HIGHER EDUCATION STRATEGY ASSOCIATES

MONITORING TRENDS IN **ACADEMIC PROGRAMS**

Higher Education Strategy Associates

VOLUME 3, ISSUE 1

HESA Presents

ABOUT HESA

Monitoring Trends in Academic Programs

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ABOUT THE COMPANY

Higher Education Strategy Associates (HESA) is a Toronto-based firm providing strategic insight and guidance to governments, postsecondary institutions, and agencies through excellence and expertise in policy analysis, monitoring and evaluation, and strategic consulting services. Through these activities, HESA strives to improve the quality, efficacy, and fairness of higher education systems in Canada and worldwide.

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TABLE OF CONTENTS

Monitoring Trends in Academic Programs

INTRODUCTION TO MONITORING TRENDS

Volume 3, Issue 1 (2021)

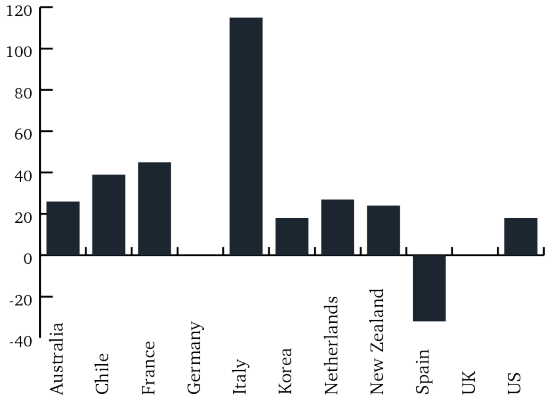
WELCOME

This is the third publication in Higher Education Strategy Associates' ongoing series, Monitoring Trends in Higher Education, and will focus on programs relating to agriculture and food. The most RECENT EDITION focused on trends in the health sciences, from biomedical engineering to health informatics. This edition continued this series' focus exploring how different academic disciplines are creatively bringing together different disciplines, breaking down academic silos while providing students with exposure to topics that they can focus on through graduate studies or industry work. Another overarching theme is exploring how programs are connecting to communities, organizations, and industries outside academia. This has been a long-standing ambition of post-secondary institutions, but one that becomes more pressing as both colleges and universities face increasing financial pressures. While colleges and universities benefit from the entrenched expectation that many jobs require some sort of formal training, they are not necessarily seen as engines of economic growth and innovation by politicians or the wider public. Nor are they seen as central to solving the existential challenges that face us today, from climate change to political fracture. Some of the programs reviewed here consider questions that deal directly with climate change and ensuring food security during uncertain times.

Many creative administrators and faculty are working hard to ensure that universities and colleges alike are engaged in these conversations and are at the centre of developing solutions. It is for this reason that this issue focuses on program developments in the broad fields of agriculture and aquaculture, or more generally, in food. Food programs have always been required to be connected to the world beyond the academy, such as the network of extension and experimental farms that dotted North America during the 19th century. Institutions seeking to provide agricultural workers with up-to-date knowledge have always had to be aware of the rhythms of the season and adjust their programming to meet the agricultural calendar. Further, they have drawn on a wide array of disciplines, from business to biology to ecology to geology, to provide as much "useful" knowledge as possible.

In other words, food programs have long histories of doing what has recently become fashionable in other disciplines: applied, interdisciplinary learning. Now, with questions around food security and supply chains becoming ever more pressing, food programming is even more essential. And student enrolment trends around the world are reflecting this: RBC's influential report *Farmer 4.0* noted that in Canada, enrolment in agriculture programs increased by 29% in the past decade.[1] And around the world, bachelor's degrees in agriculture are seeing growth in many countries around the world, as Figure 1 demonstrates:

Figure 1: Change in Bachelor's Degree Graduates in Agriculture, 2013 to 2018, Select OECD Countries



This edition of Monitoring Trends has three main sections, each devoted to a particular aspect of agricultural education, using examples from college and universities across the world. They are:

1. **Agricultural Technology.** There are several programs that focus specifically on understanding, managing, and using various forms of technology to improve monitoring, foster automation, and use data effectively.

2. **Organic/Sustainable Agriculture.** Many of these programs combine knowledge of areas like soil management and effective husbandry with an appreciation of the social and political dimensions of agriculture.

3. **Aquaculture.** There are a robust mix of research-intensive programs and vocational programs in aquaculture, as sustainable management of water and ocean resources becomes all the more important.

The report concludes with a brief discussion of implications of these programs and how those implicates can be applied to other programs. The selected programs highlight the power of multidisciplinary approaches and community engagement in ways that can be considered in other areas and speak to the growing importance of food and dealing with the realities of climate change.

Finally, a brief caveat: this report is not intended to be comprehensive or authoritative. There are many excellent programs and institutions that may not be included in this discussion, and readers who specialize in agricultural education will likely be able to identify many such programs. The report is intended to primarily provide some intriguing examples of new programs or of program approaches that we believe illustrate a multidisciplinary and applied approach that should be considered by academic programs across disciplines and credential level. It also focuses primarily (though not exclusively) on programs that have launched within the last ten years, so some well established and influential programs do not receive specific mention.

Note: a bibliography of works cited is available on request.

AGRICULTURE **TECHNOLOGY**

Agricultural technology (or agricultural innovation—or Ag-Tech) programs are generally closest in agriculture programs to the intersection between academia and industry.

These programs, which range from short-term certificates to intensive graduate programs, develop or enhance student knowledge of a variety of techniques and approaches in an effort to improve yields and improve monitoring to make harvests more predictable. Ag-Tech also must balance progress and predictability with uncertainty—farming is a fundamentally high risk and uncertain venture that is subject to sudden shifts in weather, labour shortages, market dynamics, and other near-impossible to predict changes.

These programs are particularly interesting because they can expose students to real-world applications of cutting-edge technology. This section considers agricultural technology programs that are aimed at working farmers and those that are aimed at students considering academic or industry research.

CERTIFICATE PROGRAMS

Ag-Tech is an area where certificate programs are particularly valuable, as they can offer working and emerging professionals a relatively accelerated education on new technology. A recently-launched example of this sort of program is the Agriculture Technology Integration Post-Diploma Certificate at Olds College. This eight-month program, which just launched in Fall 2020, teaches students about the installation, calibration, and repair of precision agriculture hardware and software systems. Students will complete courses in robotics and automatic control, design thinking, entrepreneurship, and network thinking.

Olds College students also benefit from the campus Smart Farm, which opened in 2018. The Smart Farm is a 2,000-acre facility that provides demonstration and experimentation with new technologies, monitoring systems, and regenerative practices. The farm has partnerships with over 40 companies and features a "pitch day" where students can get seed money for new ideas.[2] The farm also has significant investments from Telus, the United Farmers of Alberta, and Cervus Equipment A core part of the Smart Farm vision is the creation of new programs like the Agriculture Technology Integration credential. What makes the Smart Farm particularly fascinating is how it acts as a hub to spread new ideas to students, companies, and farmers alike, with partnerships and demonstration days. It draws on older traditions of demonstration farming and applies it to new technologies and techniques.

Further north in Alberta, Lakeland College revised their Animal Science Technology diploma program in 2019. The diploma now has four distinct majors in beef, dairy, equine, and livestock. The intention was to provide more direct and specific training for each of these areas, particularly allowing students to focus their practicum. Students also get to work on the New Holland Farm as part of a distinct unit. Students in the Dairy major work in the Dairy Learning Centre, which opened in 2017 and operates with five design principles:

- Safe student and industry training;
- maximize automation and minimize environmental impact;
- transition cow management;
- cow comfort and animal care; and
- bio security.

Of particular interest are the maximization of automation and the use of energy efficient systems to reduce the carbon footprint of the facility.

Other national programs of interest include McGill's CEGEP credential in Farm Management and Technology, which includes a mix of language and humanities courses along with courses in soil management, animal management, and farm finances. During their third year, students complete a course in Precision Agriculture, which introduces them to GPS and GIS systems, soil sampling methods, and yield maps.

The University of the Fraser Valley (UFV) has a two-year Agricultural Technology diploma, which includes course work at the relatively new Agriculture Centre of Excellence in Chilliwack, which opened in 2014. This centre features the tallest greenhouse in North America. In 2016, UFV received approval to offer a four-year bachelor's degree in agricultural science, which diploma students can ladder into, with a wide range of projects condu.

These certificate programs are compelling because they are linked to modern facilities that represent significant investment from government, institutions, and industry alike. Students are able to work directly on the farms, and while they may not be able to adopt all of the technology to their farms, expanding knowledge of the techniques to a wider audience can help to drive growth and create pressures to close the technology gap identified in Canadian agriculture.[3]

RESEARCH PROGRAMS

Some programs are designed to support students who might be farm owners, operators, or managers. Others are geared towards students who seek to drive agricultural research forward and be able to develop the tools and techniques of the future. Two intriguing examples can be found overseas: the Master of Science in Agricultural Innovation at Australian National University (ANU) and the Sciences et technologies de l'agriculture, de l'alimentation et de l'environnement at three French institutions. Both programs are at highly ranked global institutions and push into somewhat different directions: ANU looks towards industry development and business opportunities, while the French program is orientated towards sustainability (and has a plant health stream in the second year). The U.S. also has a long tradition of agricultural research, with some compelling work being done at UC Davis and Purdue.

ANU's program has just launched and will admit its first students in 2021. At the core of the program is the opportunity to work at the Centre for Entrepreneurial Agri-Technology (CEAT), which opened in 2018 as a joint project between a government agency and ANU. CEAT has five industry partners, including companies in genomics, plant science instruments, and applying quantum computing to replicate natural processes. Students in the MSc in Agricultural Innovation program can work with these industry partners on their projects as part of their program.

The program is explicitly multidisciplinary and has students complete courses from a range of departments like ecology, biology, computer science, entrepreneurship, environmental studies and modelling, and system engineering. Part of the goal of the program is to have students work with multidisciplinary groups, the realization of which is aided by the fact that there is only one core course, so students come into the team projects with a wide range of academic backgrounds. Since this program has yet to launch, its impact cannot be assessed, but it is an intriguing new program that is should be monitored.

The United States has several universities with globally ranked agricultural departments and research programs. Two research initiatives that are of particular interest are the Digital Agriculture initiatives at Purdue and the Smart Farm at UC Davis. Purdue's Digital Agriculture program features a 1400 acre farm that is pushing advancements in how broadband internet can improve farming by tracking weather patterns and monitoring data sets to facilitate decision making. The farm has major sponsorship with Hewlett Packart, but Purdue also invests considerable resources into promoting open data sources and systems for farmers as well. As part of its agricultural undergraduate program, Purdue students can take courses in the Purdue Data Mine-Agriculture, which has students learn about engineering computation, remote sensing, genetics, and data science for agriculture.

UC Davis identified the Smart Farm as one of their major Big Ideas priority areas in 2020. This farm will also feature a new Agricultural Innovation Hub on site. The plan is to have academic programming from the certificate to doctoral levels. Major fields of research include automation, data mining, animal care, and ecological sustainability. They are also identifying partner farms in the area to provide students and people in the area with practical experiences and applied technology. This initiative is developing, but given UC Davis' record in the area and clout, it is very promising.

Finally, agricultural technology is an area of transnational concern that can attract international students. Three French institutions combine to offer the Master Sciences et technologie de l'agriculture, de l'alimentation et de l'environnement : Montpellier SupAgro, Agrocampus Ouest, and AgroParisTech. The program is particularly targeted towards international students and has them study and evaluate a range of agricultural innovations and technologies, along with courses in systems biology and ecology. A main goal of the program is to provide students (who hold bachelor's degrees) with a range of approaches for understanding both the governmental and technological aspects of agriculture and agricultural management, and to promote critical thinking about which technologies and innovations can be applied to different contexts. Students also complete a master's thesis.

This program is intriguing because it demonstrates the potential of institutions combining to offer particular modules that their institution specializes in and provide students with exposure to different innovative tools and approaches. It also allows students to complete some of their studies in different agricultural contexts, since agricultural knowledge arises from a combination of both broad principles and local context.

SUMMARY

This section considered several agricultural technology programs that are orientated towards both working farmers and farm managers and towards people interested in research and development. As the large number of new agricultural research facilities suggests, this is an area of increased funding and interest for both institutions and governments alike.

This research and training agenda is not confined to traditional research universities, either. Colleges like Olds and Lakeland are also actively engaged in research and training and are forging impressive links with industry and community partners to draw findings beyond the sphere of higher education. While European and Australian institutions have considerable clout in this area, there is exciting movement at Canadian institutions.

SUSTAINABLE AND **ORGANIC AGRICULTURE**

Programs in sustainable agriculture often combine practical hands-on courses in particular farming techniques with study of food chains, the environment, development, and policy. Like the Ag-Tech programs, these programs are generally multidisciplinary and have applied components. However, these programs also tend to be more explicitly mission orientated, with commitments to sustainable development, justice, and access to food especially common. As a recent *University Affairs* article noted, many of Canada's agricultural facilities are "drawing an increasingly urban student body less interested in tilling soil and more interested in questions of social justice [and] food security[.]"[4] Such ambitions can also be seen in calls to "learn about the significant [agricultural] contributions from marginalized people that haven't been traditionally represented."[5]

This section also includes organic agriculture as a sub-category, as there are some credentials focusing particularly on organic agriculture and many of the sustainable agriculture programs address organic agriculture. For instance, Kwantlen Polytechnic University's bachelor's program in sustainable agriculture has a focus on organic production. Thus, while "sustainable agriculture" and "organic agriculture" are not synonymous in how the programs are presented, there is considerable overlap.

Organic agriculture in particular is an area of economic growth, which drives interest. As Washington State University's pitch for their certificate in organic agriculture notes, in the US the organic food industry has grown at a rate of 20 percent per year for about a decade—and there are few signs of this growth slowing.

Our discussion will consider degree programs and certificate programs and then turn to an evaluation of how they provide a sense of mission. This combination of skill development and mission-based curriculum presents an intriguing model that many other programs in other academic disciplines should seek to provide.

DEGREE PROGRAMS

In general, there are two main types of sustainable programs: science-intensive ones and science/social science blends. This distinction is not absolute—essentially every program has students consider questions of sustainability from a social and cultural perspective. For science-intensive programs, UBC's Sustainable Agriculture and Environment program has students complete courses in agroecology, crop production and soil science; Manitoba's BSc in

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Agroecology likewise focuses on the tangible production of crops and conduct agricultural experiments.

Not every sustainable agriculture program intends for students to become farmers or agriculturalists, but they do generally have to take some courses that get them into fields and greenhouses. Many programs scanned highlight the facilities that students can work at during their studies, indicating that these programs often emphasize bridging the theory-practice divide in higher education.

European universities are highly ranked in these fields; nine of the top twenty universities in the QS World University Rankings in Agriculture & Forestry are in Europe. Several top European programs that take this flexible approach that draws from the social sciences and the sciences into a graduate degree. Wageningen University in the Netherlands, which is often at the top of agricultural school rankings, offers a Master's in Organic Agriculture that explicitly combines these perspectives, having students take courses like "Social Transformations in Sustainable Food Studies" with ones like "Grassland Science." Wageningen targets students who are interested in farming and working in the agricultural sector along with students who are interested in policy and government work. Likewise, the Swedish University of Agricultural Sciences' graduate level Sustainable Food Program admits students with both science and social science credentials and combines some training in management and business leadership with science courses and policy courses. In the UK, the University of Reading's MSc in Agriculture and Development has students consider agricultural trends in the global south and exposes them to development and sustainability studies in various contexts.

In Canada, there have been a few intriguing developments in this area. Of course, Guelph has long been a world leader in agricultural research and education. However, there is growing interest from other institutions. For instance, Trent's Sustainable Agriculture and Food Systems program, which launched in 2011, allows students to take courses from a wide range of departments to complete their

degree. Students can select taking a BSc, which includes courses from environmental science and biology, or a BA that then has students take courses in Geography, History, and Indigenous Studies. Bishop's specialization in Sustainable Agriculture and Food Systems, which just launched in 2019, takes students from geography, environmental studies and environmental sciences. Currently, Trent is the only Canadian program in this area with a BA option, though Bishop's plans to launch distinct BA and BSc programs in the field by 2022. Both programs emphasize access to student gardens and community organizations as part of the experience.

The sustainability programs are thus particularly rich examples of programs that offer students hands-on experience, interdisciplinary learning, and (in many cases) flexibility to allow students to orientate their studies towards a particular interest while providing a cohesive base. As a relatively new discipline, sustainability programs are interesting examples of how programs are assembled, absent traditional program structures.

CERTIFICATE PROGRAMS

A few Canadian certificate programs have changed the academic landscape over the past decade at both universities and colleges. In 2009, Fleming College launched a graduate certificate in sustainable agriculture, which provides training on livestock production, market gardens, machines and equipment, and business planning. It ends with on-farm co-op work and a capstone research paper that reflects on experiences from the classes and the co-op work. Assiniboine College's advanced diploma in Sustainable Food Systems features a large sustainable greenhouse where students learn about different greenhouse models and planning. These programs require students have a post-secondary credential prior to admission, but are relatively open about what that credential is, offering a wide range of students a door into the field and reflecting the relatively interdisciplinary nature of these programs.

In fall 2020, Ryerson launched a fully online certificate in urban agriculture, which focuses on its policies, practices, and context. One of their courses is connected to the Dutch RUAF Global Partnership on Sustainable Urban Agriculture and Food Systems (reflecting the considerable influence of the Netherlands in this area, as that country routinely leads international rankings in publications and research impact in agriculture). One of the courses is experiential, but the program generally stands out in not requiring students to complete an experiential element to receive it. The aforementioned Washington State certificate is also online, though it does have one small experiential learning requirement, a choice of a practicum or an internship.

The Ontario Agriculture College at the University of Guelph launched a Certificate in Organic Agriculture in 2018. The certificate can be taken by any undergraduate student at the university; the main pre-requisite is completing an overview course about organic agriculture. Students then select courses from lists grouped by soils, animals and plant production, and society and sustainability. This nicely encapsulates the relatively open and interdisciplinary nature of these programs—while there is a variety of technical skills and knowledge required, many of these programs are designed in a way to accept people from a wide range of backgrounds and perspectives.

MISSION STATEMENTS

Every post-secondary department and program contributes to society in various ways, but in many cases this contribution is implicit. In contrast, programs in sustainable/organic agriculture explicitly inform their curriculums with a sense of mission and purpose. Kwantlen Polytechnic University's program has a set of Program Values that encapsulate the perspective of many programs:

- Sustainability is imperative.
- Good, wholesome nutritious food is a basic human right.
- Co-creation of knowledge fosters citizen engagement and positive change.
- Pursuit of accuracy and truthfulness are critical for constructive discourse.
- Science is enriched by honouring diverse perspectives and ways of knowing.[6]

This sense of mission also shapes Trent's description, "By studying sustainable agriculture, you can learn to create food systems that are responsible, justice-orientated, efficient, effective, and viable."

In general, these programs emphasize the interconnectedness of humanity and the earth, the need to fully understand food pathways and how we eat, the necessity to draw on different forms of knowledge to develop effective solutions, and the need to work actively to secure future food security. There is a bit of a spectrum—some programs are a bit more entrepreneurial/business orientated while others are more mission driven, but no scanned program in this space lacked some element of mission.

While sustainable/organic agriculture has the advantage of contending very obviously and directly with an issue of global import, other programs and departments can learn from the sense of mission. This need for issue-based learning, mobilizing students to contend with major and pressing problems, and clearly presenting how the program is helping to mitigate problems has been noted in our previous Monitoring Trends editions. In order to help ensure that post-secondary is at top of mind for government (and students) when thinking about societal problems, programs beyond sustainable/organic agriculture should consider applying these approaches to their own fields.

AQUACULTURE

Aquaculture programs have recently proliferated across Canada. Sustainable aquaculture is increasingly promoted as a way to provide protein to a burgeoning population.[11] While the field is not without controversy and critique, it has seen a steady increase in value and production in Canada particularly over the 2000s.

The production is largely split between BC and the Atlantic provinces, with some small contributions from Ontario and Quebec.

This is also an area where unmet labour demand in Canada is anticipated. The sector is quite small relative to agriculture as a whole, employing 4,650 people in 2017, but there were an estimated 125 unfilled positions in that year with a projection suggesting that the sector will see shortages through to 2029 at current levels.[7] Further, many of these shortages are in regions where population decline has been a challenge. Considering the emergence of programs that seek to mitigate these shortages is of interest. After examining these programs, this section concludes with a brief consideration of research-based programs. Norway remains a major global leader in this field, but there are programs in Canada that are seeking to close the gap.

CERTIFICATE PROGRAMS

Canadian colleges are expanding their aquaculture offerings in anticipation of this labour demand, both for students with and without other postsecondary credentials. North Island College, which has campuses throughout Vancouver Island, has recently added a new Aquaculture Technician Certificate, which they designed in direct response to requests from both the BC Shellfish Grower's Association and the BC Salmon Farmer's Association. The certificate can also connect to their six-month aquaculture diploma program. Students in the program learn about finfish, shellfish, and aquatic plants and receive direct training in the industry.

On the other coast, Nova Scotia Community College launched a new 19-week aquaculture operations certificate at the start of 2020. This program, based in Shelbourne, has students learn about finfish and shellfish health, feeding, and biosecurity; students also learn about both farm fishing and salt-water harvesting. Both of these programs are aimed at students who may not have other credentials but who are looking for entry level training into the industry.

For students who are already working in the industry, the Marine Institute launched a Certificate in Aquaculture Management in 2017. This twelve day program, which requires industry experience but not significant academic experience, offers basic courses in human resource management, project management, and regulations. MI provides the certificate in communities throughout Newfoundland through their Community Based Education Delivery model.

Despite Ontario's relatively small footprint in acquaculture, Fleming College offers a

post-graduate certificate in acquaculture. This is a one-year program that is more aimed at potential managers, though students are still required to learn about aquaculture fundamentals and working at campus-based hatcheries. Interestingly, the program advises prospective students that they may need to relocate for a position in the industry, which suggests that their students may end up at a coastal facility.

These certificate programs are noteworthy because of how they emerged in response to anticipated demand and how they are in areas of the country that can struggle with net migration. Institutions like North Island College and the Marine Institute are providing training in parts of the country where higher education can be more difficult to access locally. While the sector is still a relatively small one compared to the other fields considered in this report, it is one to keep an eye on for new program offerings over the next decade as technology and demands evolve.

RESEARCH PROGRAMS

As the Farmer 4.0 report noted, the Arctic University of Norway is involved in advanced research in aquaculture, and its Seafood Innovation Cluster produces research into outbreaks in sea lice and other advanced data analysis.[8] The Norwegian University of Science and Technology (NTNU) offers a two-year Master of Science with a specialization in Aquaculture that provides a robust basis in fish breeding, genetics, and nutrition and combines that with courses on economics, policy, and fisheries engineering. The program is offered in conjunction with the Technical University of Denmark and students can complete components at either institution. The program is designed with two outcomes in mind for students: further scientific and academic research into aquaculture, or leadership positions in the industry.

Across the North Sea, Scotland's University of Sterling's MSc in Sustainable Aquaculture has long been a field leader. In 2019, Sterling's Institute of Aquaculture was awarded the prestigious Queen's Anniversary Prize for its work in "tackling global problems of food security and hunger."[9] The master's program is based on foundational courses on aquaculture species, commercial activity, and industry governance before moving towards specialized paths in aquaculture policy and planning, livelihood analysis, feed formulation, epidemiology, and ecotoxicology. Students also complete an experiential component at a facility or a lab in a wide range of locations across Europe and Asia, or they can complete a research thesis. This interplay between academic and professional training seems to be a key feature of these programs.

On the other side of the world, Japan has several universities with significant research presence in aquaculture, including the Tokyo University of Agriculture's Laboratory of Aquaculture Science and the Aquaculture Research Institute at Kindai University. The latter institution famously began to cultivate bluefin tuna in 2003 and has a history of research that stretches back to 1948.[10] One intriguing initiative at Kindai was to open a series of restaurants to provide the public with an opportunity to try their products.

These programs are leaders for a few reasons. One is the degree of international collaboration; both NTNU and Sterling draw on international connections to widen student opportunities. Second is public engagement and education, as illustrated by Kindai's restaurants. And third is mission—these programs are driven by a sense of need to develop new forms of sustainable protein and draw substantially on both scientific and political research.

Canadian universities have established aquaculture degrees and diplomas across Canada, including an advanced diploma and undergraduate degree at Vancouver Island University (who also received program approval for a new minor in aquaculture this year), a bachelor's degree at Dalhousie's Truro campus, and a MSc degree in Sustainable Aquaculture at Memorial University (with participation at the Marine Institute of Memorial). Memorial's program resembles other graduate-level programs here in that it draws on faculty from various departments, including biology, food sciences, and engineering. Memorial (and the Marine Institute) is also leading a major research project through the Ocean Frontier Institute in improving sustainability, mitigating the effect of pathogens, and identifying new aquaculture candidates. The Ocean Frontier Institute, which includes Memorial, Dalhousie, and UPEI, also forges research connections to several European institutes, constituting one of the more ambitious cross-Atlantic research agendas. These projects and programs should be monitored as aquaculture continues to grow in stature and importance to the broad food security agenda.

SUMMARY

This field remains fairly niche in Canada, but there is growth at the diploma and certificate level. These certificate and diploma programs are intriguing because they offer training and some degree of job security in more rural parts of the country that can suffer from net outmigration and aging populations.

Internationally, aquaculture is seeing considerable research attention as the field continues to develop. A great deal of research is devoted to managing the health of farmed populations and avoiding the outbreak of disease from them, which has long been a source of public concern.

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IN CONCLUSION

Monitoring Trends in Academic Programs

Several important trends are revealed by this brief examination of agricultural and aquacultural programs. These include:

- **Food programs are at the cusp of interdisciplinary learning**: Many of the scanned programs draw from faculty and students from across fields and bridge the gap between the sciences and social sciences. These collaborations bring together scientific research, social questions around justice and distribution, and policy concerns in a way that few other fields achieve.

- **Food programs are proliferating at various degree levels**: This brief scan identified several new degree programs, certificates, and diplomas that have emerged over the past decade. There is little to indicate that this growth has over-saturated the market, particularly given that labour shortages remains a key challenge for many agricultural and aquacultural providers.

- **Research programs are collaborative**: Many of the scanned graduate level programs pride themselves on offering their students opportunities outside the host institution. This includes industry placements, but also includes course work, field trips, or research opportunities with other institutions. The collaboration of French universities in creating an agricultural technology program speaks to this impulse. Given the importance of sustainble food production, institutional collaboration seems necessary.

- **Links to industry and farms are crucial**: These programs have significant links outside academia, from corporate partnerships for research farms to student projects in working fields. A lot of the cutting edge technology is very expensive and partnerships allow students to access them early in their careers. And connecting to nearby farmers and communities ensure that the research provides value beyond the students they serve.

- **Traditionally underserved populations are targeted**: Programs in these fields are often hosted at smaller campuses that are not in major urban centres, providing cutting edge and in-demand programs to people who sometimes have difficulty accessing such programs where they live. The recent expansion of aquaculture programming in central and northern Vancouver Island is an intriguing illustration of this.

- **The programs have a sense of mission**: Canadian post-secondary funding trends suggest that politicians and the public do not always think of post-secondary as fundamental to solving global challenges. Many of these programs have explicit mission statements and a strong sense of purpose that directly tackle issues that can dominate attention and headlines, particularly in the wake of COVID that revealed some weaknesses in supply chains. This research matters, and it can be started by a wide range of students.

For readers in other disciplines, we believe that many of these lessons in relatively open, interdisciplinary, and mission driven learning can provide useful precedents and examples for thinking about how to present and develop courses and programs in other areas. Agricultural and food based programs have not always received their due attention and this scan suggests that this will change rapidly.

ENDNOTES

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This document is just an example of some of the work that Higher Education Strategy Associates provides for program analysis and review.

At HESA, we keep a close eye on academic trends to understand what programs are attracting students and the sort of studies that attract and excite students.

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