EMILI

Accelerating Digital Agriculture

EMILI is a non-profit that advances technology and develops skills to accelerate digital agriculture.

The EMILI team during a summer 2023 tour of Innovation Farms.

Table of
Contents

"*Since its inception, EMILI has been committed to growing the digital agriculture ecosystem, and I am proud of the way we work collaboratively with industry and academia to embrace the power of AI and machine learning to increase productivity, sustainability, and profitability throughout the value chain. EMILI is unique in its ability to test and validate agricultural technology in a full-scale, commercial setting while also creating opportunities to engage students to showcase this technology in action.*"

Ray Bouchard, EMILI Board Chair, Enns Brothers President and CEO

Executive summary

As an industry-led non-profit, EMILI sees first hand how the potential of artificial intelligence and machine learning is transforming the agriculture and agri-food sector. This is leading to increased innovation and wider integration of technology solutions to drive productivity and sustainability. It is also highlighting the importance of cross-industry collaboration to empower people with digital skills, support startups to grow in the prairies, and accelerate Canada's growth as a leader in digital agriculture. We are proud of our ability to work closely with producers, industry, and academia to provide people with the connections, skills, training, and resources they need to succeed.

The launch of **Innovation Farms *Powered by AgExpert*** in late 2022 has allowed us to partner on a number of projects to increase the development and adoption of on-farm technology and grow the digital agriculture ecosystem here in Manitoba and across the Prairies. From the recent construction of the **Innovation Farms Centre** to joining the **Pan-Canadian Smart Farm Network**, to collaborations with industry leaders such as **PrairiesCan, Rutherford Farms, MacDon, Farm Credit Canada,** and **Enns Brothers,** this initiative has increased our ability to share best practices and provide industry and academia with exposure and access — at commercial scale — to cutting-edge equipment and emergent technology to address specific regional needs and opportunities.

To cement Canada's status as an agricultural leader will require years of sustained investment and progressive industry leaders with a commitment to innovation. The support we have received represents a big investment in the future of digital agriculture in Canada to expand technology and education initiatives across, and beyond, the Prairies. EMILI is proud to be part of this. As you flip through this document you will find key examples of this work over the past few years.

Thank you for your support in building the digital agriculture ecosystem.

Jacqueline Keena

"The projects we are undertaking represent a big investment in the future of digital agriculture in Canada to expand technology and education initiatives across the agri-food industry. This will accelerate innovative technologies and provide people with the skills and training required for a sustainable and economically resilient digital agriculture industry for generations to come."

Jacqueline Keena, EMILI Managing Director

Developers from AIRM visit Innovation Farms to review the progress of their Crop Sentry system.

Increasing technology integration

We create space to demonstrate, test, and validate intelligent technologies to increase the integration and adoption of digital tools.

Canada is recognized worldwide as a leader in both AI and agricultural innovation thanks to strategic investments into basic research at our public institutions. Yet there exists a stubborn gap between devising new digital tools – such as remote sensors, data analytics, image recognition software and autonomous robotics – and these tools being adopted at the farm level.

To fill this gap, EMILI's Innovation Farms, and other members of The Pan-Canadian Smart Farm Network are working collaboratively to advance Canadian agriculture.

By providing industry and academia with exposure and access at commercial scale to cutting-edge equipment and emergent technology such as weather stations, soil sensors and crop cameras, while sharing best practices from across Canada, we can support farmers to more comprehensively address specific regional needs and opportunities.

According to RBC's Farmer 4.0 report, "a fourth agricultural revolution is underway and this one isn't about seeds or diesel. It's all about data."

"Producers are adopting satellite imagery, drones, visual recognition-assisted robotics, autonomous harvesting vehicles and a range of sensors

— all continuously feeding data on soil health, pest management, weather conditions and more into cloud-based platforms powered by artificial intelligence that converts data into predictive analytics accessed by farmers and agronomists on their mobile smartphones," said EMILI Managing Director Jacqueline Keena in a Winnipeg Free Press article earlier this year.

As EMILI works to accelerate digital agriculture through our work with agtech startups and research and development projects at Innovation Farms, it is vital that we continue to build a strong culture of data governance that sustains trust in the use of data and digital tools both on-farm and across the Canadian agri-food sector.

Right behind cost and return on investment, questions about privacy, data ownership and trust are often some of the first raised in any discussion about data in agriculture. And that's exactly why EMILI launched the Canadian Agri-Food Data Initiative, formerly known as the EMILI Data Initiative, in 2021 with the goal of complementing the exciting new digital technology coming into the agriculture sector with the non-technical skills and knowledge that farmers, workers, and business owners need to make smart, strategic decisions when it comes to their data.

PROJECT SPOTLIGHT

Creating value with data and digital tools

Equipping the Canadian agriculture and food sector with the right tools, knowledge, and skills to make the best use of data and digital technology is central to EMILI's work in digital agriculture.

This is not work we do alone. EMILI's digital agriculture expertise is informed by partnerships, collaborations, and conversations with producers, industry, and academia.

In fall 2022, Dan Lussier and Alicia Demanuele from EMILI's Canadian Agri-Food Data Initiative wanted to engage our community on what needs to be done so the Canadian agriculture and agri-food sector can create value using data and digital technology.

Using an online platform to gather ideas, 37 contributors shared ideas that generated 548 votes in response to the question:

> What needs to be done to ensure that everyone in the Canadian agriculture and food sector has the tools, knowledge and skills needed to create value using data and digital technology?

Four key themes emerged, illustrating the importance of increasing training opportunities, developing a strong value proposition for new technologies, building relationships in the data ecosystem, and maintaining high data quality.

"We want to make sure people have the knowledge and tools they need and are empowered to participate fully in ongoing conversations surrounding the growing use of digital technology and data in agriculture."

Dan Lussier, EMILI Director, Agri-Food Data
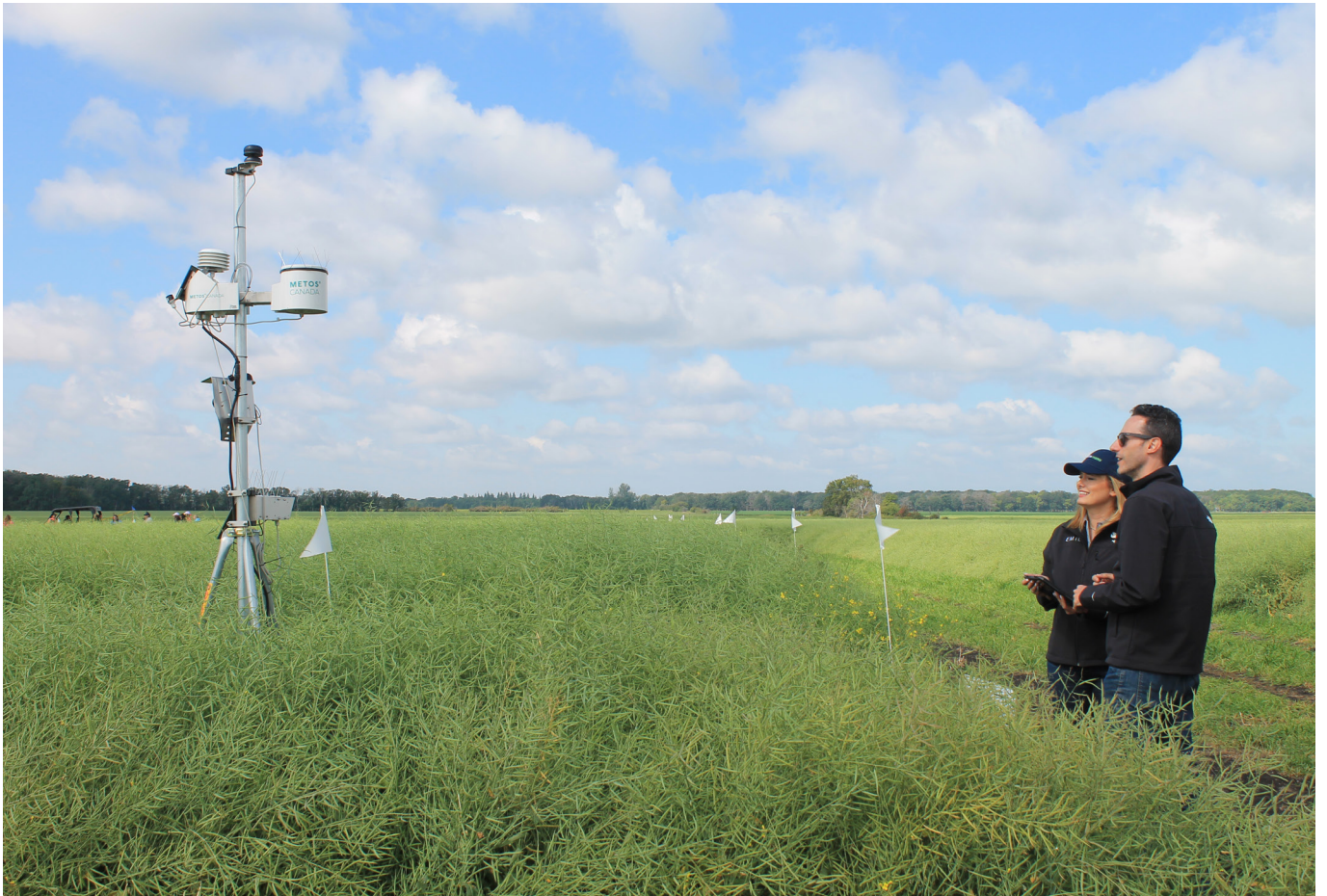
Jacqueline Keena and Dan Lussier examine one of 47 weather stations and sensors placed across Innovation Farms.

Strengthening the data ecosystem

The Canadian Agri-Food Data Initiative is focused on building the capacity of the Canadian agriculture and food sector to make use of data and digital tools in a responsible way that benefits everyone along the value chain.

Data literacy training

EMILI is launching the first modules of a data literacy training course for growers in late 2023. This course has been developed with key collaborators at Western Canadian colleges and the Community Safety Knowledge Alliance, a non-profit organization specialized in cybersecurity.

Data literacy training is a great starting point, a launching pad for anyone trying to make sense of the rapidly changing context surrounding the use of data in the agri-food sector.

EMILI will be working with partner organizations over the coming months to deliver data literacy training sessions both in person and through online webinars.

Interoperability: The State of Play

The users of digital technology just want their devices and software to work, and to work together. That is as true on-farm as in everyday life. But what exactly do growers and technologists mean when they refer to interoperability? How could these different players in the digital agriculture ecosystem work together to deliver increasing interoperability in the near and long

term? To find out, EMILI interviewed more than 25 stakeholders from across the agtech industry. This includes growers, researchers, and technologists working at major agtech companies and startups. Based on this series of interviews EMILI has distilled its findings into a report that identifies the dominant perspectives we heard, the key challenges limiting interoperability in agriculture data today as well as some potential ways forward.

"Through this series of fascinating conversations we've focused on really getting our hands around the concept of interoperability," said EMILI Agri-Food Data Director Dan Lussier. "It was interesting to hear directly from people working on agtech solutions about the challenges they are facing and the approach they are taking to create a more cohesive agri-food data ecosystem."

Legal Landscape for Agri-Food Data

EMILI has worked in collaboration with a group of legal academics and practicing lawyers to draft a series of guidebooks that aim to help non-lawyers working in the agri-food sector understand some of the key legal issues connected with the use of agricultural data. The series of reports will focus on the core topics of contracts, ownership, and privacy. It will also touch on other important issues such as competition law, right to repair, and how useful data institutions like data cooperatives can be built – and all this from a Canadian perspective which can be difficult to find.

"Producers and other users of digital agriculture technology are right to ask questions about the legal arrangements that impact the use of agri-food data," said EMILI Senior Project Associate, Alicia Demanuele. "Building up the knowledge, especially among non-lawyers, helps to bring more people into the conversation and will support the continued adoption of digital tools in the agriculture and food sector."

ECOSYSTEM SPOTLIGHT

In November 2022, EMILI joined Ag Data Transparent (ADT) as its first supporting member. At the same time, EMILI Agri-Food Data Director Dan Lussier joined their board of directors.

ADT is an American non-profit organization that assists producers with understanding and evaluating contracts associated with collection, storage, transfer, and use of their agricultural data. Historically, membership was limited to agtech companies who were certified by ADT, as well as American farmer-led associations. When ADT created its supporting membership to include other agricultural organizations who do not directly collect farm data yet want to advocate for and support data transparency, EMILI was quick to jump on board.

For EMILI, joining ADT builds on the work of the Canadian Agri-Food Data Initiative to empower growers with the knowledge and tools they need to make smart, strategic decisions about their data.

Emergence Grant recipients Geco Engineering and Green Aero Tech demonstrate how drone mapping technology combined with data driven insights can help farmers predict where weeds will emerge.

Empowering entrepreneurs

Connecting digital agriculture entrepreneurs to resources and support is an important way to strengthen our economy.

Canadian organizations and entrepreneurs, many of them located here in the prairies, are recognized as world leaders in digital agriculture and are poised to play a major role in increasing the productivity and sustainability of our agricultural food systems.

Supporting early stage organizations with financial support and guidance is an important way to increase the speed of innovation, accelerate technology adoption, create new jobs, and foster sustainability.

EMILI established the Emergence Grant in 2021 to help bridge the gap startups and emerging tech

organizations experience when developing new digital agriculture technologies. This initiative provides vital support to increase the scale of agtech innovation in Manitoba and across the prairies.

The program has been extremely successful and is a key way that EMILI increases the capacity of agritech startups and scale-ups in the province. This funding can open doors for small to medium organizations to access opportunities in the ecosystem.

For example, Emergence Grant recipients Cody Ray and Holly Anderson, founders of NeoNutes, say that without EMILI's support they might have

missed the opportunity to partner with Futurpreneur to purchase the modular grow pod and related technologies needed to provide year-round lettuce to their micro-green customers in Brandon, Manitoba.

"These early-stage organizations – many of them women-led, share a passion for innovation and a desire to increase the economic and environmental sustainability of agriculture in the prairies," said EMILI Managing Director Jacqueline Keena.

As rapid growth in the capacity of digital agriculture and the potential of artificial intelligence and machine learning transforms the agriculture and agri-food sector, it is vital that finance and investment remain steady enough for homegrown Canadian startups to reach the commercialization stage before they are bought up or choose to relocate, along with their intellectual property, to a more lucrative environment south of the border.

As an example of how important it is to equip startups and emerging technology organizations with financial and other resources to bridge this gap, Manitoba has seen only $860 million in private equity investment since 2013, which is only 0.4% of private equity investment across Canada. Of this number, an even smaller percentage is invested in digital agriculture solutions.

As food systems worldwide face mounting challenges that require more resilient and sustainable approaches to agriculture, the digital agriculture sector is on the verge of enormous growth in demand. This creates a tremendous opportunity to realize the full potential of digital agriculture to increase economic and environmental sustainability across Canada.

PROJECT SPOTLIGHT

Field demos showcase novel digital agriculture solutions

In July 2023, Emergent Grant recipients as well as other startup organizations were invited to Innovation Farms to showcase emerging digital agriculture technologies to potential investors, government funders and community supporters at EMILI's first Innovation Demo Day event. Participating companies included:

- CultivateCI
- TheoryMesh
- InputsPro
- FeedFlo
- Carbon Lock Tech
- Carbon Asset Solutions
- GrainFox
- UKKÖ Robotics
- Green Aero Technology
- Geco Engineering

These organizations have all developed novel solutions to help farmers increase sustainability on the farm.

"Supporting early-stage organizations is an important way to increase the speed of innovation, accelerate technology adoption, create new jobs, and foster sustainability."

Lasha Glennie, EMILI Capital Enablement Manager

Emergence Grant recipient Kristen Timmerman visited Innovation Farms to demonstrate how InputsPro increases access to essential crop data.

Bridging gaps faced by small and medium enterprises

EMILI is committed to empowering digital entrepreneurs by connecting them with resources and support.

Increasing access to essential data

Raised in an entrepreneurial agriculture-focused family from Treherne, Manitoba, Kristen Timmerman has always strived for innovation. In 2022, she launched her own agtech company from the small community she grew up in.

In May 2023, InputsPro received one of EMILI's 2023 Emergence Grants, expanding the company's capacity to provide growers and agronomists in Western Canada with essential crop data through its website and mobile app. EMILI's Innovation Farms team is using this app throughout the

season to retrieve information on rates, water volume, tank mix options and more for the safe and effective application of crop inputs.

"It is truly inspiring to work with EMILI and Innovation Farms as they support InputsPro and other like-minded startup companies to advance digital agriculture technologies," said Timmerman.

Increasing efficiency of crop applications

Green Aero Tech uses Unmanned Aerial Vehicle (UAV) technology to provide land data to farmers,

engineers, civil administrators, and construction companies looking for accurate information about their land. EMILI's funding supports the integration of LiDAR technology, accelerating the development of their elevation mapping service. This addition allows UAVs to see through trees to provide more accurate, comprehensive data.

Digitally automating malt production

Dacotah Malt is working with EMILI to increase digital automation and streamline production in its Elie, Manitoba facility. Electro-mechanical equipment and sensors such as a self-contained transfer system to simplify the process of moving grain and malt from one piece of processing equipment to another will increase the productivity of their small-batch malt production.

Improving crop yield with precision planter

N49 Genetics is working with EMILI to develop precision planting equipment to improve the resilience and yield of Manitoba-grown crops. This will enable N49 to identify and advance soybean lines with early season vigor and improved stress tolerance traits for select growing regions of Manitoba.

Harnessing early weed detection technology

Geco Engineering is developing a data-driven, digital solution for the strategic management of weeds in prairie farm fields. Using data from farm equipment and remote sensing, they predict where weeds will emerge and identify areas of herbicide resistance using digital tools. EMILI's funding supports the utilization of drones and satellite imagery to analyze and document the presence of both susceptible and herbicide resistant weeds, including kochia and wild oat.

Developing precision equipment

EMILI is supporting Taproot Research Ltd. to develop specialized precision equipment to increase the capacity of their small plot agricultural research offerings.

The Rosenort, Manitoba-based research farm launched in 2021 to advance Canadian agriculture by providing agriculturally sustainable research services for local growers, government, industry, and academia.

ECOSYSTEM SPOTLIGHT

BioEnterprise has supported EMILI's Emergence Grant since it launched in 2021. The program has been extremely successful and is a key way that EMILI increases the capacity of digital agriculture startups and scale-ups in the province.

One of the first organizations that EMILI invested in through the Emergence Grant is **Ukkö Robotics.** EMILI helped them develop a small-scale version of the innovative autonomous barn they have designed to make pasture-based farming more accessible. In a full circle moment, the team at Ukkö Robotics shared their resources and knowledge with a more recent Emergence recipient, using the same technology that powered their autonomous barn to help **Carbon Asset Solutions** develop carbon sequestration equipment.

EMILI is also proud to have supported **TheoryMesh** with their integrated farm and food data platform, and **GrainFox** in the creation of educational tools to help customers use their grain marketing technology. EMILI's support helped **First Descent Software** create an integrated sales and marketing platform to trace the journey of crops from farm to greenhouse, and helped the software development team at **Tactica Interactive** launch a website focused on agtech innovation.

Digital agriculture innovation on a full-scale farm

Innovation Farms Powered by AgExpert provides innovators across industry and academia access to leading-edge equipment, technology, and production practices in order to develop viable solutions to the diverse agronomic and technological constraints and opportunities farmers face.

We do this by **demonstrating** the productivity and sustainability of commercialized technologies; **testing and validating** new technologies to bring them from pre-commercial to market; and **sharing** our findings to increase understanding of and access to digital agriculture tools.

Agtech startups demonstrate digital agriculture innovation

Two innovative agtech companies came together on Innovation Farms this summer when Geco Engineering created a predictive weed map from satellite and drone data in order to download predictions into a spray drone from Green Aero Tech, showing how drone mapping technology combined with data driven insights can help farmers predict where weeds will emerge.

4R field demos showcase sustainable solutions

It was a privilege to welcome over 130 attendees to the farm for Manitoba 4R Day in August 2023. Attendees learned how sustainable 4R practices can be applied to increase nitrogen use efficiency and ensure economic sustainability. 4R principles guide EMILI's Innovation Farms team throughout the season as we demonstrate the productivity and sustainability of commercialized technologies to empower farmers and others along the value chain to adopt and fully deploy digital tools.

## Machine learning increases crop resilience

We are working with the University of Winnipeg and the National Research Council of Canada to establish a large image collection of peas through crop development capturing shoot biomass in the field and root systems in controlled environments. This will be useful for present and future digital agriculture applications. It will be included in image databases used to train machine learning algorithms so we can move from time consuming manual measurements to more efficient automated phenotyping.

IoT sensors monitor crop and soil health

We have installed 47 internet of things (IoT) sensors including METOS® weather stations, Sentek soil probes, CropVIEW® crop cameras, iSCOUT® insect traps, and an Ukko weather station across Innovation Farms. These sensors send live data to our mobile phones and other devices to provide in-the-moment insights into crop health and yield throughout the season to increase sustainability and on-farm productivity.
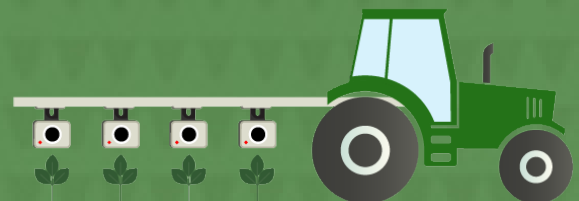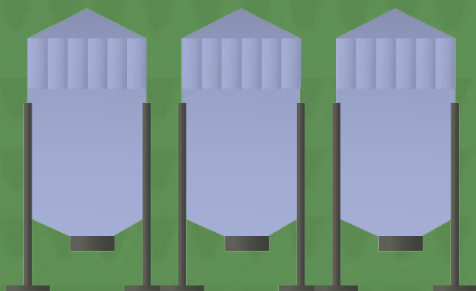
John Deere Operations Centre – AgExpert MyFarmConnect Integration

To help centralize our production in AgExpert, the Innovation Farms team utilizes MyFarmConnect integration by importing years of operation data from John Deere Operations Center into AgExpert Field. Not only does connecting directly with machine data save time and reduce duplicate entry, AgExpert helps calculate cost per acre during the growing season. This integration unlocks a wealth of historical information, enabling EMILI to gain valuable insights and optimize farm management practices.

Real time plant response and yield testing

AIRM's Crop Sentry systems collect daily data from multispectral point clouds, and other sensors, throughout the season on soil conditions, weather, and plant health. Computer vision and machine learning models provide real-time information to predict crop yield and quality outcomes to optimize decisions and inform best practice standards. Collaborative conversations between researchers and farmers ensure solutions work on a full-scale farm.

Nutriscan soil testing and analysis

Collecting soil samples from a canola nitrogen ramp trial and analyzing with ATP's NutriScan diagnostic tool has allowed us to demonstrate how real-time monitoring of field conditions can provide more frequent insights into the nutrient status of your soil to inform decision-making.

"We are entering an exciting new era full of potential. With every year that passes, the industry addresses issues, increases efficiency, fine-tunes practices, and creates solutions guided by innovative and sustainable technologies.

Leanne Koroscil, Innovation Farms Manager

Jacqueline Keena shares insight on ways to address skill and labour gaps at 2023 Digital Agriculture Table event.

Expanding skills and knowledge

Technology is changing at a rapid pace and will require people with new and evolving skills and work experiences.

Digital agriculture is growing and evolving so rapidly, and is such a diverse sector, that almost any person and skill set can find a home for their expertise, but realizing this potential will continue to require active participation across the sector.

The future of digital agriculture requires increased education and experiential learning opportunities to develop vital competencies around technology application, employee readiness, and human skills. This requires increased collaboration between industry and academia. That's where the Manitoba Digital Agriculture Table comes in.

Since launching in 2020, this Table has engaged over 405 participants, fostering a diverse network across the industry to discuss issues, opportunities, and expertise to advance digital agriculture.

These conversations led to a strategic roadmap outlining the importance of fostering industry and academic alignment to support research and development partnerships; identifying and mitigating skills and talent gaps; and increasing education and training opportunities.

EMILI supports and facilitates the development of STEM programs, career panels, and work-integrated learning opportunities to provide learners from diverse backgrounds with education, training, and work experience to meet the changing needs across the digital agriculture ecosystem.

In the Spring of 2023, EMILI launched a work-integrated learning (WIL) web platform to highlight the most relevant funding opportunities that industry can leverage to increase the talent pipeline in the digital agriculture ecosystem.

By highlighting and promoting the benefits of WIL experiences for post-secondary students, and promoting the skill sets needed to be successful in the industry, EMILI hopes to raise awareness of the many meaningful career opportunities that exist in this sector.

Technology is advancing at a rapid pace and will continue to require people with new and evolving skills and work experiences. By forging partnerships with industry leaders such as Enns Brothers, MacDon, and Farm Credit Canada, and academic institutions such as the University of Manitoba, University of Winnipeg, and Assiniboine Community College, EMILI is able to expand technology and education initiatives and increase awareness of the rewarding career paths in the agri-food industry.

PROJECT SPOTLIGHT

Developing the innovators of the future

Since 2021, EMILI, Actua and Agriculture in the Classroom have partnered with Protein Industries Canada on the Explore Project to deliver programming to youth in K-12 that focuses on STEM, in-demand skills, and promotion of future career opportunities in the agri-food industry.

Since the Explore project launched in 2021, we have engaged 91,967 youth with digital agriculture. This surpasses the targets we set when we launched this program.

In addition to expanding their knowledge in topics like data, machine learning, and coding, students are gaining hands-on experience in how to apply these skills in future careers within the digital agriculture ecosystem.

These programs build critical skills and connect youth to relevant career opportunities. They also promote diverse perspectives, especially those of Indigenous Peoples who have maintained a deep understanding of and connection to the land.

"I am really proud of the work we did around work integrated learning through the pandemic, and the amount of students we were able to get into great positions even when we were virtual. This is an area where I think a lot of emphasis should be placed as we go forward."

Rachel LeClair, EMILI Skills and Talent Manager

Rachel LeClair, Brittanie Parisien, and Jacqueline Keena work collaboratively to create opportunities for individuals from non-agriculture backgrounds to gain exposure to digital agriculture career paths.

Engaging with diverse people and technologies

EMILI increases access to work-integrated learning resources and increases exposure to careers in the sector.

Hiring students through work-integrated learning (WIL) programs not only helps students gain new skills and connections, it also helps employers build and strengthen the talent pipeline.

Brittanie Parisien joined EMILI in 2022 as part of University of Manitoba's Arts Career Apprenticeship Program, a role that led to a full time contract supporting EMILI's Skills and Talent portfolio. She knows firsthand how important this experience is for students and employers alike so she was thrilled to work with her manager, Rachel LeClair to develop an online resource to make WIL more accessible within the

digital agriculture sector.

"This new site provides an easy to understand reference to help students and employers understand what these terms mean as well as a one-stop resource to see what funding opportunities are available and how to access them," said LeClair.

By partnering with organizations to increase engagement in the digital agriculture sector, individuals from agriculture and

non-agriculture backgrounds will have opportunities to gain diverse and transferable skill sets that will strengthen the talent pipeline.

Annual Agriculture Enlightened Conference

EMILI's annual conference fosters connections between industry and academia to further advance the agri-food industry in the Canadian prairie provinces. From year to year, the conference themes identify key existing and emerging issues relevant to digitization in agricultural production, bringing together a diverse group of stakeholders to share expertise and innovative ideas pertaining to the advancement of digital agriculture.

Digital agriculture career panels

In 2020 and 2021, EMILI partnered with Agriculture in the Classroom and the Bruce D. Campbell Farm and Food Discovery Center to deliver a Digital Agriculture Career Panel series. The first introduced post-secondary students to exciting careers in digital agriculture.
The second event, which centred on digital agriculture advancements and career opportunities for women in the industry, took place on International Women's Day 2022.

Food's Future Webinar Series

A series of webinars, co-hosted by CityAge and EMILI, highlight the critical role of biodiversity in the food sector, revealing how advanced technology can unlock untapped opportunities that benefit both the environment and the global food supply. Speakers provide diverse perspectives on how to harness data to validate sustainability efforts, leverage cutting-edge technology to boost productivity, and develop essential skills for future industry leaders. To date, over 5,700 people have attended this series.

Palette Skills event inspires students to "create, compete, commercialize"

EMILI was proud to sponsor Palette Skills 2023 pitch night which took place in Saskatoon in early March. This event provided an opportunity for Automation and Digital Agriculture Specialist students to pitch innovative agtech business ideas in front of a live audience for prizes.
EMILI contributed to the development of this program in order to offer agriculture industry training to people with technical skills and introduce them to a new career path.

ECOSYSTEM SPOTLIGHT

CANADIAN AGRI-FOOD SUSTAINABILITY
Skilled Talent Needed to Meet Food Demand and Reduce Environmental Impacts
ICTC ✚ CTIC

EMILI welcomed Allison Clark and Mairead Matthews from ICTC to the May 2023 Manitoba Digital Agriculture Table, where they shared insights into the talent needed in Canada's digital agriculture sector.

ICTC's Canadian Agri-food Sustainability report, which EMILI Skills and Talent Manager Rachel LeClair contributed to, finds that environmental science and technology are driving sustainability in Canadian agriculture — while driving demand for STEM and environmental talent.

Despite an abundance of agri-food career opportunities and a growing labour gap, many students aren't aware of these opportunities or don't realize they can pursue a fulfilling career in agriculture. Helping students from all backgrounds and skill sets see a career for themselves in agriculture will be key to ensuring Canada remains an agri-food sustainability leader.

Dr. Christopher Henry (pictured here operating the R-Tech Rover) has worked with EMILI since 2019 to develop innovative technologies such as a crop identification algorithm to identify different varieties of plants.

Advancing innovation and research

Sharing knowledge and making connections between producers, industry, and academia is vital to advancing innovation and research.

The Canadian Prairies is home to 52.2 million hectares of farmland, long standing industry-leading companies, global experts at our post-secondaries, and an innovative tech startup scene. This is an ideal environment for innovation. To realize the potential of prairie-focused innovation that works across agriculture and is farmer-centric will take strategic alignment between academic research objectives and industry R&D priorities.

"When you combine the brilliance of academics with the urgent needs that industry brings, that results in outcomes," said a panelist during the Fall 2022 launch of the Manitoba Digital

Agriculture Table's Strategic Roadmap.

This roadmap, which was created with input from 184 experts across industry and academia, identifies fostering industry and academic alignment to increase research and development partnerships as a strategic priority to increase Manitoba's competitive advantage. While industry and academia share a strong desire to collaborate, more can be done to align priorities and share resources and knowledge.

In industry, solutions are developed and implemented quickly compared to academia where researchers dive deeply into long term

solutions. Yet we know that as the number of R&D projects between researchers and industry partners increases, so do opportunities to strengthen economic and environmental resilience in the Prairies and across Canada.

To address this, the Canadian Agri-Food Asset Map (CAFA), which EMILI launched in May 2023 in partnership with University of Manitoba researchers Dr. Jim House and Dr. Erin Goldberg, is designed to foster connections and expand knowledge and expertise across the agri-food industry. This comprehensive, interactive map highlights Canada's agri-food assets, making it easier for researchers, companies, and industry partners to find connections, collaborate, and share knowledge and resources.

On EMILI's Innovation Farms, industry, producers, and academics work together to validate new technologies in a commercial setting to demonstrate whether or not they can effectively solve prairie issues at a broad-acre scale. EMILI has been conducting research on Rutherford Farms (the site of Innovation Farms) since 2019.

For example, EMILI is working with the TerraByte research team at the University of Winnipeg to develop a publicly accessible database of labelled images of plants and weeds which will be used to train machine learning models for Prairie-centric plant phenotyping, disease assessment, and weed management.

PROJECT SPOTLIGHT

A growing network of smart farms

In May 2023, EMILI joined the Pan-Canadian Smart Farm Network, increasing opportunities to support the advancement of digital agriculture and expanding the reach of work taking place on Innovation Farms. Members of this network work collaboratively to increase sustainability and on-farm productivity. For example, by using the same weather stations across the network, members are able to strategically share best practices and findings across diverse agricultural regions in Canada to inform profitable crop production decisions from field to field.

The Pan-Canadian Smart Farm Network currently encompasses six regions across four provinces with access to 15,000+ acres. Members of this network include:

- Olds College
- Lakeland College
- Discovery Farm Langham
- University of Saskatchewan Livestock and Forage Centre of Excellence
- Lethbridge College
- EMILI
- Manitoba Beef and Forage Initiatives (MBFI)
- Discovery Farm Woodstock

"Together, we're able to better access and apply innovative technologies and best practices that enhance productivity, reduce costs, and increase profitability by sharing our knowledge and lessons learned."

Joy Agnew, Vice-President of Research at Olds College

Jacqueline Keena, Rick Rutherford, and Ray Bouchard developed Innovation Farms to provide innovators across industry and academia access to leading-edge equipment, technology, and production practices.

Enabling prairie-focused innovation

EMILI is committed to empowering digital entrepreneurs by connecting them with resources and support.

EMILI seeks alignment and collaboration to accelerate knowledge mobilization between industry R&D priorities and academic research, as seen in these projects.

Imaging prairie crops and weeds in collaboration with University of Winnipeg

EMILI's longest running project at Innovation Farms, Machine Learning to Grow Digital Agriculture, has generated a massive, labeled dataset of over 2.5 million images of prairie crops and weeds, informing the development of machine learning algorithms and deep neural networks able to – for example – detect diseases and differentiate between similar plants and weeds.

This has informed the development of an autonomous 24-hour EAGL-I imaging system that produces, labels, and uploads hundreds of thousands of images to a publicly accessible database; a self-propelled, GPS-guided R-Tech data rover designed to enable rapid collection of plant images; as well as environmental data over the full life cycle of the crop. Data collected will be trained for applications such as "see-and-spray" weed identification, phenotyping, yield analysis and weed control.

AI for weed management and detection in collaboration with Geco Engineering

EMILI is using drone flights and satellites to collect imagery on kochia and wild oat to assess the performance of Geco's techniques for

proactive weed management to help farmers predict weed locations and detect emerging herbicide resistance earlier.

Computer vision and phenotyping of peas in collaboration with University of Winnipeg and the National Research Council of Canada

We are developing image collections of pea plants and their root systems in order to apply machine learning to better differentiate plants and weeds and test the associations between Rhizobium inoculation and pea growth. Rapid phenotyping pipelines will allow pea breeders to select for increased resilience and higher yields faster than previously possible.

Calculating soil organic carbon in collaboration with Farm Credit Canada, Holos, and Tata Consulting Services

Historical data input into AgExpert Field provides a low-touch way to estimate soil organic carbon. This will help estimate Innovation Farm's carbon footprint using the farm management activities entered and tracked. By harnessing the combined potential of these two innovative solutions, EMILI will be able to drive sustainable practices, improve resource utilization, and enhance overall farm productivity.

Fusarium head blight risk mapping in collaboration with University of Manitoba

We are collecting and grading grain samples in areas identified by risk models to examine the available tool created by University of Manitoba researchers, and Metos Canada's disease model subscription accessed through an on-farm weather station.

ECOSYSTEM SPOTLIGHT

EMILI is proud of the work taking place across Manitoba to advance innovation and research in the prairies. Two examples that stand out from 2023 are:

The University of Manitoba's Prairie Crops and Soil Research Facility aims to become Canada's leading field crop research and innovation resource. The great work they will be able to undertake in this facility was a topic of discussion when a group of 20 University of Manitoba researchers toured Innovation Farms this summer.

Assiniboine Community College (ACC) is building their Prairie Innovation Centre for Sustainable Agriculture in Brandon. EMILI collaborates with ACC on developing data literacy training programs, increasing work- integrated learning opportunities, testing new technologies to ensure they work on a full-scale farm, and sharing Innovation Farms data with students to inform the projects they are working on.

"We are committed to sharing insights learned through our collaborations on Innovation Farms and across the ecosystem to optimize decision-making, increase skills and knowledge, and expand the development and adoption of ag tech tools for economic and environmental sustainability across the Prairies."

Jennifer Cox, Communications Manager

91,900+
youth engaged in digital agriculture

1000+
attendees at Agriculture Enlightened

170+
HQP* jobs created

100+
industry-academia partnerships

47+
Iot sensors across Innovation Farms

Working together, we can increase the integration of intelligent technologies, empower people with digital skills, and support startups to grow in the prairies.

$220k+
funding towards 15 agtech companies

5,500+
acres for agtech demos

133+
HQP* trained

180+
Industry-partnerships formed

405+
participants at 17 Digital Ag Tables

- EMILI was founded in 2016 by business and academic leaders with a common goal of growing the economy with a specific focus on digital agriculture in the prairies.

- We are an industry-led, non-profit committed to growing a sustainable and economically resilient digital agriculture industry.

- We are based in Manitoba with projects and partnerships that span the country.

- We support projects and people working to accelerate innovative technologies and increase digital agriculture skills and training.

HQP: highly qualified personnel

Collaborating with producers, industry, and academia allows EMILI to accelerate the adoption of intelligent technologies like artificial intelligence and machine learning to drive economic prosperity through innovation and provide people with the skills and training required in a digital economy.

Working together we can increase the integration of intelligent technologies, empower people with digital skills, support startups to grow in the prairies, and accelerate Canada's growth as a leader in digital agriculture.

This document was prepared by EMILI (Enterprise Machine Intelligence Learning Initiative), reprinted February 2024.

EMILI

- EMILICanada.com
- @EMILICanada
- @EMILICanada
- info@EMILICanada.com