borage, and yarrow typically take about 1 day to fully dry in a drying oven at 121°C (MU Guide, 2006) .

Quality Testing

There are two tests that need to be performed in order to ensure safety of the final medicinal plant products. These are: testing for herbicides and pesticides via gas or column chromatography, and testing for E. coli, coliform, salmonella, yeast and mold via culture analysis (WHO 1998).

Chromatography would be carried out in the Shared Instrument Facility, in the department of Chemistry at UBC. Chromatography costs \$30 dollars an hour for a non-Chemistry UBC department, and typically 5 or 6 samples can be run in an hour (E. Seo, personal communication, March 27, 2013).

The culture analyses would cost \$30-40 per sample through the UBC toxicology labs (K. Allen, personal communication, March 27, 2013).

Labor

The labor required for yarrow is approximately 16 hours for seeding, monitoring, harvesting, in the first year. 22 hours are required for yarrow in subsequent years. (Planning for Profit, 2002). Although figures could not be found for borage and comfrey labor estimates, it is assumed to be similar to the amount of time needed for production of yarrow.

The labor would include: the time it takes to sow the seeds, occasional monitoring throughout the season, harvesting of the crops, transportation to the dryer, transportation of samples to the lab for quality control testing, and transportation to the retailer.

For the purpose of this plan, labor costs are estimated as being 15 dollars per hour.

Someone who knows how to do chromatography will be needed to run pesticide and herbicide tests on these products. Testing should take about 1 hour per year.

Shipping

Shipping costs include the cost of using a car to transport the product and the cost of gas used in transport.

8. Financial Plan

2 year Profit and Loss Projection

The UBCF should not expect to make a profit in the first year of this project. Significant costs will be incurred by the firm in the first year to establish production. Also, Yarrow and Calendula do not produce salable product until their second year of production. The Profit and Loss projection estimates that the projected income from the first year of this project will be, approximately, 180\$.

According to the second year profit and loss projection, the UBCF should expect that their medicinal plant production will be profitable starting in the second year of production. The most that the UBCF should expect to earn from medicinal plants is 2,800\$.

The second year profit and loss projection can be used to model all subsequent years of production after the second year, assuming that:

The demand for medicinal plants from UBCF does not change

The price for Medicinal plants from UBF does not change

The 2 year profit and loss projection can be found in Appendix B.

Projected Cash Flow

The projected cash flow shows when agroforestry product production at UBCF will incur costs, and when it will generate revenue. The projected cash flow can be found in Appendix C.

Break-Even Analysis

The purpose of the break even analysis is to determine the amount of unites that would have to be produced to cover the costs of production, and to determine the price that at which the product would have to be sold at to meet the costs of production.

The price used to determine the break even quantity was assumed to be 70% of the retail partner's retail price for these herbs. A list of these prices can be found in the pricing section

The Quantity used to determine the break-even price is the amount requested from the retail partner. That amount is listed in the section startup costs and capitalization

Break-Even Analysis

	Total Fixed Costs	Total Variable Costs	Selling Price	Break-Even Units	Break-Even Price
	\$CAD	\$CAD	\$CAD per kg	kg	\$CAD per kg
Yarrow	66	32.25	106.66	0.89	37.75
Borage	66	38.9	76.19	1.77	44.9
Comfrey	66	26.02	101.57	0.87	30.15

The break even analysis shows that the UBCF can produce less than the estimated quantity, or sell their product for less than the estimated price, and still make a profit. This indicates that the UBCF has a fair amount of flexibility in terms of how much they produce and how they market their product.

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Twelve-month profit and loss projection

	IND. %	Apr-14	% B/A	May-14	%	Jun-14	%	Jul-14	%	Aug-14	%	Sep-14	%	Oct-14	%	Nov-14	%	Dec-14	%	Jan-15	%	Feb-15	%	Mar-15	%	YEARLY	%		
Revenue (Sales)																													
Borage		0	0.0	0	0.0	0	0.0	838	34.6	0	0.0	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	838	22.4
Comfrey		405	100.0	305	100.0	305	100.0	305	12.6	305	100.0	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	1,626	43.4
Yarrow		0	0.0	0	0.0	0	0.0	1,280	52.8	0	0.0	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	1,280	34.2
Total Revenue (Sales)		405	100.0	305	100.0	305	100.0	2,423	100.0	305	100.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3,744	100.0
Cost of Sales (Seeds)																													
Borage		0	-	0	-	0	-	0	0.0	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	0.0
Comfrey		0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	0.0
Yarrow		0	-	0	-	0	-	0	0.0	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	0.0
Total Cost of Sales		0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	0.0
Gross Profit		405	100.0	305	100.0	305	100.0	2,423	100.0	305	100.0	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	3,744	100.0
Expenses																													
Salary expenses		90	22.2	90	29.5	90	29.5	150	6.2	90	29.5	30	-	30	-	30	-	30	-	30	-	30	-	30	-	30	-	720	19.2
Drying		6	1.5	6	2.0	6	2.0	18	0.7	6	2.0	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	42	1.1
Pathogen Testing		0	0.0	0	0.0	0	0.0	40	1.7	0	0.0	40	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	80	2.1
Chromatography		0	0.0	0	0.0	0	0.0	20	0.8	0	0.0	10	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	30	0.8
Transportation		0	0.0	0	0.0	0	0.0	10	0.4	0	0.0	10	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	20	0.5
Total Expenses		96	23.6	96	31.5	96	31.5	238	9.8	96	31.5	90	-	30	-	30	-	30	-	30	-	30	-	30	-	30	-	892	23.8
Net Profit		310	76.4	209	68.5	209	68.5	2,185	90.2	209	68.5	-90	-	-30	-	-30	-	-30	-	-30	-	-30	-	-30	-	-30	-	2,852	76.2

Twelve-month profit and loss projection

Agrostrestry at UECF

Fiscal Year Begins

Apr-13

	IND. %	Apr-13	% B/A	May-13	%	Jun-13	%	Jul-13	%	Aug-13	%	Sep-13	%	Oct-13	%	Nov-13	%	Dec-13	%	Jan-14	%	Feb-14	%	Mar-14	%	YEARLY	%		
Revenue (Sales)																													
Borage		0	-	0	-	0	-	838	100.0	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	838	100.0
Comfrey		0	-	0	-	0	-	0	0.0	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	0.0
Yarrow		0	-	0	-	0	-	0	0.0	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	0.0
Total Revenue (Sales)		0	0.0	0	0.0	0	0.0	838	100.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	838	100.0
Cost of Sales (Seeds)																													
Borage		97	-	0	-	0	-	0	0.0	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	0.0
Comfrey		70	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-
Yarrow		57	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-
Total Cost of Sales		224	-	0	-	0	-	0	0.0	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	224	26.7
Gross Profit		-224	-	0	-	0	-	838	100.0	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	614	73.3
Expenses																													
Salary expenses		90	-	30	-	30	-	30	3.6	30	-	30	-	30	-	30	-	30	-	30	-	30	-	30	-	30	-	420	50.1
Drying		0	-	0	-	0	-	6	0.7	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	6	0.7
Pathogen Testing		0	-	0	-	0	-	40	4.8	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	40	4.8
Chromatography		0	-	0	-	0	-	10	1.2	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	10	1.2
Transportation		0	-	0	-	0	-	10	1.2	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	10	1.2
Total Expenses		90	-	30	-	30	-	96	11.5	30	-	30	-	30	-	30	-	30	-	30	-	30	-	30	-	30	-	486	58.0
Net Profit		-314	-	-30	-	-30	-	742	88.5	-30	-	-30	-	-30	-	-30	-	-30	-	-30	-	-30	-	-30	-	-30	-	128	15.3

Appendix C

CSFS at UBCF

March 23, 2013

	PRE-STARTUP
1. Cash On Hand	
[Beginning of month]	
2. Cash Receipts	
(a) Cash Sales	
3. Total Cash Receipts	
	\$0.00
4. Total Cash Available	
	\$0.00
5. Cash Paid Out	
(a) Gross Wages (Labor at \$15/hr)	
(b) Supplies (Fertilizer)	
(c) Delivery Costs	
(d) Purchases (Seed Costs)	
(e) Drying, Testing (Toxicity and Pesticides)	
(r) Subtotal	\$0.00
7. Cash Position	
	\$0.00

2014 Projected Monthly Cash Flow Column1

CSFS at UBCF

March 23, 2013

	PRE-STARTUP
1. Cash On Hand	
[Beginning of month]	
2. Cash Receipts	
(a) Cash Sales	
3. Total Cash Receipts	
	\$0.00
4. Total Cash Available	
	\$0.00
5. Cash Paid Out	
(a) Gross Wages (Labor at \$15/hr)	
(b) Supplies (Fertilizer)	
(c) Delivery Costs	
(d) Purchases (Seed Costs)	
(e) Drying, Testing (Toxicity and Pesticides)	
(r) Subtotal	\$0.00
7. Cash Position	
	\$0.00

2014 Projected Monthly

March MONTH 1	April MONTH 2	May MONTH 3	June MONTH 4	July MONTH 5
\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
\$10.00	\$60.00	\$450.00	\$225.00	\$30.00
\$225.10				\$6.00
\$235.10	\$60.00	\$450.00	\$225.00	\$36.00
-\$235.10	-\$295.10	-\$745.10	-\$970.10	-\$1,006.10

Column2	Column3	Column4	Column5	Column6
March MONTH 1	April MONTH 2	May MONTH 3	June MONTH 4	July MONTH 5
\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
\$10.00	\$60.00	\$450.00	\$225.00	\$30.00
\$225.10				\$6.00
\$235.10	\$60.00	\$450.00	\$225.00	\$36.00
-\$235.10	-\$295.10	-\$745.10	-\$970.10	-\$1,006.10

Cash Flow

August MONTH 6	Sept MONTH 7	Oct MONTH 8	November MONTH 9	December MONTH 10
\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
	\$4,325.00			
\$0.00	\$4,325.00	\$0.00	\$0.00	\$0.00
\$0.00	\$4,325.00	\$4,325.00	\$4,325.00	\$4,325.00
\$120.00	\$120.00			
	\$20.00			
\$6.00	\$150.00			
\$126.00	\$290.00	\$0.00	\$0.00	\$0.00
-\$1,132.10	\$2,902.90	\$2,902.90	\$2,902.90	\$2,902.90

Column7	Column8	Column9	Column10	Column11
August MONTH 6	Sept MONTH 7	Oct MONTH 8	November MONTH 9	December MONTH 10
\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
	\$4,325.00			
\$0.00	\$4,325.00	\$0.00	\$0.00	\$0.00
\$0.00	\$4,325.00	\$4,325.00	\$4,325.00	\$4,325.00
\$120.00	\$120.00			
	\$20.00			
\$6.00	\$150.00			
\$126.00	\$290.00	\$0.00	\$0.00	\$0.00
-\$1,132.10	\$2,902.90	\$2,902.90	\$2,902.90	\$2,902.90

January MONTH 11	February MONTH 12	TOTAL
\$0.00	\$0.00	
		\$4,325.00
\$0.00	\$0.00	#REF!
\$4,325.00	\$4,325.00	\$4,325.00
		\$1,005.00
		\$10.00
		\$20.00
		\$225.10
		\$162.00
\$0.00	\$0.00	#REF!
\$2,902.90	\$2,902.90	\$2,902.90

Column12	Column13	Column14
January MONTH 11	February MONTH 12	TOTAL
\$0.00	\$0.00	
		\$4,325.00
\$0.00	\$0.00	#REF!
\$4,325.00	\$4,325.00	\$4,325.00
		\$1,005.00
		\$10.00
		\$20.00
		\$225.10
		\$162.00
\$0.00	\$0.00	#REF!
\$2,902.90	\$2,902.90	\$2,902.90

Appendix B