

COVER PAGE

PROJECT INFORMATION

Please complete the fields below with information regarding your project.

Project Title Heating system for season extension greenhouse (SP0249)

Brief Description Purchase and installation of a propane heating system in season extension greenhouse (SP0249) and Horticulture Center plant production greenhouse

Total Estimated Project Budget \$53,000 **Amount Requested from SPF** \$53,000

Campus(es) Impacted Downtown Macdonald Gault Nature Reserve Other _____

CONTACT INFORMATION

Project Leader

This person must be a current McGill University student, administrative staff, or academic staff.

Name	<u>Michael Bleho</u>	Affiliation	<u>Administrative Staff</u>
Phone	<u>5147122776</u>	Faculty/Unit/Organization	<u>Mac Farm</u>
Email	<u>michael.bleho@mcgill.ca</u>	Campus	<u>Macdonald</u>

Project Team Members

The SPF encourages you to be inclusive, collaborative (especially between staff and students), diverse, and interdisciplinary when possible. To list more members, please complete a second cover page. You may email it to [SPF Staff](#) to include with your application.

Name	<u>David Wees</u>	Affiliation	<u>Academic Staff</u>
Email	<u>david.wees@mcgill.ca</u>	Faculty/Unit/Organization	<u>FAES, FMT Program</u>
Name	<u>Mark Lefsrud</u>	Affiliation	<u>Academic Staff</u>
Email	<u>mark.lefsrud@mcgill.ca</u>	Faculty/Unit/Organization	<u>FAES, Bioresource Eng.</u>
Name	<u>Oliver De Volpi</u>	Affiliation	<u>Administrative Staff</u>
Email	<u>oliver.devolpi@mcgill.ca</u>	Faculty/Unit/Organization	<u>SHHS</u>
Name	<u>Gail MacInnis</u>	Affiliation	<u>Postgraduate</u>
Email	<u>gail.macinnis@mail.mcgill.</u>	Faculty/Unit/Organization	<u>Alumnus</u>
Name	_____	Affiliation	<u>Choose one.</u>
Email	_____	Faculty/Unit/Organization	_____

SUBMISSION INFORMATION

In line with the [SPF Eligibility Criteria](#), our team certifies that this project takes place at [McGill University](#), is sustainability focused, is requesting seed funding, and is action oriented. Yes No

Our team has read the [SPF Terms & Conditions](#) and agrees to respect them. Yes No

Our team understands that this application is not confidential and consents to have its contents shared with relevant stakeholders during the review process and, if approved, on the SPF website. Yes No

Our team agrees to have [their contact information](#) included in the complete and shared application and, if approved, on the SPF website. Yes No

PART 1: PROJECT OVERVIEW

Instructions: Please answer the questions below as clearly and concisely as possible. You will be able to detail your project further in Part 2 of the Over \$5,000 application process, the Project Plan, as well as submit relevant appendices. Once you have completed this Project Overview, save it and submit it online. SPF Staff will respond with feedback on your application within two weeks and send you Part 2. Once all sections are complete, the combined application will be provided to the SPF Governance Council for their review and decision. As a reminder, all SPF applications are assessed using the [SPF Eligibility & Evaluation Criteria](#):

ELIGIBILITY CRITERIA		EVALUATION CRITERIA		
AT MCGILL	SUSTAINABILITY FOCUSED	ANALYSIS	IMPACT	FEASIBILITY
SEED FUNDING	ACTION ORIENTED	COLLABORATION	SUPPORT	CAPACITY BUILDING

Before starting, you may find it helpful to consult the [SPF Sustainability Brief](#) and the [Climate & Sustainability Strategy 2020-2025](#).

CONTEXT

Criteria assessed in this section: **SUSTAINABILITY FOCUSED, ANALYSIS**

- 1. What specific sustainability-related need/issue have you identified at McGill and aim to address through your project? In your response, please describe clearly how the need/issue is related to sustainability.**

Note: Please wait to detail your project idea in response to Question 5. Limit ~100 words

McGill's residences and dining halls prepare around 10,000 meals per day when in full operation. Over the past 10 years Mac Farm has become one of the principle producers of in season fruits and vegetables for SHHS. This has increased McGill's local food sourcing, reducing its carbon footprint and contributed to a circular local economy that allows its farms to stay viable while offering employment to students and providing services as well as learning and research opportunities to students and staff. Putting in place these heating systems in our greenhouses will allow the Mac farm to continue to produce food for this initiative for many years to come.

- 2. How do you know this is a need/issue? What research have you done (e.g. consultation, observation, survey)?**

Limit ~100 words

McGill's SHHS has identified local sourcing of its food needs as a sustainability objective; this project meets that need. McGill students appreciate the fact that the food they eat in our cafeterias is grown at McGill farms in a sustainable way. The project presently pays out roughly 5,000 hours of wages to our students during production and harvesting periods helping our students meet their financial needs. The Raymond greenhouses are extensively used for student projects and research, but will be torn down and renovated in March '21. This will impact many student projects that usually require greenhouse space (eg. MSEG). Our SPF request would put us in a position to help these student groups where possible.

- 3. What relevant information and/or best practices have you found that relate to this need/issue? In addition to information from external sources, detail any relevant related initiatives (past or current) that you are aware of at McGill.** *Limit ~100 words*

There is an underlying systemic need for a local, sustainable and high quality food supply at McGill and our project works towards meeting this need. Much of the food produced by this project will be consumed by McGill students and staff at various outlets across the University. We are open to supplying any food retailer on any of the McGill Campuses

- 4. What expertise or qualifications does your team have regarding this need/issue, if any?** *Limit ~100 words*

Our multi-disciplinary team is made up of horticultural, technical and academic (teaching and research) people, agricultural engineers, student researchers and the chefs at McGill. The team has all the expertise to plan, build, grow, harvest, cook, teach and research.

PROJECT IDEA

Criteria assessed in this section: **ALL ELIGIBILITY & EVALUATION CRITERIA**

5. In context of the sustainability-related need/issue that you previously identified, what is your project idea? Please describe the idea thoroughly and concisely. In your response, share how your project is new or how it is complementary to existing initiatives. *Limit ~400 words*

This project would complete the original SP0249 project vision that was put in place in 2020. The original Big Wave request included a heating system for the greenhouse, which was ultimately removed from the application due to the timeline, sourcing problems with bio mass furnaces abilities to meet city of Montreal particulate emission targets, and factors beyond our control (ie. Covid). In order to use the greenhouses for food and plant production out of season, a heating system is essential. Once installed, the greenhouse will be usable for food production in fall and early spring. All food produced will be used by the "McGill feeding McGill" initiative. We are also proposing to install a heating system in one of our smaller greenhouses that we use exclusively to produce the transplants that we grow for our field production (also for McGill feeding McGill). Presently the heating system in that greenhouse is inadequate to produce quality transplants (rundown and requires major upgrading to be functional), installation of a new heating system would ensure present transplant production and also allow for any expansion in upcoming years. We have done extensive research on various heating systems for our greenhouses and the major problem with the carbon neutral heating systems (Geothermal and Electric) is that the Hort Center presently does not have enough available hydro electric capacity to operate these systems. We have had many discussions with Facilities management at Mac and a request for more power at the Hort Center has been put in place but will take many years to complete. Please see the attached letter from Dr. Mark Lefsrud for a detailed explanation of other renewable energy heating options and our reasons for selecting propane furnaces. For the above reasons we are proposing to install two propane heating systems (with CO2 capture and storage technology) which would ensure that the greenhouses are fully functional in a cost effective manner for years to come. SP0249 and this project address issues of food security in a changing climate, reduction of environmental impacts of food production as well as the education of students, staff and the general public.

6. Is your project related to the University's [Climate & Sustainability Strategy 2020-2025](#)? Yes No
7. If you answered yes to Question 6, how does it relate? Please refer to the strategy category or related action in your response. If your project relates to either transversal theme from the Strategy (Climate Change Mitigation & Adaptation and/or Equity, Diversity & Inclusion), please elaborate. *Limit ~100 words*

The project relates to many of the categories of McGill's vision 2020, most specifically operations (food, water, land), connectivity (wellness+health, community engagement), education (experiential learning) and research (interdisciplinary, ecological footprint). Our project also directly relates to the new Climate and Sustainability Strategy; food systems category.

TRANSFORMING CAMPUS

Criteria assessed in this section: **AT MCGILL, IMPACT**

8. In the table below, describe your proposed project's 2-5 main impacts on the McGill community or its main goals to accomplish. Please check the stakeholders that will be impacted. Finally, list at least one key success indicator

for each impact (e.g. # people will be engaged, % waste will be diverted, # buildings certified, etc.). Note: Indicate a realistic target for each success indicator (e.g., rather than “# people engaged,” include a target such as “50 people engaged”).

Main Impacts/Goals		McGill Stakeholders Impacted (check all that apply)	Key Success Indicator(s)
REQUIRED	1 More sustainable food production using less pesticides	<input checked="" type="checkbox"/> Undergraduate <input checked="" type="checkbox"/> Academic Staff <input checked="" type="checkbox"/> Postgraduate <input checked="" type="checkbox"/> Admin. Staff <input checked="" type="checkbox"/> Alumni	Monitor pesticide usage
	2 Increasing out of season production	<input checked="" type="checkbox"/> Undergraduate <input checked="" type="checkbox"/> Academic Staff <input checked="" type="checkbox"/> Postgraduate <input checked="" type="checkbox"/> Admin. Staff <input checked="" type="checkbox"/> Alumni	Out of season deliverables eg: kgs of vegetables harvested after mid October
OPTIONAL	3 Maintaining consistent food production despite changing climate	<input checked="" type="checkbox"/> Undergraduate <input checked="" type="checkbox"/> Academic Staff <input checked="" type="checkbox"/> Postgraduate <input checked="" type="checkbox"/> Admin. Staff <input checked="" type="checkbox"/> Alumni	Quantities produced and delivered to our partners at SHHS
	4 Teaching students and the general public about out of season food production	<input checked="" type="checkbox"/> Undergraduate <input checked="" type="checkbox"/> Academic Staff <input checked="" type="checkbox"/> Postgraduate <input checked="" type="checkbox"/> Admin. Staff <input checked="" type="checkbox"/> Alumni	Numbers of students, classes and visitors
	5 Increasing research opportunities for students and staff eg: sustainability of winter vegetable prod	<input checked="" type="checkbox"/> Undergraduate <input checked="" type="checkbox"/> Academic Staff <input checked="" type="checkbox"/> Postgraduate <input type="checkbox"/> Admin. Staff <input type="checkbox"/> Alumni	Numbers of researchers and projects

9. Have you considered implementing your project at more than one McGill campus? (e.g. If your project is downtown, could it be implemented at Macdonald Campus as well?)

Yes No

10. If relevant, please describe your choice of campus(es) and why this choice is best for your project. *Limit ~150 words*

Presently all food production facilities managed by Mac farm are located on the Macdonald Campus as we already have the necessary expertise, infrastructure and space. We can see certain advantages of building a greenhouse such as this on the downtown Campus but feasibility would have to be explored.

To complete the application process, please submit this form on the SPF website. The SPF Staff will be in touch regarding your application within two weeks and will send you Part 2 for the Over \$5,000 application process, the Project Plan.

STAKEHOLDER ENGAGEMENT

Criteria assessed in this section: **AT MCGILL, COLLABORATION, SUPPORT, CAPACITY BUILDING**

4. Please list all of the key stakeholders involved in your project, indicating their role and support. If the stakeholder has provided a support letter, please indicate so here and attach it as an appendix document.

Note: Projects involving modifying a space on campus, making a permanent installation, hiring a full-time staff, or adding/modifying a garden, etc., must seek permission from the appropriate stakeholder(s) (e.g. building director, Campus Planning and Development office, staff supervisor, etc.). SPF Staff can help you assess if any key stakeholders need to be added to your list.

Stakeholder's Name(s)	Title	Role in the Project	Support/Permission	Support Letter
Paul Meldrum	Mac Farm	Mac Farm administration	Confirmed support	N/A
Oliver De Volpi	Executive chef	Planning crops and	Confirmed	No
Anja Geitman	Dean FAES	Outreach and promotion	Confirmed	Yes
David Wees	Prof. FMT	Coordinating educational	Confirmed	No
Mark Lefsrud	Prof.Ag.eng	energy specialist	Confirmed	Yes
MCSS	Student	Student representatives	Confirmed	Yes
Gail McInnis	Alumnus &	Advice on native pollinators	Confirmed	No
			Choose one.	Choose one.
			Choose one.	Choose one.
			Choose one.	Choose one.

5. How will you communicate about your project and share its impacts with your stakeholders and the McGill community? Please describe your tactics (e.g. social media, workshops, tabling, newsletters, etc.) and any related timing (e.g. at the beginning, during, or after the project). Related activities can also be included in Question 1. *Limit ~200 Words*

The furnace installation will be added to our greenhouse installation video.
Educational tours will be provided by our team members to community and student groups and University colleagues to promote the facilities available for teaching and research purposes at the Hort Center.

6. If applicable, are there any training, volunteer opportunities, jobs, or complementary applied student research integrated in your project? Please describe. *Limit ~100 Words*

The greenhouse will become a training site for Horticultural students in FMT courses and provide opportunity for student harvesting jobs throughout most of the academic year.
The farm hosts several student stagieres for weeks during the season.
There is some interest in applied research related to CO2 capture and storage in small scale fossil fuel systems.
Since the Raymond greenhouses will be torn down this March (2021) we would be in a position to provide limited greenhouse space to student projects (eg: MSEG)

APPENDIX

Relevant Support Documents

List any appendix documents in order in the table, below.

Please keep the total number of pages as low as possible (recommended max 10). Please include any relevant support letters.

Doc #	Appendix Document Title	# of Pages
1	Support letter from Dean Anja Geitmann FAES	1
2	Support letter from Oliver De Volpi SHHS McGill	1
3	Support letter from MCSS (Mac Campus)	1
4	Letter outlining propane furnace selection process	2
5		
6		
7		
8		
9		
10	Staff Position Information Appendix, if applicable	



McGill

**Faculty of Agricultural
and Environmental Sciences**

McGill University
Macdonald Campus

Department of Bioresource Engineering
Tel.: (514) 398-7773

**Faculté des sciences de
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21,111 Lakeshore
Ste-Anne-de-Bellevue
Québec, Canada H9X 3V9

January 9, 2021

RE: MCGILL SUSTAINABILITY FUND

Dear McGill Sustainability Fund Committee,

I am writing this letter in support of the Macdonald Market Greenhouse project and to provide justification for the proposed heating system. When this was first envisioned, we wanted to equip the greenhouse with a low carbon heating system. Our initial goal was to use a wood pellet biomass furnace, with exhaust gas from the chimney acting as a carbon dioxide source for plants in the greenhouse. After discussion with the municipality of Sainte-Anne-de-Bellevue regarding their new bylaw on wood heating systems, we came to understand that the city would not be willing to approve our custom-built system, as they require an EPA-certified unit to meet the bylaw and no exceptions would be granted. As a result, we investigated other heating systems. Many proved unfeasible or had too high of a carbon footprint to be considered for the project. For example, solar and wind electrical systems have a higher carbon footprint when compared to hydroelectric power produced in Quebec, and they are a more costly means of electrical generation than hydroelectric power.

Each of our final listed heating systems, propane, direct electrical and geothermal, has benefits and challenges. A propane heating system is the cheapest, uses the least amount of electricity, and is the fastest to install, yet it is the highest carbon-emitting system in the list. A second benefit of the propane heating system is that it is inexpensive to operate and can be used as a supplemental/back-up heating system if another heating system is added to the greenhouse. We plan to use some of the requested funds to design a catalytic exhaust gas recovery system (with sensors and controls) that allow for carbon dioxide enrichment in the greenhouse, as this does not exist in the current system and it will be custom-built for this project.

A direct electrical heating system is slightly more expensive than a propane system, has a lower carbon footprint than propane, and is easy to install. However, we currently do not have enough power available at the greenhouse to allow installation of such a system. Requesting more power to the greenhouse is beyond the scope of this request, but it is needed and would greatly benefit this project.

Geothermal heating system represents the most cutting edge technology on all investigated heating systems. There are only a limited number of these heating systems present in Quebec for greenhouses, and our proposal comprises an open column system, which, to our knowledge, does not yet exist in our province for greenhouses. The electrical demand for this system is high, representing approximately one third of the power needed for direct electrical heating, and again, is not currently available at the greenhouse. Nevertheless, geothermal heating appears to hold the greatest potential for this project. It has the lowest carbon footprint of all of the possible heating systems, it represents an excellent opportunity to showcase and attract innovation in agriculture at McGill's Macdonald Campus, and it will result in significant educational (tours for *BREE 314 Agri-food Buildings* and *BREE 327 Bio-environmental Engineering*) and research benefits. For example, a carbon footprint comparison of the above mentioned heating system is planned by a recent hire (Dr. Goldstein,



McGill

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Department of Bioresource Engineering) if the system is installed. While the cost of a geothermal heating system is higher than the other systems, subsidies are available from Hydro Quebec to reduce cost.

We have carefully considered all feasible heating systems, and while geothermal heating represents our most viable option, the lack of power at the McGill Horticultural Research Centre needs to be addressed. Our second ranked system, the electrical heating system, also needs more power. If this is achievable, I firmly believe that it would best serve a geothermal system, while simultaneously aligning with McGill's aim to reduce its carbon footprint and demonstrating advancement and much needed modernization at Macdonald campus. To be operational this spring, the only available and feasible option is propane heating. If we are successful in obtaining the necessary power required for the Horticultural Research Centre, we propose the subsequent installation of a geothermal heating system, using the propane system as an emergency back-up heating system for temperatures below -25°C , or if CO_2 enrichment of the greenhouse is required during plant growth. In doing so, it provides the setup needed for a carbon dioxide enrichment system, while enabling the development of a carbon footprint calculator. Importantly, this plan will allow for maximized plant production, while serving as an education tool and exhibition of our capability during tours.

Thank you in advance for your careful consideration of these options and system requirements, and please feel free to contact me if you have any further questions.

Sincerely,

Mark Lefsrud, PhD, P.Eng, P.Ag.
Associate Professor and William Dawson Scholar
QAQCC Director
21,111 Lakeshore, Ste-Anne-de-Bellevue, QC, H9X 3V9
514 398 7976; mark.lefsrud@mcgill.ca



February 19, 2020

McGill Office of Sustainability
Sustainability Projects Fund (SPF)
c/o tanner.zekonic@mcgill.ca

Dear members of the SPF review committee,

I fully support the application for the Season Extension Technology for the Horticulture Center at Macdonald Campus. The additional high tunnel and greenhouse will enhance our capability to produce food locally for the McGill Feeding McGill initiative, with the added benefit of providing hands-on teaching opportunities for courses in Plant Science, Agronomy, Food Science, and Farm Management and Technology, while offering part-time employment to students in all programs. This project will also serve as demonstration of sustainable methods to extend the growing season and reduce the use of pesticides in fruit and vegetable production. The installation of these new facilities will complement the existing high tunnel and two greenhouses and will respect the intent of the master plan for Macdonald Campus.

I would encourage the SPF to accept the Season Extension Technology project, and look forward to seeing the many benefits that will result for years to come.

Sincerely,


Anja Geitmann



Macdonald Campus Students' Society
Tel: (514) 398-8787
Centennial Centre, 21,111 Rue Lakeshore
Sainte-Anne-de-Bellevue, QC, H9X 3L9

To: Tanner Zekonic, SPF Council

From: Mary Bergen, MCSS President (president.mcass@mail.mcgill.ca)

Keel Scruton, VP Finance (finance.mcass@mail.mcgill.ca)

Letter of Support for the SPF Horticultural Project

The MCSS Executives have read and acknowledges the Big Wave SPF Application (titled: Season-extension technology to meet the need for local food) from Michael Belho. We believe that this project will be of great benefit to the sustainability of our horticultural operations and food security. On top of that, this project will be an avenue for increased collaboration and connectivity between campuses and provide opportunities for growth and learning for multiple stakeholders at the Macdonald Campus.

The MCSS would like to express our full support for the project.

All the best,

The MCSS Executives



January 27, 2020

McGill Sustainability Project Fund
RE: project McGill Feeding McGill
Season-Extension Technology to Meet the Need for Local Food (20-462)

Dear member of the SPF working group,

Student Housing and Hospitality Service has been working with MacDonald Campus Horticulture and Animal Science department on the project McGill Feeding McGill for 10 years and I believe nothing has given us as much recognition as this project. Student are thrilled to be eating the best produce available and parents are impressed that much of this seasonal produce comes from our own MacDonald Campus. McGill Food and Dining Service has been recognized for their sustainability initiative with awards from the Canadian College and University Food Service Association (CCUFSA) and the National Association of College and University Food Service (NACUFS) as well as a Green Business Award and all of them having to do with McGill Feeding McGill.

We have actually institutionalized in our contracts with outside food providers the purchase of Mac Produce. Our main food provider must purchase a minimum amounts of produce from the Mac Market (18,000\$ next year / approximately 15,000lbs). Our Self operated units purchased 34,000\$ or approximately 30,000lbs.

McGill food service is purchasing close to our maximum amount for the short season that we have these amazing products available (8 weeks), from the end of August to October 15ish and the opportunity to extend this season by as little as 3 weeks could increase our purchasing by more than 20%

Should you need addition information, please do not hesitate to contact me.

Oliver de Volpi

Executive Chef, Operations and Sustainability – Chef exécutif, opérations et développement durable
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