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THE CANADIAN AGRICULTURE AND AGRI-FOOD MICRO-CREDENTIAL LANDSCAPE

UNIVERSITY OF THE FRASER VALLEY
FOOD AND AGRICULTURE INSTITUTE

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ACKNOWLEDGEMENTS

The Food and Agriculture Institute at the University of the Fraser Valley is situated on the sacred lands of the Stó:lō peoples. The Stó:lō have an intrinsic relationship with S'ólh Tém:éxw (Our Sacred Land), and we express our gratitude and respect for the honour of living and working in this territory.

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EXECUTIVE SUMMARY

The skills required for participation within Canada's robust agriculture and agri-food workforce are rapidly changing. Emerging technologies and increasing interest in (as well as demand for) sustainable agri-food production and processing require new training materials that are flexible, practical, and accessible for a variety of learners.

Post-secondary institutions across Canada and the world are developing micro-credentials to satisfy this demand. Micro-credentials can support a broad range of trainings, from in-depth exploration of popular software programs to highly tailored technical skills. Importantly, successful completion of a micro-credential is (as it says it is) *credentialed*, meaning its receipt provides a verifiable signal of competence and proficiency for industry and prospective employers.

In this work, the researcher reviewed the current agriculture and agri-food micro-credential offerings currently available across Canada. The researcher examined the most common micro-credential programs (i.e. suites of certifiable courses under a single program 'theme'), course topics, as well as the cost and delivery method for each, using publicly available website data. This was with the goal to define the organization and potential administration of agriculture and agri-food micro-credentials to be offered at the University of the Fraser Valley.

Key Findings

1) Most micro-credential programs provide training in agronomy and agriculture technology, with fewer materials designed for fisheries, food manufacturing/processing, or urban agriculture and alternative food systems.

2) The majority of single credentialed courses are delivered asynchronous and online, costing between $200-300 for each course, and with each program typically comprised of three to four courses. Nearly all micro-credential programs offer a digital badge upon their successful completion.

3) Industry engagement is an increasingly key component for micro-credential design and administration.

These findings suggest that the University of the Fraser Valley's efforts to develop urban agriculture and agri-tech micro-credentials are in-line with current demand, and will satisfy a gap that bridges urban agriculture and technology innovations. Micro-credential course offerings should fall roughly within the same cost, time constraints, be delivered online, and should be clearly and transparently designed through industry engagement to be competitive in the current landscape.

1. INTRODUCTION

The nature of work in the agriculture and agri-food sector is rapidly changing. Currently, the Canadian agricultural sector employs approximately 2.3 million individuals, from on-farm production through to retailing (Government of Canada, 2024). Agriculture is a vital contributor to employment at a national scale. Yet, the skills required to participate in this sector are rapidly developing. Farmers and owner-operators now spend more time off their fields, managing multi-million-dollar operations, equipment, and logistics (Stackhouse, 2019). Emerging technologies, from suites of digital tools, autonomous machines, and decision-support software, to emerging biotechnology and controlled environment growing systems present new opportunities for sustainable and efficient production (Herrero et al., 2021). However, they require a substantially different set of skills to be used and implemented, from coding, engineering, and bioengineering, to spatial science and data science.

Canada has a robust set of post-secondary institutions that support applied and research-intensive agricultural learning. Universities such as the University of Guelph and the University of the Fraser Valley host a broad suite of plant science, environmental science, agri-business, and agricultural economics research as well as teaching. Colleges such as Olds College and Lakeland College provide robust hands-on learning and workforce development opportunities. Student enrollment in agricultural programs has continued to grow over the past decade (Figure 1), though enrollments are spread unevenly across the country, favouring Ontario and British Columbia (StatsCan, 2023).

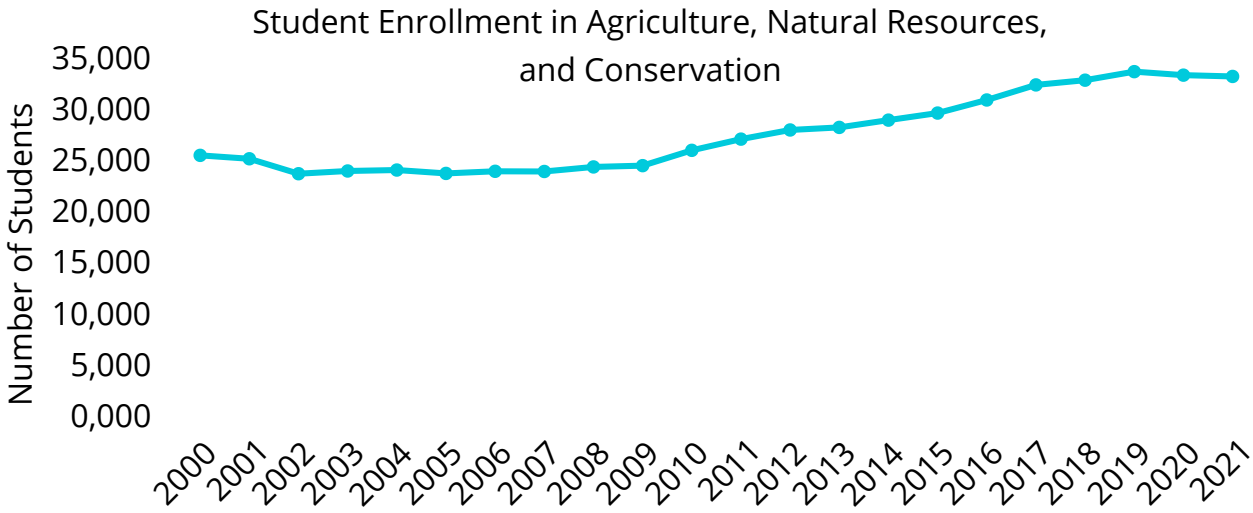

Figure 1. Student enrollments in agriculture-related post secondary programs have increased over the past two decades (StatsCan, 2023).

There is a need for agricultural training and retraining programs as well as tools to adapt to new realities brought forth by the fourth agricultural revolution (RBC, 2023). Training materials should be flexible and adaptable to accommodate for individuals who are students interested in agriculture, or who are already working agriculture professionals interested in upskilling opportunities. They should also directly interface with and explore emerging agricultural technologies and tools. Finally, training materials should incorporate a broad suite of considerations related to how to responsibly and sustainably integrate emerging technologies into food systems (see Julseth-White & Glaros, 2024).

The Food and Agriculture Institute at the University of the Fraser Valley is exploring possible models and developing learning tools for stackable micro-credentials – short courses and modules that support flexible and training and retraining for the agricultural sector. Micro-credentials are an increasingly leveraged resource for post-secondary institutions to attract additional enrollment while simultaneously exposing students to in-demand skills building opportunities. Stackable micro-credentials ladder into existing credentials and accreditation systems at post-secondary institutions, paving the way for the future pursuit of and/or wrapping up existing efforts to complete degrees or diplomas. This first phase of micro-credential work involves exploring possible models for the development of an urban agriculture-themed micro-credential to train students on emerging local food technologies and planning considerations.

There are two objectives to this work:

1) To assess the landscape of current agriculture and agri-food related micro-credentials across Canada.

2) To identify key topics, ideas, and considerations for future micro-credential program design by the Food and Agriculture Institute at the University of the Fraser Valley.

2. WHY MICRO-CREDENTIALS?

Micro-credentials are a rapidly emerging strategy for post-secondary institutions to enable additional enrollments and respond to industry needs (Toronto Metropolitan University, 2021). Important to the development of micro-credentials are trust, value, and exchange – that the recipient and possible employers recognize and trust the value of the certification, and that they are certifiable and easily transferred across and among institutions (e-campus Ontario, 2021).

For the agricultural sector, micro-credentials are potentially a particularly useful learning strategy given the highly time-intensive nature of the work, that the technologies used in the industry are rapidly developing and being adopted, and due to existing skills gaps observed across the sector (see Stackhouse, 2019). Farmers across the country are increasingly using novel technologies for more efficient and sustainable on-farm production (Figure 2). Training materials to scale technology adoption and to support current producers, extension agents, and farmer associations access additional skills are urgently required.

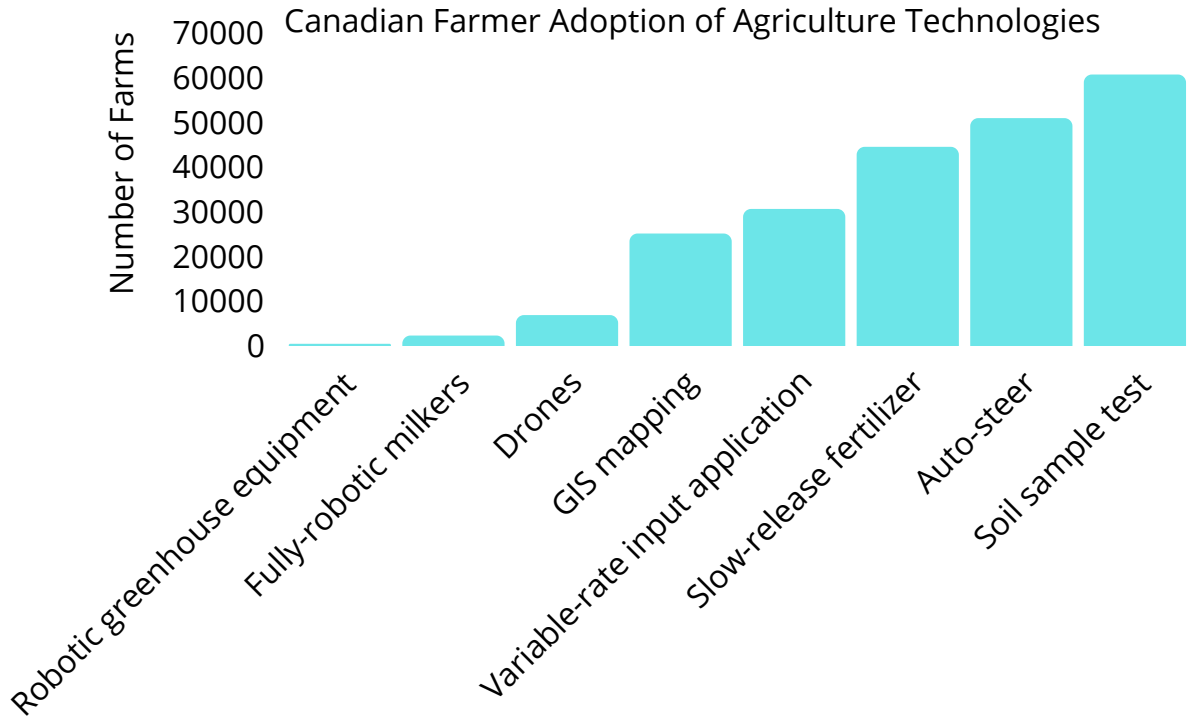

Figure 2. Farmer adoption of technologies from the 2021 agriculture census (StatsCan, 2023).

The University of the Fraser Valley is already equipped with a strong and well-established agricultural department, offering degree programs and certifications. A micro-credential can build upon this program's existing strengths, while potentially bridging multiple departments pertinent to the agricultural sector such as business, engineering, and the social sciences.

3. METHODOLOGY AND FINDINGS

The researcher examined a set of agriculture and agri-food-themed micro-credential programs and projects (currently operational as well as planned) across Canadian post-secondary institutions. College, university, polytechnic, and CEGEP institution websites were examined for micro-credential program offerings. All webpages hosting agriculture and agri-food related micro-credential programs and/or individual courses were documented and saved for future analysis. Agriculture and agri-food related programs are defined as those with a focus on primary production, processing, or agri-food manufacturing.

These micro-credentials were examined with the goal to understand their structure (e.g., as laddered or standalone systems), their content areas and themes, and the types of learning tools used in their delivery, with the objective to identify possible directions for the development of an urban agriculture-themed micro-credential to be hosted by the University of the Fraser Valley. Only publicly available materials were used in this research, which include micro-credential websites, promotional materials, and syllabi if and as available.

3.1 The Agriculture and Agri-Food Micro-Credential Landscape

The analysis focused on ten post-secondary institutions delivering agriculture and agri-food themed micro-credentials across Canada. To the author's knowledge, these institutions represent the vast majority (if not the only) institutions offering agriculture and agri-food themed micro-credentials in the country. These institutions were primarily concentrated in the prairies (Olds College, Lakeland College, Medicine Hat College, Saskatchewan Indian Institute of Technologies, Saskatchewan Polytechnic), with some representation from Ontario (Humber College, Fanshawe College), Atlantic Canada (Holland College, Dalhousie University) and British Columbia (UBCO). The researcher identified a total of twenty-eight unique micro-credential 'programs' - single courses or sets of courses hosted on a unique webpage and related thematically. By one example is Lakeland College's 'Sustainable Agriculture' program which hosts three related courses, each uniquely certifiable via a digital badge, that includes nitrogen management, cover cropping, and rotational grazing. The number of individual courses offered within each program ranged from 1 to 13, with the median falling at 3 courses per micro-credential program.

The two most common micro-credential programs were related to agronomy and agriculture technologies. Nearly one quarter (23%) of all programs examined in this research are focused upon agronomic practices (Figure 3). These programs include course topics such as fertilizer and nutrient management, cover cropping, growing environment management, and grow media management. Agriculture technology programs (20% of all programs) primarily emphasize topics such as precision agriculture, drone piloting, data management systems, as well as two specifically focused on vertical agriculture technologies.

Beverage processing programs included topics and courses on fermentation, quality assurance, additives, and tasting. Livestock related programs encompassed production-side approaches to livestock management such as rotational grazing, as well as more directed and technical instruction for veterinary medicine. Plants and plant tissue programs provided instruction on plant propagation and tissue culture techniques as well as metabolomics. Alternative food system programs encompassed topics related to social dimensions of agriculture (e.g., food sovereignty), urban food production, and permaculture design. Agri-food processing programs often included highly specialized and technical topics related to operational safety, machine operations, and food safety standards. A complete list of topics and courses under each program is available in Appendix A.

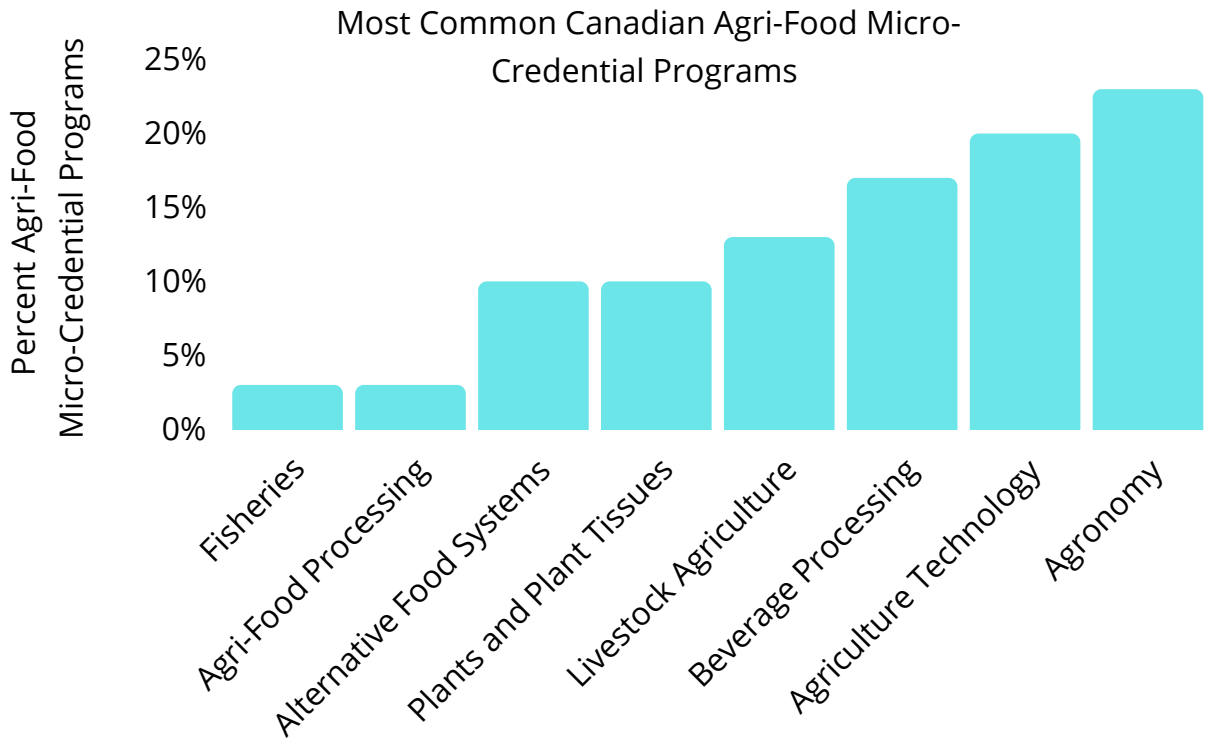

Figure 3. Prevalence of program themes among Canadian institutions offering agriculture and agri-food related micro-credentials.

3.2 Micro-Credential Design Considerations

The researcher examined how micro-credential programs are developed and operated, looking at their delivery method, cost, as well as key audience and design considerations taken among offerings. The majority of micro-credentials are offered online, not typically delivered in-person or in blended formats (Figure 4). Further, most programs are delivered over longer durations (define 'long programs' as those that will take more than 20 hours to complete in their entirety). Typically, individual courses range from 8-12 hours within each program, constituting 20-30 hours in total duration. Most in-person courses were designed over a short period of time (e.g., 2-3 days of instruction). Typical costs per program range from $600 to $1500, with some exceptions (e.g., Saskatchewan Indian Institute of Technology offers free training; UBCO offers metabolomics course trainings for $4500). Individual/standalone courses are typically offered at $200-300.

The vast majority programs offer digital badges for completion of individual courses, while a handful opted for un-accredited 'letters of proficiency'. Digital badges are verifiable digital certificates that are embeddable within social media sites such as LinkedIn, and shareable with prospective employers. Several micro-credential program offerings directly partner with industry to develop and/or assure quality on their offerings (e.g., agronomist associations), or highlighted industry-government-academia partnerships in the design of micro-credential offerings.

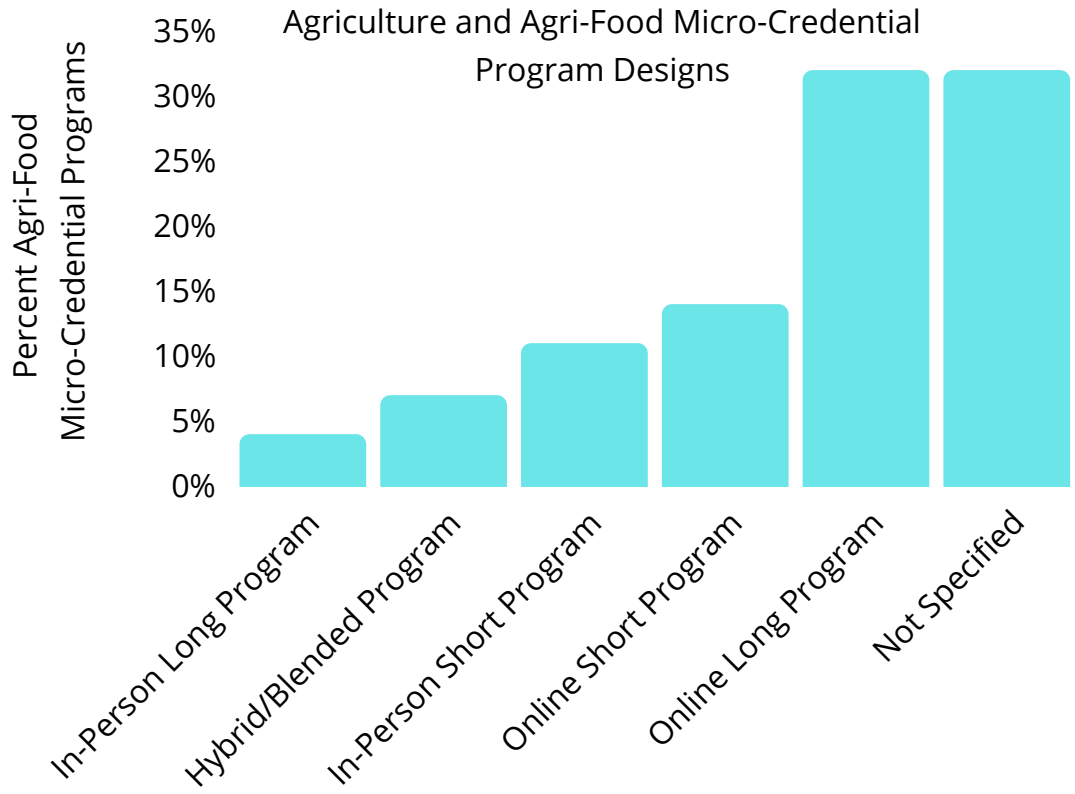

Figure 4. Micro-credential program designs typical among examined programs.

4. RECOMMENDATIONS

From our analysis, we outline the following three key recommendations to inform the development of future micro-credential offerings at the University of the Fraser Valley:

1) Skills development and training related to urban agriculture and technologies for urban food production are in-demand. Urban food systems education and training offerings comprise a relatively small portion of micro-credential programs among Canadian post-secondary institutions, while there is substantial engagement with agriculture technologies and, specifically, digital tools. **Micro-credential offerings that combine alternative food system practices/processes and agriculture technologies are novel and in-demand**. This presents a novel micro-credential offering in the current training landscape.

2) The most common micro-credential program offerings are online. Typical programs take students more than 20 hours to complete in their entirety, with individual courses taking between 8-12 hours to complete. Individual courses typically cost between $200-300 with total programs ranging from $600-1500 to complete. As the Food and Agriculture Institute and the University of the Fraser Valley develop training materials, **individual course offerings should be developed for online instruction and within these cost and required time ranges to be competitive**.

3) Developing training materials alongside and in consultation with industry and government is important for developing workforce ready students. There are only a handful of post-secondary institutions that **work directly with professional associations or industry associations to develop their micro-credential offerings, presenting a gap in current micro-credential offerings on the market.** This type of engagement aligns with the skillsets, demonstrated work, and mandate of the Food and Agriculture Institute.

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Appendix A

Institution and Name	Micro-Credential Topics	Structure	Cost	Key Audience
Dalhousie University – Fish Health and Diagnostic Procedures	• Fish Care and Husbandry in Research Facilities - Module 2 • Fish Care and Husbandry in Research Facilities - Module 3	In-Person Long Program • Two week standalone modules of 6 week course • In-person • Provides micro-credential badge	Not specified	Not specified
Dalhousie University – Tractor Safety	. Tractor Safety	In-Person Short Program • In-person over two days • Provides micro-credential badge	Not specified	Not specified

Fanshawe College – Prud'Homme Beer Certification Program	• Prud-Homme Level 1 – Beer Enthusiast	In-Person Short Program · In class · 12 hours · Provides digital badge	Not specified	Not specified
Fanshaw College – Grow At Home: Urban Agriculture	• Not specified	In-Person Short Program · In class · 18 hours · Provides digital badge	$304.50 total	Not specified
Humber College – Sustainable Urban Farming	• Introduction to Food Sovereignty • Sustainable Food Production • Indoor Vertical Gardens I: Purpose & Planning • Indoor Vertical Gardens II: Building & Planting • Growing and Harvesting • Troubleshooting Pests and Diseases • Social Impacts of Sustainable Urban Farming	Online Long Program • Online and asynchronous • Each topic is 3 hours, total 21 hours • Provides a digital badge	$434.44 total	Not specified

Lakeland College – Sustainable Agriculture Microcredentials	• Nitrogen management • Cover cropping • Rotational grazing	Online Long Program • Each course takes ten hours to complete • Online and asynchronous • Each course provides a 'digital badge' • Offered as well at Olds College	$200 per course ($600 total)	Professional agronomist and crop advisor
Holland College – Climate Smart Agriculture	• Fundamentals • Cropping Systems • Livestock Systems • Data Management and Information Systems	Online Long Program • Online and asynchronous • Each course provides a 'digital badge' • 24 hours to complete • Convened provincial industry, government, and associations to develop credential	$300 per course	Not specified
Holland College – Climate Smart Agrology for Economic and Sustainable Production	Not specified	Online Long Program • Online and asynchronous • Partnered with PEI federation of agriculture • Provides a digital badge • 30 hours to complete	$300 total	PEI agronomists

Holland College – Technologies for Data Informed Agriculture	Not Specified	Online Long Program • Online and asynchronous • Provides a 'digital badge' • 24 hours to complete • Convened provincial industry, government, and associations to develop credential	$300 total	Not specified
Holland College – Food Manufacturing Fundamentals	• Problem Solving and GMP in Food Manufacturing • Positive Work and GMP in Food Manufacturing	Online Long Program • Online and asynchronous • Provides a 'digital badge' • 16 hours to complete, each • Convened provincial industry, government, and associations to develop credentials	$300 per course	Not specified
Medicine Hat College – Microcredentials	• Rainwater Harvesting • Unmanned Aerial Vehicle Advanced Pilot Training • Permaculture Design	• Program Design Not Specified • Provides a digital badge • No additional information publicly available	Not specified	Not specified

Saskatchewan Indian Institute of Technology – Agri-Food Processing Micro Credential Program	• Essential: Communication Skills • Essential: Personal Development • Essential: Math Skills • Essential: Thinking Skills • Fundamental: Organizational Policy and Procedure • Fundamental: Occupational Health and Safety • Fundamental: Food Safety Management • Fundamental: Utilities and Sustainability • Work Placement • Process Operator Technician: Batching • Process Operator Technician: Equipment and Tools • Process Operator Technician: Quality Management • Process Operator Technician: Sanitation	Hybrid/Blended Format • 12 week program • Each unit can form a credit, but successful pass/fail completion of all courses required for full micro-credential	No cost	Admission preference for those who are Status First Nations